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Ştefan Cristian Gherghina

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Editorial

Corporate Finance

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Corporate finance deals with the financing and investment decisions set by the corporations' management in order to maximize the value of the shareholders' wealth. However, due to the separation of ownership and control, managerial goals are pursued at the expense of the shareholders. Stockholder prosperity is enlarged through financial managers making rational investments, financing, and dividend resolutions. Moreover, for the longstanding success of the corporation, the board should be operative and be jointly accountable.

Corporate finance is concerned with the efficient and effective administration of the company funds so as to accomplish the aims of that business, comprising forecasting and monitoring the supply of capital (where funds are brought up), the distribution of funds (where resources are directed), and the supervision of resources (whether funds are being used effectively or not) (Watson and Head 2016). Corporate finance is grounded on three principles, namely the investment principle (establishes where corporations invest their funds), the financing principle (manages the mixture of funding—debt and equity—laid down to finance the investments), and the dividend principle (sets the amount of earnings that should be reinvested back into the firm and how much should be repaid to the owners of the corporation) (Damodaran 2014). The supreme objective is to augment wealth for the supplier of capitals, especially stockholders (Vernimmen et al. 2018). Therefore, the secret of triumph in financial management is to increase value (Brealey et al. 2018). Legally, managers have a fiduciary obligation to the owners, which imply that management should prioritize the interests of the shareholders over their own (Parrino et al. 2011). However, due to the split of ownership and control, corporations encourage managerial goals at the expense of shareholders (Ross et al. 2015). Such a dispute is an entitled agency problem (Ross et al. 2017). Corporate governance addresses the challenges that ensue from the division of proprietorship and management, being focused on the internal structure and guidelines of the board of directors, the formation of independent audit committees, standards for information reporting to stockholders and lenders, as well as management oversight (Fernando et al. 2018). Therefore, corporate governance regulates and monitors corporate behavior, considers the interests of stakeholders, pledges for a trustworthy enterprise conduct, and has the final purpose of reaching the utmost level of efficiency and profitability for the company (Plessis et al. 2011). In this regard, corporations are responsible to the entire society, upcoming generations, and the natural world (Solomon and Solomon 2004).

This book comprises 19 papers published in the Special Issue entitled "Corporate Finance", focused on capital structure (Kedzior et al. 2020; Ntoung et al. 2020; Vintilă et al. 2019), dividend policy (Dragotă and Delcea 2019; Pinto and Rastogi 2019) and open market share repurchase announcements (Ding et al. 2020), risk management (Chen et al. 2020; Nguyen Thanh 2019; Štefko et al. 2020), financial reporting (Fossung et al. 2020), corporate brand and innovation (Barros et al. 2020; Błach et al. 2020), and corporate governance (Aluchna and Kuszewski 2020; Dragotă et al. 2020; Gruszczyński 2020; Kjærland et al. 2020; Koji et al. 2020; Lukason and Camacho-Miñano 2020; Rashid Khan et al. 2020), covering companies

worldwide (Cameroon, China, Estonia, India, Japan, Norway, Poland, Romania, Slovakia, Spain, United States, Vietnam), as well as various industries (heat supply, high-tech, manufacturing).

Capital structure policies are among the essential part driving the orientation of decisions that fulfill several contradictory objectives which demanding stakeholders place before a financial director (Agarwal 2013). With regard to the papers concerning capital structure, Vintilă et al. (2019) established that factors such as tangibility, growth, size, or liquidity have an important influence on long-term and short-term debt rates of corporations part of the technology industry and listed on the New York Stock Exchange. Furthermore, Kedzior et al. (2020) concluded that liquidity, firm age, and investments in innovativeness determine capital structure of companies listed in the Warsaw Stock Exchange that are classified as high-tech firms. For a sample consisting of 888 Spanish unlisted small and medium size firms, Ntoung et al. (2020) proved that most family companies use less debt financing than non-family firms, and therefore preserve a lower level of debt.

Dividend decisions are a kind of financing decision that influence the amount of earnings that a corporation allocates to stockholders against the portion it holds and reinvests (Baker 2009). Amid the topic of dividend policy, Dragotă and Delcea (2019) suggested an agent-based model for assessing the duration of systematically making bad decisions and noticed that this period can be very long. For a balanced data covering 424 companies out of the NIFTY 500 NSE-index, Pinto and Rastogi (2019) found that corporations with a larger size, higher interest coverage ratio and profitability, but low business risk and debt, are likely to distribute higher dividends in India. In addition, a different way to pay cash to investors is through a share repurchase or buyback (Berk and DeMarzo 2017), the frequent method being open market share repurchase whose approval is granted by the board of directors or subsequent to a shareholders meeting (Vermaelen 2005). The paper of Ding et al. (2020) documented for the case of the United States that, compared with companies which do not repeat share repurchase announcements, corporations that reiterate their share repurchase programs register higher growth opportunities, have more free cash flows, are more profitable, less undervalued, larger, and show significantly lower cumulative abnormal announcement period returns.

Corporations encounter an extensive variety of risks that can influence the outcome of their activities (Hopkin 2017). Nevertheless, the financial risk that ensues from uncertainty can be handled (Crouhy et al. 2006). In addition, to pay off purchases of resources and services for the daily operation of business, companies require cash (Paramasivan and Subramanian 2009). Concerning the papers regarding risk, Nguyen Thanh (2019) explored 306 non-financial companies listed on the Vietnam Stock Exchange and highlighted that a proportion of cash holding within a threshold of 9.93% can contribute to improvement of the company's efficiency. By means of a sample of 1625 multinational companies out of the United States, Chen et al. (2020) proved that pension incentive should promote executives to more actively manage firms' risk. For 497 companies operating in Slovakia in the heat supply industry, Štefko et al. (2020) supported that the data envelopment analysis (DEA) method is an appropriate alternative for predicting the failure of the explored sample.

Inside and outside stakeholders use the financial reports for taking decisions (Gibson 2007). With reference to the manuscripts regarding financial reporting, Fossung et al. (2020) emphasized, based on a questionnaire distributed to 80 professional accountants drawn mostly from the Institute of Chartered Accountants of Cameroon (ONECCA), that financial statements prepared in conformity with the International Financial Reporting Standards (IFRS) are more suitable in presenting a true and fair view.

The essential features that outline the corporate brand as a distinct field are intangibility, complexity, and responsibility (Ind 1997), whereas its subjects are the whole persons interested in the merchandise offer (Ormeño 2007). Corporate branding enables companies to use their culture and values as an advertising instrument and as a guarantee of value to the market (Roper and Fill 2012). In this respect, the study of Barros et al. (2020) demonstrated that the concept of brand relationships covers three dimensions: trust,

commitment, and motivation. Furthermore, the transformation of governance structure can influence the outcomes regarding innovation by assigning managers focused on innovation, by supporting investments in the scientific and technological sector, and by appealing associates in the share capital so as to take on fresh business initiatives and hence alleviate perils (Rangone 2020). The paper of Błach et al. (2020) focused on small and medium-sized enterprises (SMEs) in the European Union and found that SMEs from the new member states try to catch up with SMEs from nations with a higher level of development, concentrating on product innovations.

With the purpose of preserving rightfulness and reliability, corporate management needs to be effectively responsible to some independent, experienced, and inspired delegate (Monks and Minow 2004) so as to balance the interests of varied stakeholders (Minciullo 2019). In this respect, corporate governance deals with how the board of a corporation acts and specifically how it sets the values of the firm (Simpson and Taylor 2013). The board of directors manage and govern a company and, accordingly, an effective board is vital to the success of the corporation (Mallin 2013). Among the papers related to the corporate governance, Dragotă et al. (2020) investigated 36 companies listed on the Bucharest Stock Exchange and noticed the political inference in Chief Executive Officer (CEO) turnover decision. Furthermore, Aluchna and Kuszewski (2020) explored declarations of conformity for a sample of 155 companies listed on the Warsaw Stock Exchange and revealed a negative and statistically significant association among corporate governance compliance and company value. Lukason and Camacho-Miñano (2020) explored 77,212 private SMEs from Estonia and showed that the presence of woman on the board, higher manager's age, longer tenure, and a larger proportion of stock owned by board members lead to less-likely violation of the annual report submission deadline, but in turn, the presence of more business ties and existence of a majority owner behave in the opposite way. With reference to boardroom gender diversity, the manuscript of Gruszczyński (2020) explored 1194 companies out of 18 European countries and found that female presence on a board is not significantly related to firm performance. As regards the influence of corporate governance on earnings management, Kjærland et al. (2020) found for a sample of 168 companies listed on the Oslo Stock Exchange that board independence and share ownership by directors positively influence earnings management, whereas board activity and directors as majority shareholders did not reveal a statistically significant effect. With reference to the impact of corporate governance on firm performance, Koji et al. (2020) explored 1412 Japanese manufacturing firms and established that institutional shareholding and foreign ownership promote the performance of both family and non-family companies. Rashid Rashid Khan et al. (2020) concluded for 2248 Chinese A-listed firms a positive moderating effect of corporate governance quality and ownership concentration on the connection between agency cost and firm performance, whilst non-state (state) ownership of companies positively (negatively) moderates the agency–performance link.

As a final remark, the set of manuscripts covered by this Special Issue broadened the knowledge on corporate finance worldwide and proposed fascinating future research directions.

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Article

Optimal Cash Holding Ratio for Non-Financial Firms in Vietnam Stock Exchange Market

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Abstract: The purpose of this research is to investigate whether there is an optimal cash holding ratio, in which firm's performance can be maximized. The threshold regression model is applied to test the threshold effect of the cash holding ratio on firm's performance of 306 non-financial companies listed on the Vietnam stock exchange market during the period of 2008–2017. Experimental results showed that a single-threshold effect exists between the ratio of cash holding and company's performance. A proportion of cash holding within a threshold of 9.93% can contribute to improvement of the company's efficiency. The coefficient is positive but tends to decrease when the cash holding ratio passes the 9.93% check point, implying that an increase in cash holdings ratio will continue to diminishment of efficiency eventually. Therefore, the relationship between cash holding ratio and firm's performance is nonlinear. From this result, this paper provides policy implications for non-financial companies listed on the Vietnam stock exchange market in determining the proportion of cash holding flexibly. In detail, non-financial companies listed on the Vietnam stock exchange market should not keep the cash holding ratio over 9.93%. To ensure and enhance the company's performance, the optimal range of cash holding ratios should be below 9.93%.

Keywords: cash holding ratio; firm's efficiency; threshold regression model; non-financial companies; Vietnam stock exchange market

1. Introduction

The amount of cash held plays an important role in most companies because it provides the ability to pay in cash and directly affects the performance of the company. The amount of cash held by the company is understood as cash and cash equivalents such as bank deposits and short-term securities which are able to be quickly converted into money (Bates et al. 2009; Ferreira and Vilela 2004). If the company holds a large amount of cash, the opportunity cost will arise. However, if a company holds too little cash, it may not be enough to cover the regular expenses. Therefore, the amount of cash held by the company must be sufficient to ensure regular operations solvency, contingency for emergencies, and also future projections (if needed). Dittmar and Mahrt-Smith (2007) stated that in 2003, the sum of all cash and cash equivalents represented more than 13% of the sum of all assets for large US firms. Al-Najjar and Belghitar (2011) found that cash represents, on average, 9% of the total assets for UK firms. In Vietnam context, the cash and cash equivalents account for more than 10% of total assets of firms. Thus, cash represents a sizeable asset for firms. Cash management may therefore be a key issue for corporate financial policies.

Regarding this topic, the first studies looked at antecedents of corporate cash holdings (Ferreira and Vilela 2004; Kim et al. 1998; Opler et al. 1999; Ozkan and Ozkan 2004). Most of these papers assume that cash holding is determined by the firm characteristics (i.e., leverage, growth opportunities, cash flow, investment in fixed assets, and size of the firm) and industry sector. In addition, Sheikh and Khan (2016) showed that cash holding is determined not only by the firm characteristics but

also by the manager characteristics (i.e., age, gender, whether or not the manager is a chief executive officer, and whether or not the manager is a board director). Besides, corporate governance may also affect the value of a firm's cash holdings. Evidence by Dittmar and Mahrt-Smith (2007) shows that investors value the excess cash holdings of well-governed firms at nearly double the value of the poorly governed firms.

Despite the increasing amount of literature on corporate cash holding, there are not many studies focusing on the relationship between cash holding and company performance. At the same time, corporate cash holdings have benefits and costs for the firm and, consequently, an optimum cash level may exist at which the performance of the firm is maximized. Evidence by Martínez-Sola et al. (2013) shows that in US industrial firms there exists an optimal cash holding ratio. This finding is also consistent with Azmat (2014), which found the existence of optimal cash level for a sample of listed Pakistani firms. Following this optimal level, firms will adjust their cash reserve to maximize firm value. On the other hand, most of the research work has been carried out in developed economies and very little is known about the cash holding of firms in developing economies.

According to Horioka and Terada-Hagiwara (2014), Asian firms are heavily constrained by borrowing limits and will hold more cash for future investments than firms in developed countries. Hence, our focus on an emerging country, Vietnam, allows us to offer a number of new insights beyond the existing studies of the relationship between cash holdings and firm's performance. In Vietnam context, given the great opportunities and challenges now, companies need to focus on cash management, as lifeblood of the company. Therefore, the current question for listed companies on the Vietnam stock exchange market is how to manage cash in order to improve operational efficiency and contribute to increase of the company's value. To solve this problem, listed companies on the Vietnam stock exchange market need to know how the cash holding ratio affects the firm's performance.

In this study, the goal is to indicate to what extent the cash holding ratio will have a positive effect on increase of the company's performance and to what extent the cash holding ratio will have a negative effect on reduction of company's performance. Different from previous studies, this study applies the threshold regression model of Hansen (1999) to build the model to investigate the impact of cash holding ratio on the performance of the listed companies on the Vietnam stock exchange market. The results show empirically that an optimum level of cash holdings exists where firm's performance is maximum, for a sample of 306 listed non-financial Vietnamese companies during 2008–2017. Deviations from the optimum level reduce firm value. It means that firms should balance the costs and benefits of cash holdings to find the optimal cash level to maximize firm's performance and value. If a firm has a cash holding above or below the optimal level, its performance and value will decrease. The results of this study can help managers of listed companies on the Vietnam stock exchange market to adjust the cash holding ratio to improve operational efficiency and contribute to the increase of the company's value.

To the best of author's knowledge, until now, there has been no published research on the application of threshold regression model to study this relationship. Hence, by using the threshold regression model developed by Hansen (1999), this study further fills the gap in the literature on the behavior of firms, and focuses on evidence of cash policies and firm's performance.

The paper includes five parts: Section 1 introduces research issues; Section 2 presents a theoretical overview and a research model; Section 3 presents data collection and methods; Section 4 presents the results of empirical research; the final section summarizes the findings and implications for cash management.

2. Literature Reviews and Hypothesis

Making a decision to hold an amount of cash in the company will affect efficiency or dynamics and corporate value. Each company has different reasons for holding cash; according to previous studies, there are major motives for the company to hold cash, that is:

Trading motive: Cash is the mean of exchange, so companies need cash to conduct daily transactions; however, the demands for cash of different companies are not the same (Bates et al. 2009; Opler et al. 1999). According to Nguyen et al. (2016), when firms have insufficient internal funds or liquid assets, they will raise funds from external capital markets, liquidate existing assets, limit dividend payouts, and reduce investment opportunities. However, all of these activities are costly.

Prevention motive: In addition to keeping cash for daily transactions, companies also need cash reserves for unexpected spending needs. According to Ferreira and Vilela (2004), the company holds cash to finance financial or investment activities when other resources are unavailable or very costly; however, each company has various demands for cash reserves in obtaining different objectives depending on situations.

Signal motive: Because of information asymmetry between managers and shareholders, managers will signal the prospects of the company to investors through their dividend payment policy. According to Harford (1999), the payment of dividends is more positive than the purchase of treasury shares by cash, because dividend payment generates a signal of a commitment to a higher dividend payment in the future; meanwhile, buying treasury securities is considered to be this year's event only, and should not continue in the next year.

Represent motive: Managers can decide whether the company will withhold cash or pay dividends to shareholders. The free cash flow might increase discretion by managers, which goes against shareholders' interest (Jensen 1986). The study of Harford (1999) confirmed that companies with large amounts of cash tend to spend a lot of money to conduct numerous acquisitions. Furthermore, the study of Blanchard et al. (1994) provided evidence that firms do not pay dividends during a period of time but making zero acquisitions will spend their cash in many other investment activities.

The corporate cash holding determinants have been a subject of explanation in the framework of three theories, namely the trade-off model, pecking order theory, and free cash flow theory.

The free cash flow theory suggests that managers hold cash to serve their own interests, thus increasing the conflict between investors and company's managers (Harford 1999; Jensen 1986). The theory of free cash flow also highlights the representative cost of holding cash. Companies with high growth opportunities have high agency costs, so they will tend to store more cash in order to be proactive in their capital. If there is a conflict between management and shareholders, management tends to store as much cash as possible to pursue their goals. Cash can be paid not only for making profits, but also for projects where investors are not ready to raise capital. Moreover, the board can also hold cash because of risk aversion.

The pecking order theory of Myers and Majluf (1984) suggests that managers can decide the order of capital financing to minimize the cost of information asymmetry and other financial costs. This theory implies that companies prefer internal financing. The directors adjust the dividend payout ratio to avoid the sale of ordinary shares, preventing a major change in the number of shares. If external funding is available, Myers and Majluf (1984) believed that the safest securities should be issued first. Specifically, debt is usually the first security to be issued and equity sold outside is the last solution. However, Myers and Majluf (1984) also argued that there will be no optimal level of cash holdings, but holding cash should serve as a buffer between retaining profits and investment needs.

The trade-off theory suggests that companies can finance by borrowing or retaining cash and they all have their advantages and costs. With the trade-off theory, also called transaction cost model of Opler et al. (1999), the company can determine a level of cash holdings by balancing the marginal cost of holding highly liquid assets and the profit margins of holding cash. Profit margins of cash holdings will reduce the likelihood of financial distress, allowing the company to make optimal investments and avoiding the costs incurred by external funding or liquidation of assets of company. Because the market is imperfect, it is difficult for companies to access the capital market or to bear the cost of external funding. The marginal cost of holding cash is the opportunity cost of holding cash when it offers less benefit than investing in an equal risk condition (Ferreira and Vilela 2004; Opler et al. 1999). When companies need cash to meet their expenses, they need external funding from the capital market

or liquidate their assets. Since the capital markets are imperfect, transaction costs can be avoided by holding an optimal cash level.

Based on the benefits and costs of holding cash, there have been a few recent studies on the relationship between the amount of cash held and the performance or value of the company. The real impact of cash on firm's performance or value is still being debated on the basis of empirical theory and evidence, creating many different perspectives.

The first view is that a high ratio of cash reserves will reduce the performance or value of the company. Supporting this point of view, Harford (1999) examined the relation between a firm's acquisition policy and its cash holding. It was shown by the results that firms with a large amount of cash are more likely to make acquisitions that will decrease operational efficiency and firm value. The results of this empirical study are explained based on the theory of free cash flow. It means that managers of firms with a large amount of cash desire to increase the scope of their authority. In another study, Harford et al. (2008) concluded that firms with poor governance will spend more cash than other similar firms since the entrenched managers will prefer to overinvest rather than reserving cash for firms. Therefore, firms with a high level of cash holdings will have a lower firm performance or value.

The second opinion supports the existence of a positive relationship between business value and the amount of cash held. Saddour (2006) studied the relationship between firm's value and the amount of cash held on the French stock exchange market in the period of 1998–2002. The results indicate that high cash reserves will increase operational efficiency or company's value. Similarly, Bates et al. (2009) also found evidence that firms hold more cash when firms' cash flow becomes riskier. This evidence strongly supports the precautionary motivations of cash holdings and implies a positive relationship between firm value and cash holdings.

The third view believes in a nonlinear relationship between cash holding and firm's performance or value. Supporting this perspective, Martínez-Sola et al. (2013) used US industry's data from 2001 to 2007, and found a nonlinear relationship between cash holding ratio and company's value. They explained that the concave relationship between cash holdings and firm value exists because firms balance the costs and benefits of cash holdings to identify the optimal level of cash. Following this optimal level, firms will adjust their cash reserve to maximize the firm value. This result was also discovered earlier by Azmat (2014), who found the existence of optimal cash level for a sample of listed Pakistan firms from 2003 to 2008. In Vietnam, Nguyen et al. (2016) investigated the nonlinear relationship between firm value and corporate cash holdings in a sample of non-financial Vietnamese firms from 2008 to 2013. Authors focused on both static and dynamic regressions to test for a nonlinear relationship. Their results reveal an "inverse U-shape" relationship between firm value and cash holdings, which is in line with the trade-off theory.

According to the trade-off theory, in the context of Vietnam firms, author still expect there is a nonlinear relationship between cash holdings and company's performance. Agreeing with thes studies above, for this relationship, we set the hypothesis as following:

Hypothesis 1 (H1): *There is a nonlinear relationship between cash holdings and company's performance in Vietnamese listed non-financial companies.*

3. Data and Methodology

3.1. Data and Sample Collection

Data includes the annually audited financial statements which can be collected from the website: https://vietstock.vn/. The companies selected for the sample are active non-financial companies, with full financial reporting for the period of 2008–2017. With this sampling method, data collected includes 306 non-financial companies operating in the 2008–2017 period. Consequently, the final dataset is a strongly balanced panel dataset, which includes 3060 firm-year observations of 306 companies (306 companies × 10 periods = 3060 observations).

3.2. Variables

3.2.1. Dependent Variable

When studying the relationship between firms' cash holdings and performance, to measure firms' performance, Shinada (2012) used the return on asset (denoted by ROA). Iftikhar (2017) and Vijayakumaran and Atchyuthan (2017) also used the ROA to measure company's performance. Agreeing with these above studies, we used the book value to calculate firms' performance. The measurement of firms' performance was defined as below:

$$\text{ROA} = \frac{\text{Profit before tax and interest}}{\text{Total assets}} \tag{1}$$

3.2.2. Threshold and Explanatory Variables

There are two categories of explanatory variables in our panel data and threshold regression model. One is the threshold variable, which is the key variable used to assess the optimal cash holding ratio of a firm and to capture the threshold effect of cash holding on company's performance.

The threshold variable is a variable. When the threshold variable is bigger or smaller than the threshold value (γ), the samples can be divided into two groups, which can be expressed in different slopes β_1 and β_2. The explanatory variable is a variable, reflecting its impact on the dependent variable. In the threshold regression model, explanatory variable impacts are not fixed but depend on the threshold value of the threshold variable.

In this study, the measurement of threshold and independent variables through the cash holdings ratio (denoted by CASH) was performed. Following previous studies (Azmat 2014; Martínez-Sola et al. 2013; Nguyen et al. 2016; Opler et al. 1999; Vijayakumaran and Atchyuthan 2017), the cash holdings ratio was calculated as cash and cash equivalents divided by total assets. We used the book value to calculate the cash holdings ratio. The measurement of firms' cash holdings ratio was defined as below:

$$\text{CASH} = \frac{\text{Cash and cash equivalents}}{\text{Total assets}} \tag{2}$$

3.2.3. Control Variables

On the basis of previous studies (Azmat 2014; Martínez-Sola et al. 2013; Nguyen et al. 2016; Vijayakumaran and Atchyuthan 2017), our threshold regression model includes several additional variables to control for a set of firm-specific characteristic that are likely to be correlated with company's performance. These include firm size (denoted by SIZE), leverage (denoted by LEV), and firm's growth (denoted by MB). The following section will analyze interconnection between these variables relative to company's performance.

Firm size (SIZE): According to Dang et al. (2018), in empirical corporate finance, the firm size is commonly used as an important, fundamental firm characteristic. They examined the influences of employing different proxies (total assets, total sales, and market capitalization) of firm size. The results show that, in most areas of corporate finance, the coefficients of firm size measures are robust in sign and statistical significance. In addition, the coefficients on repressors other than firm size often change sign and significance when different size measures are used. Therefore, the choice of size measures needs both theoretical and empirical justification.

The firm size is considered one determinant of firm performance and value. Abor (2005) and Vijayakumaran and Atchyuthan (2017) suggested that enterprises of higher size generally have higher firm performance. On the other hand, researches by Cheng et al. (2010), Martínez-Sola et al. (2013), and Nguyen et al. (2016) suggest that enterprises of higher size generally have lower firm performance and value. Thus, the relationship between the size and the performance of companies is unclear. To measure the firm size, there exist different perspectives. According to Azmat (2014), Nguyen et al. (2016), and Vijayakumaran and Atchyuthan (2017), the firm size is defined by a natural logarithm

of total assets. Further, Martínez-Sola et al. (2013) showed that the firm size is defined by natural logarithm gross sales. In this study, we only used the book value of total asset to calculate the firm size. The measurement of firm size was defined as below:

$$\text{SIZE} = \text{Ln}(\text{Book value of Total assets}) \tag{3}$$

Growth (MB) is considered to be a factor related to firm performance. Abor (2005) suggested that enterprises of higher growth opportunities generally have higher profitability. On the other hand, researches by Nguyen et al. (2016) suggest that enterprises of higher growth generally have lower firm performance and value. In addition, Vijayakumaran and Atchyuthan (2017) suggested that sales growth is not significantly related to firm performance. Thus, the relationship between the growth and the firm performance is unclear. To measure growth, there exist different perspectives. According to Abor (2005), Nguyen et al. (2016), and Vijayakumaran and Atchyuthan (2017), growth is defined by the growth rate on operating sales. Further, Cheng et al. (2010) showed that growth is defined by the growth rate of operating sales and growth rate of total assets. In this study, growth was measured by market value over the book value of stocks. The measurement of growth was defined as below:

$$\text{MB} = \frac{\text{Market value of stocks}}{\text{Book value of stocks}} \tag{4}$$

Leverage (LEV) is considered one determinant of firm performance and value. Abor (2005), Nguyen et al. (2016), and Vijayakumaran and Atchyuthan (2017) suggested that enterprises of higher leverage generally have lower profitability. On the other hand, researches by Martínez-Sola et al. (2013) suggest that enterprises of higher leverage generally have higher firm value. In addition, the empirical results by Cheng et al. (2010) strongly indicate that triple-threshold effect exists between leverage and firm value. Thus, the relationship between the leverage and the firm performance is unclear. To measure leverage, there exist different perspectives. According to Abor (2005), Azmat (2014), and Nguyen et al. (2016), leverage is defined by total debt over total assets. Further, Martínez-Sola et al. (2013) and Vijayakumaran and Atchyuthan (2017) showed that leverage is defined by total debt over total equity. In this study, we only used the book value of total debt and total asset to calculate leverage. The measurement of leverage was defined as below:

$$\text{LEV} = \frac{\text{Market value of total debt}}{\text{Book value of total assets}} \tag{5}$$

3.3. Models and Estimation Methods

This study aimed to test whether there is an optimal threshold between the cash holding ratio and company's performance. According to the trade-off theory, the optimal ratio of cash holdings is determined by a trade-off between marginal cost and profit margin of cash holdings (Opler et al. 1999). Therefore, this study assumed the existence of an optimal ratio of cash holdings, and tried to use the threshold regression model to estimate this ratio. To test the hypothesis, this study applied the threshold regression model of Hansen (1999). Single-threshold and multi-threshold models were based on the threshold regression model of Hansen (1999) as follows.

The single-threshold regression model was shown as:

$$\text{ROA}_{i,t} = \begin{cases} \mu_i + \theta' \text{H}_{i,t} + \beta_1 \text{CASH}_{i,t} + \varepsilon_{i,t} \text{ if } \text{CASH}_{i,t} \le \gamma \\ \mu_i + \theta' \text{H}_{i,t} + \beta_2 \text{CASH}_{i,t} + \varepsilon_{i,t} \text{ if } \text{CASH}_{i,t} > \gamma \end{cases}, \tag{6}$$

where $\theta' = (\theta_1, \theta_2, \theta_3)'$ and $\text{H}_{i,t} = (\text{SIZE}_{i,t}, \text{MB}_{i,t}, \text{LEV}_{i,t})$; $\text{ROA}_{i,t}$ represents for firm's performance, measured by profit before tax and interest on total assets; $\text{CASH}_{i,t}$ represents the proportion of cash held by the company, measured by the ratio of cash and cash equivalents on total assets; ($\text{CASH}_{i,t}$) is the explanatory variable and also the threshold variable, estimated at each different threshold;

$H_{i,t}$ are control variables that affect company performance, including company size ($SIZE_{i,t}$), company growth ($MB_{i,t}$) and leverage ($LEV_{i,t}$); θ_1, θ_2, and θ_3 are the estimated regression coefficients of the corresponding control variables; γ is the value of the estimated threshold; μ_i is a fixed effect representing the heterogeneity of companies operating under different conditions; β_1 and β_2 are regression coefficients of the proportion of cash held by the company; the error $\varepsilon_{i,t}$ is assumed to be independent and has a normal distribution $\left(\varepsilon_{i,t} \sim \text{iid}(0, \sigma^2)\right)$; i represents different companies; t represents different periods.

According to Hansen (1999), for estimating procedures, this study first removed the fixed effect (μ_i) by using the techniques of estimating "internal transformation" in a traditional fixed-effects model for panel data. By using the ordinary least square estimation method and minimizing the sum of squared error ($S_1(\gamma)$), the test can obtain the estimation of the threshold value ($\hat{\gamma}$) and the residual variance ($\hat{\sigma}^2$).

For testing procedures, this research first tested the hypothesis that there is no threshold effect ($H_0: \beta_1 = \beta_2$), using the likelihood ratio: $F_1 = (S_0 - S_1(\hat{\gamma}))/\hat{\sigma}^2$, where S_0 and $S_1(\hat{\gamma})$ are the sum of squared error under hypothesis H_0 and the opposite hypothesis ($H_1: \beta_1 \neq \beta_2$), respectively. However, since the asymptotic distribution of F1 is not normal, we used the bootstrap procedure to determine critical values and probability values (*p*-value). When the *p*-value is less than the desired condition value, we reject the H_0 hypothesis.

When a threshold effect exists ($\beta_1 \neq \beta_2$), Hansen (1999) considered that γ is consistent with γ_0 (actual value of γ) and asymptotic distribution is not normal at a significant level. Therefore, we needed to check the asymptotic distribution of the estimated threshold with the hypothesis $H_0: \gamma = \gamma_0$, by applying the likelihood ratio: $LR_1 = (S_1(\gamma) - S_1(\hat{\gamma}))/\hat{\sigma}^2$ with asymptotic confidence intervals of $c(\alpha) = -2\log(1 - \sqrt{1-\alpha})$, where α is the significance level (1%, 5%, and 10%). With the significance level α and $LR_1(\gamma_0) > C(\alpha)$, we can reject the hypothesis $H_0: \gamma = \gamma_0$, meaning that the actual threshold value is not equal to the estimated threshold value.

If there exists a double threshold, the model can be modified as follows:

$$ROA_{i,t} = \begin{cases} \mu_i + \theta' H_{i,t} + \beta_1 CASH_{i,t} + \varepsilon_{it}, & \text{if } CASH_{i,t} \leq \gamma_1 \\ \mu_i + \theta' H_{i,t} + \beta_2 CASH_{i,t} + \varepsilon_{it}, & \text{if } \gamma_1 < CASH_{i,t} \leq \gamma_2, \\ \mu_i + \theta' H_{i,t} + \beta_3 CASH_{i,t} + \varepsilon_{it}, & \text{if } CASH_{i,t} > \gamma_2 \end{cases} \quad (7)$$

where $\gamma_1 < \gamma_2$. This can be extended to multi-threshold models $(\gamma_1, \gamma_2, \gamma_3, \ldots, \gamma_n)$.

According to Li (2016), in econometrics, the endogeneity problem arises when the explanatory variables and the error term are correlated in a regression model, leading to biased and inconsistent parameter estimates. Particularly, this problem plagues almost every aspect of empirical corporate finance. To solve for the endogeneity problem, among all the remedies, the generalized method of moments (GMM) has the greatest correction effect on the coefficient, followed by instrumental variables, fixed-effects models, lagged dependent variables, and control variables.

Earlier literature on corporate cash holdings showed that there exist problems of endogeneity and omitted variable bias (Ozkan and Ozkan 2004). The endogeneity problem might arise in cash literature for several reasons. For example, firm-specific characteristics are not strictly exogenous, and have shocks affecting firm performance as well as influencing dependent variable CASH like size and leverage. Additionally, the presence of dependent variables may be correlated with past and current residual terms. To solve for the endogeneity problem that appears in the empirical analysis of cash holdings and firm value, Martínez-Sola et al. (2013), Azmat (2014) and Nguyen et al. (2016) applied the dynamic regression model—GMM estimation.

The threshold regression methods by Hansen (1999) were developed for non-dynamic panels with individual specific fixed effects. Least squares estimation of the threshold and regression slopes was proposed using fixed-effects transformations. This method has the disadvantage that the independent variables in the model are exogenous assumptions, which may in fact be endogenous. Therefore,

this method explicitly excludes the presence of endogenous variables, and this has been an impediment to empirical application, including dynamic panel models.

4. Results and Discussions

4.1. Descriptive Statistics for Variables in the Model

Table 1 below presents descriptive statistic for the variables in the model. All of these variables were calculated based on the financial information collected from the balance sheet and income statement of 306 non-financial companies listed on the Vietnam stock exchange market in the period of 2008–2017.

Table 1. Descriptive statistic of variables.

Variables	Observations	Mean	Median	SD	Min	Max
ROA	3060	0.0955	0.0850	0.0991	−1.6451	1.1362
CASH	3060	0.1049	0.0625	0.1189	0.0001	0.9546
SIZE	3060	26.6859	26.6279	1.4318	22.6384	31.6017
MB	3060	1.1012	0.8640	0.8965	0.1001	9.2005
LEV	3060	0.4852	0.5043	0.2306	0.0056	0.9982

Note: ROA represents company performance, measured by profit before tax and interest on total assets; CASH represents the percentage of cash held by the company, measured by the ratio of money and cash equivalents to total assets; MB represents company growth, measured by market value over book value of stocks; SIZE represents company size, measured by Ln (total assets); LEV represents company leverage, measured by total debt over total assets.

The statistical results described in Table 1 showed that the average ROA is 9.55%, indicating that in average with 1 VND (VND commonly refers to Vietnamese đồng, the currency of Vietnam) of capital used annually, firms can generate about 0.0955 VND profit before tax and interest. The average cash holding ratio (CASH) is 10.49%, indicating that cash and cash equivalents account for 10.49% of the company's total assets. The average firm's size is 26.6859, equivalent to 389 billion VND, the ratio of market value to book value is 1.1012 on average, and the average leverage (LEV) is 48.52%. Observation numbers, median values, standard deviations, and minimum and maximum values of variables are also presented in Table 1.

4.2. Stationary Test Results of Variables in the Model

In fact, the threshold regression model of Hansen (1999) is an extension of the ordinary least squares (denoted by OLS) traditional estimation method. This method requires that all variables considered in the model must be stationary variables to avoid spurious regression. This study uses the Levin et al. (2002) and Im et al. (2003) standards to test the stationarity of variables in the model. By using STATA software with the dataset described in Section 4.1, the results of the unit root test and stationarity test of the variables are shown in Table 2 below.

Table 2. Unit root test results.

Variables	LLC		IPS	
	t-Statistic	*p*-Value	*z*-Statistic	*p*-Value
ROA	−8.6771	*** 0.0000	−3.4253	*** 0.0000
CASH	−9.4776	*** 0.0000	−5.3907	*** 0.0000
SIZE	−7.6484	*** 0.0000	−2.2162	** 0.0133
MB	−17.2837	*** 0.0000	−3.5020	*** 0.0000
LEV	−13.0545	*** 0.0000	−2.9177	*** 0.0018

Note: LLC and IPS are unit root tests of Levin et al. (2002) and Im et al. (2003) respectively. *** and ** give 1% and 5% significance, respectively.

Table 2 shows that according to LLC and IPS accreditation standards, all variables representing profitability (ROA), cash holding (CASH), scale (SIZE), growth (MB), and leverage (LEV) are stationary sequence and statistically significant at 1% and 5%. Thus, the use of these variables in the threshold regression model is completely acceptable.

4.3. Threshold Regression Results

This study used GAUSS software and applied the bootstrap method to obtain an approximation of F-statistics and then calculated *p*-value. *F*-statistics include F1, F2 and F3, to evaluate H_0 hypotheses for zero, one, and two thresholds, respectively. Table 3 provides results of single-threshold, double-threshold and triple-threshold tests.

Table 3. Test results of threshold effect of cash holding ratio on firm's performance.

Threshold Value	*F*-Statistics		Test Critical Values		
	***F*-Statistic**	***p*-Value**	**1%**	**5%**	**10%**
Single-threshold test					
0.0993	21.3377	*** 0.004	18.1411	14.3497	12.8103
Double-threshold test					
0.0993					
0.1715	10.1255	0.156	17.4561	13.5491	17.4561
Triple-threshold test					
0.0722	7.4726	0.334	18.1409	13.1731	10.6866
0.0993					
0.1715					

Note: *F*-statistics and *p*-value were obtained by executing a repeating bootstrap procedure 500 times for each bootstrap test. *** indicates significance at 1%.

First of all, this study examined the existence of a single-threshold effect. By using bootstrap to perform 500 times, the obtained F1-statistics and *p*-value are 21.3377 and 0.004 (<1%), respectively. This suggested that the null hypothesis is rejected at the 1% significance level. Next, this study examined the existence of a double-threshold effect. Similarly, using bootstrap to perform 500 times, the obtained F2-statistics and *p*-value are 10.1255 and 0.156 (>10%), respectively. This suggested that the hypothesis that a double threshold is rejected. Finally, this study examined the existence of a triple-threshold effect. Similarly, by using bootstrap to perform 500 times, F3-statistics are 7.4726 and the *p*-value is 0.334 (>10%). This showed that the triple-threshold hypothesis is rejected.

Thus, the results of the threshold effect test showed that there is a single-threshold effect on cash holding and company efficiency. Figure 1 below shows the construction of confidence intervals for a single-threshold model.

Table 3 above presents the estimated values of the single threshold at 0.0993. The first-step threshold estimate is the point where the $LR_1(\gamma)$ equals zero, which occurs at $\hat{\gamma}_1 = 0.0993$. All observations in the sample were divided into two sets by the CASH threshold variable (above and below the threshold value of $\gamma = 0.0993$). Accordingly, this study identified two modes formed by threshold values from 0 to 9.93% and above 9.93%.

Table 4 shows the estimated coefficients, standard deviations according to the OLS, and White Methods for two models mentioned above. When the cash holding ratio (CASH) is smaller than 9.93%, the estimated coefficient $\hat{\beta}_1$ is 0.4078 and statistically significant at 1%, indicating that ROA will increase by 0.4078% when the cash holding ratio increases by 1%. When CASH is higher than 9.93%, the estimated coefficient $\hat{\beta}_2$ is 0.1556 and statistically significant at 1%, indicating that ROA will increase by 0.1556% when CASH increases by 1%. The results showed that the ROA regression coefficient by CASH is not a fixed value but depends on each threshold of cash holding ratio. Thus, it is clear that the relationship between cash holding ratio and operational efficiency (slope values)

varies according to different changes in cash holding ratio. This suggested the existence of a nonlinear relationship between cash holding ratio and company's performance.

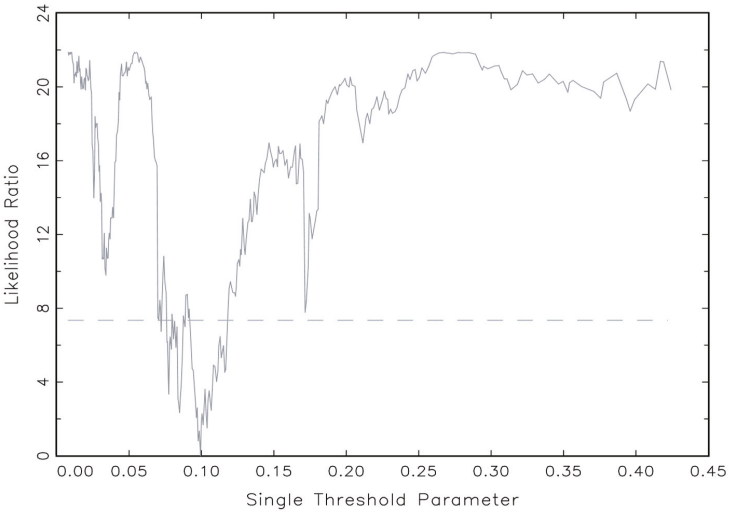

Figure 1. Confidence interval for the single-threshold model.

Table 4. Estimated results of regression coefficient for the cash holding ratio.

Regression Coefficient	Estimated Value	OLS SE	t_{OLS}	White SE	t_{White}
$\hat{\beta_1}$	0.4078	0.0670	*** 6.2620	0.0801	*** 5.4124
$\hat{\beta_2}$	0.1556	0.0187	*** 8.8011	0.0340	*** 5.1182

Note: $\hat{\beta_1}$ and $\hat{\beta_2}$ are the coefficients of the cash holding ratio variable corresponding to each value of the threshold. *** indicate the meaning of 1% respectively.

Table 5 shows the estimated coefficients, the standard deviation according to the OLS, and White methods of three control variables, company size, growth, and leverage.

Table 5. Estimated results of coefficients for control variables.

Regression Coefficient	Estimated Value	OLS SE	t_{OLS}	White SE	t_{White}
$\hat{\theta_1}$	0.0135	0.0021	*** 5.7517	0.0032	*** 3.7767
$\hat{\theta_2}$	−0.0169	0.0042	*** −5.8027	0.0057	*** −4.9657
$\hat{\theta_3}$	−0.1146	0.0153	*** −7.4835	0.0199	*** −5.7470

Note: $\hat{\theta_1}$, $\hat{\theta_2}$, and $\hat{\theta_3}$ are the estimated coefficients of company's growth (MB), company's size (SIZE), and leverage (LEV). *** indicates significance at 1%.

Table 5 above shows the estimated coefficients, the standard deviation according to the OLS, and White methods of three control variables, company size, growth, and leverage.

Table 5 shows that the estimated coefficient of company's growth $\hat{\theta_1}$ is 0.0135 and has a positive relationship with ROA at the 1% level, implying that company's growth is a motivation to increase company efficiency. This result is consistent with empirical research by Abor (2005). Meanwhile, the estimated coefficient of company's size $\hat{\theta_2}$ is −0.0169 and is inversely related to ROA at the 1% level. This implied that scaling up the company is not an incentive to increase company efficiency. The empirical finding is consistent with Cheng et al. (2010), Martínez-Sola et al. (2013), and Nguyen

et al. (2016). At the same time, the estimated coefficient of company's leverage $\hat{\theta}_3$ is −0.1146 and is inversely related to ROA at the 1% level, suggesting that the use of more debt capital in the capital structure is harmful to firm's performance. This finding is consistent with the finding of Abor (2005), Nguyen et al. (2016), and Vijayakumaran and Atchyuthan (2017).

From Tables 4 and 5, the estimated model can be rewritten as follows:

$$\mathrm{ROA}_{i,t} = \begin{cases} \mu_i + 0.0135MB_{i,t} - 0.0169\mathrm{SIZE}_{i,t} - 0.1146\mathrm{LEV}_{i,t} + 0.4078\mathrm{CASH}_{i,t} + \varepsilon_{i,t} \text{ if } \mathrm{CASH}_{i,t} \le 9.93\% \\ \mu_i + 0.0135MB_{i,t} - 0.0169\mathrm{SIZE}_{i,t} - 0.1146\mathrm{LEV}_{i,t} + 0.1556\mathrm{CASH}_{i,t} + \varepsilon_{i,t} \text{ if } \mathrm{CASH}_{i,t} > 9.93\% \end{cases}.$$

Table 6 below shows the number of companies in each threshold by year.

Table 6. Number of companies in each threshold by year.

Year	$\mathrm{CASH}_{i,t}$ of ≤9.93%		$\mathrm{CASH}_{i,t}$ of >9.93%	
	Number	Percentage (%)	Number	Percentage (%)
2008	212	69%	94	31%
2009	189	62%	117	38%
2010	197	64%	109	36%
2011	193	63%	113	37%
2012	195	64%	111	36%
2013	179	58%	127	42%
2014	184	60%	122	40%
2015	186	61%	120	39%
2016	202	66%	104	34%
2017	211	69%	95	31%
Total	**1948**	**64%**	**1112**	**36%**

Table 6 shows that about 64% of companies fall into the category of having a cash holding ratio within the threshold of 9.93% (meaning that about 179 to 212 companies fall into this threshold each year), and about 36% companies fall into the threshold of having a cash holding ratio above 9.93% (meaning that about 94–127 companies fall into this threshold each year).

5. Conclusions and Recommendations

The decision on the cash holding ratio could have a significant impact on firm's performance and value. This study used the threshold regression model of Hansen (1999) to examine the threshold effect of cash holding ratio on the performance of 306 listed non-financial companies in the Vietnam stock exchange market during the period of 2008–2017. ROA was used to represent company performance, and the ratio of money and cash equivalents on total assets (CASH) was used to represent the company's cash holding ratio.

Experimental results showed that the single-threshold effect exists between the ratio of cash holding and company's performance. In addition, the coefficient is positive when the cash holding ratio is less than 9.93%, which means a proportion of cash holding within this threshold could contribute to improvement of company's efficiency. The coefficient is positive but tends to decrease when the ratio of cash holdings is higher than 9.93%, implying that an increase in cash holdings ratio beyond this threshold will further reduce the company's performance. Therefore, this result might conclude that the relationship between cash holding ratio and firm's performance is a nonlinear relationship. These results are consistent with the trade-off theory, in that the optimal cash holding ratio is determined by a trade-off between marginal cost and profit margin of cash holdings (Opler et al. 1999). At the same time, this result is also consistent with some previous empirical research (Azmat 2014; Martínez-Sola et al. 2013; Nguyen et al. 2016). Among the control variables, firm size and leverage have a significant negative effect on company's performance whereas market-to-book value ratio of stocks has a significant positive effect on company's performance.

From the research results above, this study suggested a few recommendations for non-financial companies listed on the Vietnam stock exchange market in deciding the cash holding ratio as follows: Firstly, companies should not hold cash more than 9.93% of total assets. To ensure and improve the company's performance, the optimal range of cash holding ratio should be below 9.93%. Secondly, for companies that currently have a cash holding ratio higher than 9.93%, it is necessary to reduce the cash holding ratio to approach the optimal ratio as discussed above. In order to accomplish this task, it is necessary to identify the factors that affect the motive of holding cash, thereby having specific policies to adjust the cash holding ratio more suitable for each specific group of companies. From this idea, we will conduct research on the factors that affect the cash holding motive for each group of companies at each specific cash holding rate threshold. Hopefully, our next research results will provide practical suggestions in determining the optimal percentage of cash holdings to improve firm's performance and value.

This study has used panel threshold regression by Hansen (1999), that is, for non-dynamic panels, studies can be conducted by using extended threshold panels (for dynamic panels and considering the issue of endogeneity) and for more rigorous results. This would be a worthwhile subject for future research.

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Sectoral Analysis of Factors Influencing Dividend Policy: Case of an Emerging Financial Market

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Abstract: This study aims to determine whether a firm's dividends are influenced by the sector to which it belongs. This paper also examines the explanatory factors for dividends across individual sectors in India. This longitudinal study uses balanced data consisting of companies listed on the National Stock Exchange (NSE) of India for 12 years—from 2006 to 2017. Pooled ordinary least squares (POLSs) and fixed effects panel models are used in our estimation. We find that size, profitability, and interest coverage ratios have a significant positive relation to dividend policy. Furthermore, business risk and debt reveal a significantly negative relation with dividends. The findings on profitability support the free cash flow hypothesis for India. However, we also found that Indian companies prefer to follow a stable dividend policy. As a result of this, even firms with higher growth opportunities and lower cash flows continue to pay dividends. We also find evidence that dividend policies vary significantly across industrial sectors in India. The results of this study can be used by financial managers and policymakers in order to make appropriate dividend decisions. They can also help investors make portfolio selection decisions based on sectoral dividend paying behavior.

Keywords: dividend policy; emerging market; industrial sectors; NSE India; panel data

JEL Classification: C33; G11; G35

1. Introduction

All investors expect a certain amount of return on their investment for the risk taken. Firms can allocate profits to their stockholders either through dividends or share repurchases. Investors can get a return on their investment through dividends (current income). Alternatively, if a company has a lucrative investment opportunity available, it may not distribute its profits. The outlay in a profitable venture will also increase the value of a company, resulting in capital gains (future income) to investors. Theoretically, both dividend payout and retention lead to shareholder wealth maximization. Thus, as concluded by Miller and Modigliani (1961), investors should not differentiate among dividends and retaining profits. However, Miller and Modigliani's assumptions of a perfect capital market, no taxes, certainty, and fixed investment strategy does not really exist.

Certain studies consider that the dividend decision influences the value of a firm (Walter 1963), and is interlinked with the firm's investment policy. Researchers also theorize that generally, investors are risk-averse and give preference to receive certain dividends rather than uncertain capital gains, which are riskier. It is referred to as the "bird-in-hand" argument, as investors prefer current income rather than future income (Gordon 1963). Also, the tax treatment of dividends and capital gains is different. Furthermore, tax preference determines the stocks selected by investors, depending on the

stocks' specific dividend policies. It is denoted as the "clientele effect." However, Allen et al. (2000) report that dividends are not used by managers to attract investor clientele.

The signaling theory by Solomon (1963) and Ross (1977) suggests that dividend policy gives information about a stock. Dividends can be distributed out of profits, and require the existence of free cash flows; hence, the payment of dividends provides a positive signal to investors (Bhattacharya 1979; Miller and Rock 1985). According to Jensen (1986), the agency cost of the free cash flow model predicts that companies with larger free cash flows tend to distribute higher dividends rather than investing in projects with a lower net present value (NPV). It also assumes that such firms also take a higher amount of debt, which involves the payment of fixed interest charges. The obligation on the part of the company to make timely payments of principal and interest will ensure that the company does not invest in less profitable investment opportunities, and thus helps in reducing agency cost.

Various factors influencing a firms' dividend policy have been evaluated by researchers. The outcome of these studies has not entirely resolved the controversies linked to dividend decision. Hence, it is not astonishing that "dividend controversy" has been listed by Brealey and Myers (2002) as one among ten of the most important unsolved corporate finance problems. Also, the determinants of dividend decision are not uniform across firms. Nevertheless, researchers have reported that determinants of dividends vary across countries and over different periods of time e.g., (Ramcharran 2001). Studies have also reported that variations in dividends across countries occur because of differences in economic policy for each country, including corporate governance policy (Mitton 2004; Sawicki 2009) and pertinent laws applicable (La Porta et al. 2000b; Sawicki 2009).

Emerging and developed markets also differ in many ways. Glen et al. (1995) report that dividends in emerging market firms are more volatile than U.S. firms. Aivazian et al. (2003b) find that country-specific factors have an impact in determining dividend policies in emerging markets. They have also reported that compared with U.S. firms, higher dividends are paid by emerging market firms, which itself is puzzling. Reddy and Rath (2005) have also reiterated that dividend behavior in emerging markets has not been evaluated extensively. Hence, it is necessary to evaluate the dividend paying behavior of emerging market firms in further detail.

Lintner (1956) postulates that sectors influence the dividend policy. This sectoral influence is mainly because firms belonging to a sector have similar earnings prospects, investment prospects, and accessibility of resources. As a result of these similarities, firms in the same sector have similar dividend policies (Michel 1979; Baker 1988; Dempsey et al. 1993). However, very limited studies have evaluated the variances in dividend policy behavior across sectors. Also, the economy has undergone multiple changes, thereby altering this relationship. Furthermore, these studies have focused on developed markets.

Considering the above facts, this paper contributes to the existing literature in two ways. Firstly, it provides insight into the dividend policy issue for an emerging market. India has developed as the fastest expanding major economy across the globe, and hence it is considered for the purpose of this study. It is attracting many major economies for strategic investments, owing to the presence of an immense variety of industries, investment prospects, and increasing integration into the global economy. Secondly, this study strives to bridge a significant gap in the existing literature by evaluating the dividend behavior across industrial sectors.

The remaining paper is organized as follows. Section 2 appraises the present literature, develops the hypotheses and also provides an ephemeral overview of the Indian economy and its implication on dividend-paying behavior; Section 3 defines the source of our data and the variables involved, and also lays down the construction, relevance, and validity of the tools and techniques used for empirical analysis; Section 4 presents and discusses the outcomes from the analysis of collected data; and Section 5 provides the summary and conclusion of the paper.

2. Review of Literature and Institutional Background

Dividend policy is a crucial corporate finance decision, which is interrelated to financing and investing decision. The existing literature has identified various dividend policy determinants. However, researchers agree that there is no solitary description of the dividend-paying behavior of firms. In fact, the more we look at the dividend behavior of firms, the more it seems like an unresolved "dividend puzzle" (Black 1976). Ooi (2001) has also cited that although dividend payout is considered as a vital management decision, it continues to puzzle managers, researchers, and investors. The puzzle circles around the factors influencing the dividend payout and whether investors pay attention to dividends?

2.1. Factors Affecting Dividend Policy

Lintner (1956) has reported that managers give importance to the stability of dividends. They do not like to cut or omit dividends. Instead, companies generally set a target payout ratio and consider current years' earnings and dividend of the previous year as essential dividend policy determinants. Present as well as future earnings, the stability of earnings, and shareholders' needs are considered as essential factors for dividends by Indonesian firms (Baker and Powell 2012).

Al-Najjar and Kilincarslan (2017) have reported that publicly listed firms in Turkey generally adopt long-term payout ratios, and hence the stability of the dividends is followed (comparatively less than the developed markets of the U.S.). They also report that the concentration of ownership affects the target payout ratios. Mehar (2005) has stated that dividends are related positively to insider ownership and inversely to liquidity for Pakistan listed firms.

Kevin (1992) finds that a change in profitability does not influence the dividends of Indian companies, as they tend to follow a sticky dividend policy. Mahapatra and Sahu (1993) have found that Lintner's model finds no support in the Indian context. They establish that mainly cash flows and then the net earnings are essential for a dividend payout in India. However, Bhat and Pandey (1994) surveyed the finance directors of the Economic Times 250 top Indian firms, and found that dividend payment depends on present and future earnings, as well as preceding years' dividend per share. Hence, these findings explain that Lintner's model is applicable in India. Mishra and Narender (1996) also report similar findings for state-owned-enterprises in India. Pandey and Bhat (2007) have found that restricted monetary policy leads to a reduction in dividend payments. They also report that the previous two years' dividends and the current year's dividend are significant for a dividend payout in India. However, they report an instability of dividend policies and not much of a tendency of smoothing dividends in Indian companies.

Fama and French (2001) have reported that large firms with a high profitability and low investment opportunities tend to pay dividends, and vice versa. Hence profitability, investment opportunities, and size are the three important characteristics that enable the differentiation between dividend paying and non-paying firms in the United States. These findings are consistent with studies conducted in developed economies by (Fama and French 1999; Easterbrook 1984; Benito and Young 2003; Ferris et al. 2006; Renneboog and Trojanowski 2007; Von Eije and Megginson 2008).

In addition to profitability, investment opportunities, and size, Yarram (2015) reports that dividends of Australian firms are also positively related to corporate governance. Chowdhury et al. (2014) however, report that dividend payments by Chinese firms do not indicate future profitability, but demonstrate good corporate governance.

For profitability, investment opportunities, and size, Al-Najjar (2009) report similar findings for Jordan listed firms. However, they also find that debt is inversely related to cash dividends. Yusof and Ismail (2016) also report similar findings for listed companies in Malaysia. Additionally, they also state that profitability and liquidity significantly influence dividends for Malaysia.

Bhole and Mahakud (2005) have reported that the retention ratio has a positive relation with profit after tax, investment level, borrowing cost, and rate of growth for Indian firms, and has a

negative association with borrowed funds, tax rate, and cost of equity. These results are similar to Auerbach (1982) and Bhole (2000).

Reddy and Rath (2005) have reported that more profitable companies, having lesser opportunities to invest with a larger size, are likely to distribute dividends in India. Subhash Kamat and Kamat (2013) have reported that for Indian companies, the tangibility of assets, size, and earnings are significant for determining payout policies. The results are consistent with (Fama and French 2001; DeAngelo et al. 2004; Denis and Osobov 2008).

Setia-Atmaja (2010) has found that firms controlled by families pay higher dividends because of the existence of a larger proportion of independent directors, for publicly listed Australian companies. Gul (1999) has reported that government ownership is positively associated with debt financing and dividends for Shanghai-listed companies.

Extending the Baker and Wurgler (2004) theory of catering incentive to increase and decrease in dividend payments, Li and Lie (2006) have reported that companies tend to pay more dividends if they are profitable and large, and have low past dividend yield, debt ratio, cash ratio, and price-to-book ratio. Baker et al. (2007, 2013) have reported that firm size, profitability, investment opportunities, and catering incentives are essential factors for Canadian firms. Tangjitprom (2013) finds the support of catering theory of dividend in Thailand.

2.2. Factors Affecting Dividend Policy—A Comparison across the Globe

La Porta et al. (2000a) compare the dividends for 33 countries across the world. They report that the dividend payout is higher in countries that have a stronger system of investor protection. However, in such countries, the payout is lower for those companies who have high growth opportunities. Ramcharran (2001) has examined the differences in dividend yields for twenty-one emerging market economies (including India) from 1992–1999. The study found that in countries with a higher country risk, firms tend to have lower dividend payouts to use cash flows for financing future growth opportunities.

Aivazian et al. (2003b) have compared the factors influencing the dividends of emerging market firms with U.S. firms. The results show that the level of dividends paid by emerging market companies is similar to U.S. firms, excluding Turkey (because of the imposition of legal constraints). Also, a similar relationship is found between dividend policy and the following three variables: profitability ratio, debt ratio, and the ratio of market to book value as revealed by U.S. firms. For both size coefficient and business risk coefficient, the signs are inconsistent. Further results have shown that in comparison with the United States, the companies in six emerging market countries with higher tangible assets tend to pay lesser dividends.

Mitton (2004) states that companies having strong corporate governance and lesser investment opportunities pay higher dividends, for firms across 19 countries. Brav et al. (2005) have compared dividend payout policies in the 21st century for the United States and Canadian public and private companies. They report that the existence of good investment avenues is essential for dividend decision. Taxes are not found to be significant.

Denis and Osobov (2008) have examined the dividend payout determinants for six countries with well-established financial markets, namely: the United States, Canada, the United Kingdom, Germany, France, and Japan. In line with (Fama and French 2001), this study also confirms that firm size, growth opportunities, and profitability are significant factors that help to determine dividends. The retained surplus to total equity ratio is also established as a significant factor of dividend policy.

Brockman and Unlu (2009) have found that there exists a positive relation between creditor rights and probability to pay dividends, as well as the amount of dividend payout for 52 countries across the globe. Abor and Bokpin (2010) have evaluated the dividend policy for 34 emerging markets, and report that investment opportunity and dividends have a significant negative relationship. Furthermore, profits and the market capitalization of stock also influence dividend decision. However, additional

measures, namely, external financing, financial leverage, and debt finance, do not significantly impact the dividend payout.

Farooq and Jabbouri (2015) have found that dividends and cost of debt are negatively associated with each other for the Middle East and North African region (MENA) firms. They also report that this phenomenon is more prevalent in firms having higher information asymmetries.

2.3. Dividend Policy and Industry Influence

While selecting a payout policy, a firm considers various factors such as earnings, profitability, size, debt, cash flows, and many other economic factors as discussed above. Additionally, a firm also evaluates the payout policy of other firms in the same sector, before deciding its dividend policy. While a few past studies have evaluated the industrial sector's influence on dividend payout, there is no consensus.

Michel (1979) have evaluated twelve industries in the United States using the Kruskal–Wallis one-way analysis of variance. They have reported statistically significant variations in the dividend payouts for these sectors. Marsh and Merton (1987) also propose that firms detect industry practice before selecting a target dividend payout for themselves. However, its effect has not been tested explicitly by them. Baker (1988) has updated the study conducted by Michel. He also finds support for industry influence on dividends.

Pandey (2003) has studied the dividend payout for six industrial sectors of Malaysia. The author uses non-parametric, Kruskal–Wallis (K–W) one-way analysis of variance of ranks (Michel 1979; Scott and Martin 1975), and finds that the dividends of these companies differ across industrial sectors.

However, Baker et al. (2002) report that the company's industry type does not influence the manager's views in respect of dividends.

Mohamed et al. (2012) have suggested that the study of dividend policy can be widened by including an analysis across industries, and adding other characteristics that influence dividend policy.

2.4. Institutional Background

Major economic reforms in 1991 led the Indian economy towards economic liberalization and globalization. The major changes include the lowering of import tariffs and taxes, the deregulation of markets, and a rise in foreign investment. Also, since the formation of the Securities and Exchange Board of India (SEBI) in 1992, there has been an increase in the overall development, regulation, and supervision of the Indian stock market. As a result of significant improvements in the capital market regulations in India since the last two decades, companies can now issue shares using the book-building process, and raise funds through foreign capital. Indian companies thus have access to many alternative sources of finance, instead of relying on retained earnings. All of this has led to a change in their shareholding pattern. Accordingly, this will influence their dividend policy.

Furthermore, the Indian stock market consists of stocks covering the entire gamut—financial, industrial, and energy—thus providing exposure to a wide range of sectors. Another distinctiveness of the Indian stock market[1] is that more than 55% of the equity market is held by promoters, thereby reducing the overall free float of the stock. In order to address this peculiarity, the SEBI mandated all listed companies to raise public shareholdings to 25% by mid-2013. In the framework of this transformed economic setting, the objective of this study is to evaluate the factors influencing the dividends of companies in India across sixteen industrial sectors.

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[1] Further details on Indian stock market are available under https://www.nseindia.com/.

3. Data and Methodology

3.1. Sample Selection

The Indian stock market consists of two main stock exchanges, namely, the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE), apart from many other regional stock exchanges. Almost all of the significant Indian companies are listed on both these exchanges. We considered the data of all of the companies in NIFTY 500 NSE-index for the period of 2006 to 2017. The sample period was chosen to signify the current state of companies in India. NIFTY 500 index represents the top 500 companies listed on NSE based on full market capitalization. It represents 95.2% of the free float market capitalization of stocks listed on the NSE as of 31 March 2017[2]. The financial data of all of the companies were obtained from the Prowessdx database. The financial performance of all of the Indian companies were provided by the Centre for Monitoring Indian Economy (CMIE) in this database. It is the largest database, and the financial statements contained therein are standardized and do not suffer from any deliberate survival bias. Although data were extracted for all 500 companies, because of the absence of data for a few companies for entire time-period from 2006 onwards, the final analysis was done on 424 companies only. Outliers were also removed using a statistical three-sigma method. Hence, a balanced panel data of companies for 12-years, from 2006 to 2017, was used. Every company in CMIE is associated with an industry group. These industry groups have been formed by studying the number of companies in the clusters of industries, as per the detailed products and services classification[3]. Based on these industry group codes provided by CMIE, the 424 companies under selection have been grouped into sixteen sectors.

Total dividend divided by total assets was used to determine the dividend policy of a company, and is considered as the dependent variable in this study. The dependent variable, as well as the explanatory variables, were carefully chosen based on the literature review. Table 1 presents the number of companies considered under each industrial sector, along with the sector codes used in the paper and the sector-wise mean of the dividend/total assets (Div/TA).

Table 1. Summary of the number of companies considered under each industrial sector along with the sector codes and the sectoral mean of dividend/total assets (Div/TA). IT—information technology; ITES—IT enabled service.

Sr. No.	Sector	Sector Code	NIFTY 500	Final Sample	Mean (Div/TA)
1	Agro-based	AGRO	13	12	0.0106
2	Mineral-based	MINING	66	62	0.0173
3	Engineering	ENGG	24	21	0.0198
4	Automobile and ancillary	AUTO	27	24	0.0277
5	Power and fuel	POWER	24	21	0.0160
6	Textile	TEXTILE	13	13	0.0135
7	Drugs and pharmaceuticals	PHARMA	30	28	0.0311
8	Consumer goods and appliances	CONSGDS	39	32	0.0427
9	Other manufacturing	M-OTH	32	32	0.0185
10	Entertainment, health, and tourism	MEHH	25	18	0.0209
11	Trading/services (others)	S-OTHS	38	21	0.0217
12	Construction and infrastructure	CONSTR	29	22	0.0070
13	logistics	LOGISTICS	21	19	0.0259
14	IT, ITES, and telecommunication	ITTELE	30	26	0.0468
15	Banking	BANKING	33	32	0.0015
16	Other financial services	FINSER	56	41	0.0194
	TOTAL		500	424	

[2] A detailed description of NIFTY 500 companies is available under https://www.nseindia.com/products/content/equities/indices/nifty_500.htm.

[3] The detailed definition of all variables is available under prowess dictionary at https://prowessiq.cmie.com.

3.2. Description of Variables and Hypothesis

3.2.1. Dependent Variable—Dividend/Total Assets (Div/TA)

The following were used for determining the dividend payout policy of firms, out of four measures examined by (Aivazian et al. 2003b): dividend payout ratio, dividend yield, Div/TA, and dividend/book value per share; it was found that Div/TA is the most appropriate measure. The authors stated that the ratio of the dividend payout is extremely unstable and non-normal if the earnings reach near zero. Secondly, the dividend yield ratio uses market price, which is not in control of the management. Finally, the dividend to book value per share is prone to more misrepresentations, as it depends on the net worth of the company, which includes free reserves and can be easily distorted by companies. Compared to that, the total assets are less likely to be inaccurate (Aivazian et al. 2003b). Hence, this study also uses the total Div/TA as the dependent variable, and is referred to as dividend policy or payout policy hereafter.

3.2.2. Explanatory Variables

These are constructed on the theoretical framework of (Aivazian et al. 2003b) and an extensive literature review conducted herein. Apart from the sector, the remaining 12 explanatory variables have been broadly divided into the following three measures: operating measures (5), debt measures (3), and summary measures (4).

Sector. The Nifty 500 companies have been classified into 16 sectors. Classification into these 16 sectors is based on the CMIE classification of industry groups, as discussed in the previous sub-section. On the basis of the literature review conducted in the previous section, it is hypothesized that dividend policy differs significantly across industrial sectors.

Apart from the three operating measures as defined by (Aivazian et al. 2003b)—tangibility, business risk, and scale of operations (log of sales)—this study also considers two more operating measures—operating profit and size (log of market capitalization). The three debt measures include debt ratio, interest coverage ratio, and current ratio. Summary measures are further sub-divided into profitability, growth, and liquidity. To measure profitability, in addition to the return on equity (ROE), this study also considers the return on investment (ROI), following Reddy and Rath (2005). Mehmood et al. (2019) have also used both accounting measures, ROE and ROI, to measure profitability. Price to book value is used as a proxy for growth measure. Cash flow per share is used to measure liquidity, following Bhat and Pandey (1994) and Mohamed et al. (2012).

Table 2 defines each of these explanatory variables, now referred to as factors influencing dividend payout policy, and gives the nature of the relation expected with dividend payout policy.

3.3. Model Specifications

Firstly, we analyzed whether the dividend policy for the NSE-listed companies varies across sectors. We used a one-way analysis of variance test to analyze whether there are any statistically significant variations between the means of three or more independent (unrelated) groups. This technique tests the null hypothesis that the mean values of dividend policy are the same for all sectors. The null hypothesis is rejected if the calculated F statistics is greater than F critical value, or if the p-value is less than $\propto$, where $\propto$ denotes the level of significance.

The study then uses the panel data techniques to develop a model establishing a relation between the dividend policy and the explanatory factors. Hsiao (2003) has highlighted that using panel data sets for research provides researchers with more advantages compared with using conventional cross-sectional or time-series data sets, for example (Hsiao 1985, 1995; Hsiao and Sun 2000).

Table 2. Description of variables with expected signs. ROE—return on equity; P/B—the price-to-book value.

Variable Name	Definition	Symbol	Expected Relationship
Dividend policy	Total dividend paid divided by total assets	Div/TA	
A. Operating measures			
Tangibility	(Total assets minus current assets) divided by total assets	Tangibility	+
Business risk	Standard deviation of return on investment (ROI; lagged three years)	BusRisk	−
Scale of Operations	Natural logarithm of sales in local currency	LgSales	+
Scale of Operations	Natural logarithm of market capitalization in local currency	LgMCap	+
Operating profit	Earnings before interest and tax (EBIT) divided by total sales	OpProfit	+
B. Debt measures			
Debt ratio	Long term debt divided by total assets	DebtRatio	−
Interest coverage ratio	EBIT divided by interest	IntCover	+
Current ratio	Current assets divided by current liabilities	CurRatio	+
C. Summary measures			
i. Profitability			
Return on Equity	Net profit after tax (NPAT) divided by net worth (where net worth = equity share capital + reserves and surplus)	ROE	+
Return on Investment	EBIT divided by capital employed (CE; CE = net worth + long term debt)	ROI	+
ii. Growth measure			
price to book value ratio	Market price per share divided by book value at the end of the year	P/B	−
iii. Liquidity measure			
Cash flow per share	Net cash flow from operating activities divided by the number of equity shares outstanding	CFPS	+/−

The relation between dividend policy and the factors affecting it for selected NIFTY 500 companies and for each of the sectors is expressed in the form of an empirical model, as follows:

$$\frac{Divi,t}{TA\ i,t} = \propto i + \sum_{j=1}^{n} \beta i,j\ Xi,j,t + \varepsilon i,t \quad (1)$$

where $i = 1, \ldots, N$, where N is the number of cross-sectional units = 16 sectors, $t = 1, \ldots, T$, where T is the time period = 12 years and $j = 1, \ldots, n$, and where n is the number of explanatory variables = 12 (Hill et al. 2007). $X_{i,j,t}$ is the explanatory variable j for firm i at time t, $\beta i,j$ is the slope for explanatory variable j for sector i, $\varepsilon_{i,t}$ is the random error term for sector i at time t, $Div_{i,t}/TA_{i,t}$ is dividend-to-total asset ratio subscripted for sector i at time t, and α_i is the intercept.

Table 2 summarizes the dependent and explanatory variables, which form part of the empirical model expressed in Equation (1). For some companies, the data for LgSales, OpProfit, the price-to-book value (P/B), and CFPS are not available, hence the regression equation is estimated with the remaining variables, as the absence of this data limits the sample size of these sectors.

The major benefit of panel data is that it improves the efficiency of the econometric estimation by giving researchers more data points, which increases the degrees of freedom and reduces collinearity between explanatory variables (Gujarati 2009). Hence, this study uses the panel data technique, which will enable the maximum utilization of data by considering both cross-sectional and time-series data.

There are four basic models available in the panel data model, namely: pooled ordinary least squares (POLS), fixed effect model (FEM), random effect model (REM), and Seemingly Unrelated Regression Equations (SUR) model (Adkins 2010). For determining the most suitable panel data model, panel diagnostic tests are available in GRETL (Baiocchi and Distaso 2003). The first-panel diagnostic test being F-statistics. It suggests that if the p-value is less than alpha, then the null hypothesis is rejected, and FEM is more suitable than the POLS model. Secondly, the Breusch–Pagan test helps to determine whether POLS or REM is applicable. It suggests that if the p-value is less than alpha, then the null hypothesis is rejected, and REM is more suitable than the POLS model. If both the F-statistics and Breusch–Pagan test are found to be positive, then finally, the (Hausman 1978) test is used for determining whether FEM or REM is suitable for estimation. The SUR model is used to estimate panel data models that have large time periods and a small number of cross-sectional units

(Adkins 2010). Using these test results, we determine the appropriate model to be used for estimating the regression equation.

4. Empirical Results and Discussion

4.1. Discussion on Consolidated Regression

In this sub-section, we present our panel regression results, which identify the factors influencing the dividend policy for selected NSE companies. As discussed in the methodology section, the panel diagnostic test results are utilized to determine the appropriate panel data model. The results in Table 3 reveal that the *p*-value of F-statistics is 0.935 which is $>\propto$ (i.e., 0.05), hence we cannot reject the null. This suggests that POLS technique is more suitable than FEM (Adkins 2010; Cottrell and Lucchetti 2017). Hence, the findings are reported based on the POLS regression estimate.

Table 3. Consolidated (NIFTY 500) panel regression.

Independent Variable	Coefficients		
Constant	0.001	(0.698)	
Tangibility	0.000	(0.981)	
BusRisk	−0.011	(0.000)	***
LgSales	0.001	(0.000)	***
LgMCap	0.000	(0.034)	**
OpProfit	0.000	(0.463)	
DebtRatio	−0.036	(0.000)	***
IntCover	0.000	(0.020)	**
CurRatio	0.000	(0.000)	***
ROE	0.001	(0.004)	***
ROI	0.020	(0.000)	***
P/B	0.001	(0.000)	***
CFPS	−0.000	(0.004)	***
F-Statistics: 0.894 (0.935)		Breusch–Pagan test: 2.392 (0.122)	
Hausman test: 22.312 (0.034)		Appropriate model: POLS	
Durbin Watson = 1.845		Overall R-square = 0.147	
Number of Companies (N) = 424		Number of years (T) = 12	
No. of observations (balanced) = 5088			

Notes: Regression coefficients are estimated using pooled ordinary least squares. Dividends divided by total assets is the dependent variable. The independent variables are as follows. Tangibility is total assets minus current assets divided by total assets. BusRisk is the standard deviation of ROI (lagged three years). LgSales is the natural logarithm of sales in local currency. LgMCap is the natural logarithm of market capitalization in local currency. OpProfit is EBIT divided by total sales. DebtRatio is the long-term debt divided by total assets. IntCover is EBIT divided by interest. CurRatio is current assets divided by current liabilities. ROE is NPAT divided by net worth. ROI is EBIT divided by CE. P/B is the market price per share divided by book value per share at the end of the year. CFPS is net cash flow from operating activities divided by the number of equity shares outstanding. The *t*-statistics are given in parentheses. *** Significant at the 1% level; ** significant at the 5% level. POLS—pooled ordinary least squares.

The results in Table 3 reveal that scale of operations, interest coverage ratio, current ratio, ROE, ROI, and P/B ratio have a positive relation to the dividend policy. This suggests that companies with the larger scale of operations, higher interest coverage ratios, current ratio, profitability and growth opportunities are likely to pay higher dividends. However, there is evidence that business risk, debt ratio, and CFPS have a negative relation with dividend policy for NSE firms. This implies that firms with higher business risk, debt levels, and cash flows are likely to pay lower dividends.

The results for the scale of operations, interest coverage ratio, current ratio, ROE, ROI, business risk, debt ratio, and CFPS, except for the P/B ratio, are in line with our hypotheses. We had expected that companies having more growth opportunities would most likely pay lower dividends, but for our sample, the P/B ratio had a marginal positive coefficient. For the remaining variables—tangibility of assets and operating profit—we found no significant relationship with dividend policy.

4.2. Sectoral Influence on Dividend Policy

Table 1 shows that the highest Div/TA ratio is of the information technology (IT), IT enabled service (ITES), and telecommunication (ITTEL)-sector (0.0468), followed by the consumer goods and appliances (CONSGDS)-sector (0.0427). The logistics (LOGISTICS), automobile and ancillary (AUTO), and drugs and pharmaceuticals (PHARMA) sectors have a mean Div/TA ratio in the range of 0.025–0.03. The banking (BANKING)-sector shows the lowest ratio (0.0015), followed by the construction and infrastructure (CONSTR)-sector (0.007) and agro-based (AGRO)-sector (0.0106).

The one-way analysis of variance test was used for determining the relation between dividend policy and sectors. These results (not reported here) show that the means of the dividend policy of each of the 16 sectors vary significantly. The p-value of $0.000 < \propto$ (i.e., 0.05), hence we reject the null hypothesis. This signifies that the dividend policy significantly differs across sectors. Thus, the industrial sector influences the dividend policy in India.

4.3. Discussion on Sectoral Regression

In this sub-section, we present our panel regression results to detect the sector-wise factors influencing dividend policy. As discussed in the methodology section, the panel diagnostic test results are used to determine the panel data model favorable for each sector. As seen in Appendix A, the p-value of the F-statistics for the AGRO sector is 0.016, which is $<\propto$ (i.e., 0.05), hence we reject the null. This recommends that the FEM technique is more suitable than POLS for estimating the factors influencing the dividend policy in the AGRO-sector. The results reveal that for all other sectors, the p-value of F-statistics is greater than 0.05. Thus, for the remaining fifteen sectors, the POLS model is suitable. Accordingly, based on the panel diagnostic test results (Baiocchi and Distaso 2003), we report the findings using the FEM regression estimates for the AGRO-sector, and the POLS regression estimate for the remaining 15 sectors.

The overall R^2 is the highest for the AUTO-sector (0.82) and lowest for PHARMA-sector (0.12). For the LOGISTICS, textile (TEXTILE), and AGRO sectors, R^2 ranges between 0.61–0.67. The overall R^2 for the power and fuel (POWER), other financial services (FINSER), and ITTEL sectors lies between 0.50–0.55. Also, for the BANKING, other manufacturing (M-OTH), and CONSGDS sectors, it is between 0.44–0.46. For the remaining sectors—CONSTR, trading/services (S-OTHS), engineering (ENGG), entertainment, health, and tourism (MEHH), and mining-based (MINING)—the overall R^2 value ranges between 0.31–0.38. These overall R^2 values in the range of 0.31–0.82 suggest a good indication regarding the explanatory power of the individual sector panel regressions.

4.3.1. Operating Measures

The sector-wise panel regression in Appendix A reveals a strong positive relation between the tangibility of assets (TANG) and the dividend policy for firms from the AGRO, MINING, ENGG, TEXTILE, CONSGDS, CONSTR, and LOGIS sectors. This implies that the companies in these sectors tend to pay dividends if they have higher TANG, in line with past studies e.g., (Aivazian et al. 2003a; DeAngelo et al. 2004; Denis and Osobov 2008; Subhash Kamat and Kamat 2013). However, TANG has an inverse relation with dividend policy for firms of the BANKING-sector.

The business risk variable displays inconsistent signs. Although we find that it is inversely associated with dividends in the CONSTR, BANKING, and S-OTHS sectors, their importance is opposite in the ITTEL and FINSER sectors. This variable is found to be insignificant in the remaining sectors. A possible explanation for this is that all sectors are exposed to risks that are pertinent to their line of business and sector-specific regulations in which they function. Aivazian et al. 2003a also report mixed results for the business risk variable when comparing the dividend policy of the United States with emerging market firms.

For the scale of operations as measured by the log of sales (LgSales), although we expected a positive association with the dividend policy, the findings suggest that none of the sectors are

significantly influenced by it. The LgSales variable is not considered for panel regression estimation in the BANKING and FINSER sectors, because of the difference in revenue parameters. The log of market capitalization (LgMCap) is used to evaluate the influence of the size on the dividend payout for these sectors. Information on LgMCap was not available for all companies of the TEXTILE-sector, hence it is excluded for the panel regression estimation of this sector. The results show a positive association of LgMCap with dividends of the ENGG, AUTO, PHARMA, CONSGD, M-OTH, MEHH, and CONSTR sectors. The positive impact indicates that firms from these sectors that are greater in size are likely to pay more dividends. This is likely, as such firms can access capital markets without difficulty, thereby having lesser dependence on retained surplus, thus allowing them to distribute more dividends (Mohamed et al. 2012; Al-Najjar and Kilincarslan 2017).

Furthermore, Appendix A shows that operating profits have a positive effect on the payout policy for the MINING, POWER, and MEHH sectors. This means that the sectors reporting a poor operating income will pay lower dividends, consistent with (Li and Lie 2006). However, the results are opposite for the AUTO, M-OTH, and ITTEL sectors. A possible explanation for this could be that the firms of these sectors continue to pay dividends, although the operating profits are low, as they prefer to distribute stable dividends, as reported by (Bhat and Pandey 1994) for Indian firms.

The operating measures are used to evaluate the impact of the size/scale of operations. Many studies as discussed in the literature review have reported that larger size firms are likely to pay higher dividends. We also find that either a higher tangibility of assets/market capitalization/operating profits or lower business risk positively influences dividends. At least one or more operating measures are found to be significant for the consolidated sample and for each of the individual sectors.

4.3.2. Debt Measures

The results reveal a negative association between debt and dividend policy for the AGRO, MINING, POWER, MEHH, CONSTR, LOGISTICS, ITTEL, and FINSER sectors. This implies that sectors with high debt levels appear to pay low dividends (Aivazian et al. 2003b; Li and Lie 2006; Al-Najjar and Kilincarslan 2017). However, for the BANKING-sector, the results depict a significant positive effect. A possible explanation is that the easy availability of external sources of funds for banks enables them to pay higher dividends and rely less on retentions (Auerbach 1982; Jensen 1986; Bhole 2000; Bhole and Mahakud 2005). Furthermore, for the remaining sectors, debt levels do not significantly influence dividends. This means that the dividend policy of the ENGG, AUTO, TEXTILE, PHARMA, CONSGDS, M-OTH, and S-OTH sectors do not depend on the debt levels, as found by (Abor and Bokpin 2010; Farooq and Jabbouri 2015; Yusof and Ismail 2016).

Denis and Osobov (2008) have observed that a lower interest coverage ratio leads to the abandonment of dividend payout. We also show that the interest coverage ratio positively influences the payout policy for the TEXTILE, LOGISTICS, and BANKING sectors. However, for the remaining sectors, the results show no significant impact.

Similar to the consolidated panel estimates, the sector-wise panel results also reveal that the current ratio and dividend policy are significantly positively associated in the AGRO, MINING, ENGG, AUTO, POWER, MEHH, CONSTR, and LOGISTICS sectors. This implies that higher short-term liquidity enables these sectors to pay higher dividends.

Overall, we found that a higher interest coverage ratio and current ratio, and lower debt ratios tend to influence the dividends of Indian firms. Except for the PHARMA, CONSGDS, M-OTH and S-OTHS sectors, either of the debt measures were found to be significant.

4.3.3. Summary Measures

We found another positive relationship between profitability and dividend policy. Although this study uses two variables (ROE and ROI) to measure profitability, we found a significant positive impact of ROI in 14 sectors, but ROE shows a significant positive impact in three sectors only (MEHH, S-OTH, and LOGISTICS). In the MEHH and S-OTH sectors, the ROI variable is found to be insignificant.

The analysis thus indicates that firms having a higher profitability in these sectors are likely to distribute higher dividends. These findings support Jensen (1986)'s free cash flow hypothesis, and are consistent with prior studies e.g., (Fama and French 2001; Benito and Young 2003; Aivazian et al. 2003b; DeAngelo et al. 2004; Mitton 2004; Reddy and Rath 2005; Baker et al. 2007, 2013; Bostanci et al. 2018). However, the profitability measure may differ for each sector.

We found that the price-to-book value (P/B) ratio is significantly positively related to the dividend policy for four sectors only (AUTO, TEXTILE, LOGISTICS, and FINSER). This is consistent with studies such as (Nizar Al-Malkawi 2007; Foroghi et al. 2011; Al-Shubiri 2011; Imran 2011; Yusof and Ismail 2016). However, it is significantly negatively related to the dividend policy for the BANKING-sector only. This is in line with our expectation, and also in line with prior studies (Auerbach 1982; Easterbrook 1984; Jensen 1986; La Porta et al. 2000b; Bhole 2000; Fama and French 2001; Benito and Young 2003; Mitton 2004; Reddy and Rath 2005; Bhole and Mahakud 2005; Li and Lie 2006; Ferris et al. 2006). Information on the P/B ratio was not available for all companies of the AGRO and PHARMA sector, hence it was excluded for the panel regression estimation of these sectors.

As anticipated, we found that liquidity will be either positively or negatively related to dividend policy, depending upon the industry. Our panel regression estimates show that there is a significant positive impact of CFPS on payout policy for the CONSGDS and S-OTH sectors. This signifies that firms with a higher liquidity are likely to pay higher dividends in these sectors. However, results are opposite for the MINING, AUTO, and M-OTH sectors. This implies that companies in these sectors continuously distribute dividends, although they have fewer cash flows. Bhat and Pandey (1994) have found that in India, as companies prefer to follow a stable dividend policy, the availability of cash is not a significant factor for evaluating payout policy. The agency theory also explains the payment of dividends through borrowed funds in case of the non-availability of cash. Information on the P/B ratio was not available for all companies of the AGRO, TEXTILE, and PHARMA sector, hence it was excluded for the panel regression estimation of these sectors.

Generally, we can conclude that the factors influencing dividend policy differ across sectors in India. For the LOGISTICS sector firms, tangibility, LgMCap, debt ratio, interest coverage ratio, current ratio, ROE, ROI, and P/B ratio significantly impact the dividend policy. For the AUTO-sector firms, operating profit, LgMCap, current ratio, ROE, ROI, P/B ratio, and CFPS significantly influence payout policy. For the BANKING-sector, tangibility, business risk, debt ratio, interest coverage ratio, current ratio, ROI, and P/B ratio significantly influence the dividend policy. For the MINING-sector, firms, tangibility, operating profit, debt ratio, current ratio, ROI, and CFPS influence the dividends. In the CONSTR sector companies, tangibility, business risk, LgMCap, debt ratio, current ratio, and ROI are important dividend determinants. For the AGRO and ENGG sectors, tangibility, current ratio, and ROI influence the firms' dividend policy. Additionally, the debt ratio is an important dividend policy determinant in the AGRO sector, and LgMCap in the ENGG sector. In the CONSGDS sector, tangibility, LgMCap, ROE, ROI, and CFPS influence the dividend decision, whereas for the M-OTH sector, operating profit plays an important role instead of ROE for determining the dividend policy. For the MEHH sector, the operating profit, LgMCap, debt ratio, current ratio, and ROE influence the dividends. In the POWER sector, only four factors—operating profit, debt ratio, current ratio, and ROI—are important dividend policy determinants. For the TEXTILE sector, also only four factors—tangibility, interest coverage ratio, ROI, and P/B ratio significantly influence the payout policy. Moreover, for the S-OTHS-sector, only three factors (business risk, ROE, and CFPS), and PHARMA-sector, only two factors (LgMCap and ROI), significantly influence the payout policy. A possible explanation could be that macro-economic factors rather than firm-specific factors influence the payout policies of these sectors. Lastly, the sectoral regression results show that the scale of operations as measured by LgSales does not significantly influence the payout policy for any of the sectors in India.

5. Overall Summary and Conclusions

This study offers fresh evidence on the key determinants of the dividend policy for an emerging market economy using financial data for Indian-listed firms. This study uses pooled OLS and fixed effect panel data models to examine the factors affecting dividends.

Our findings suggest that in general, firms with a larger size, higher interest coverage ratio and profitability, and low business risk and debt are likely to distribute higher dividends in India. The results on profitability indicate the applicability of the free cash flow hypothesis in India. However, the findings also reveal that companies with more growth opportunities and lower cash flows also continue to distribute dividends. We attribute this to the condition that Indian firms prefer to maintain stability in dividend policy, such that availability of investment opportunities and the non-availability of cash is insignificant for determining dividend policy.

We also scrutinize the variation in dividend policy across sixteen industrial sectors in India. The results suggest that the factors influencing dividend policy differ across sectors. The sector-wise results show that size (either tangibility/LgMCap) is found to significantly influence payout policy in all sectors except AUTO and POWER. Also, either one or more of the debt measures (debt ratio/interest coverage/current ratio) are also found to be significant in all of the sectors, excluding PHARMA, CONSGDS, M-OTHS, and S-OTHS. For summary measures, we found that profitability has the same positive relation for all industrial sectors. Whereas growth measure and liquidity measure do not significantly influence the dividend policy in eleven sectors. Moreover, for the remaining sectors, the signs are mixed.

Hence, sectoral results suggest that there are no uniform set of factors influencing dividend policy for all sectors. Although a "one-size fits all" technique is unsuitable for evaluating the factors, our finding suggests that the dividend policies of firms across sectors are generally sensitive to size, debt, and profitability. Preferences of one variable over another may occur as a result of firm-level and sector-level effects on dividend policy recognized in past empirical research (such as Sawicki 2003). Furthermore, these findings provide unbiassed guidelines to investors regarding the factors that influence the dividend policies of Indian companies.

Lastly, the findings reveal that the majority of the theories on dividend policy that are classically based on developed markets can be applied to emerging market countries such as India, as most of the characteristics found to important in determining dividend policies in India are consistent with those established in developed economies. However, further research is needed for investigating the influence of other firm-specific characteristics, such as corporate governance policies and investor demographics, which are not included in this study.

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Appendix A

Table A1. Sector-wise panel regression.

Sector	Constant	Tangibility	BusRisk	LgSales	LgMCap	OpProfit	DebtRatio	IntCover	CurRatio	ROE	ROI	P/B	CFPS	No. of Obs. (Balanced)	Overall R Square	F-Statistics	Breusch-Pagan Test	Hausman *p*-Value
AGRO	0.022	0.017	0.024	−0.003	0.001	0.018	−0.036	0.000	0.001	−0.013	0.065	N/A	N/A	144	0.674	2.237	1.116	9.200
	(0.128)	(0.005) ***	(0.204)	(0.034) **	(0.382)	(0.101)	(0.000) ***	(0.364)	(0.073) *	−0.158	(0.000) ***	-	-			(0.016)	(0.291)	(0.513)
MINING	−0.007	0.012	−0.013	0.001	0.000	0.017	−0.025	0.000	0.001	0.000	0.058	0.000	−0.000	744	0.386	1.245	1.282	30.697
	(0.221)	(0.003) ***	(0.396)	(0.151)	(0.341)	(0.000) ***	(0.000) ***	(0.192)	(0.005) ***	(0.814)	(0.000) ***	(0.567)	(0.002) ***			(0.106)	(0.258)	(0.002)
ENGG	−0.011	0.046	−0.014	−0.004	0.003	−0.007	−0.024	0.000	0.005	−0.001	0.073	0.000	0.000	252	0.334	1.053	0.007	17.269
	(0.236)	(0.000) ***	(0.558)	(0.001) ***	(0.002) ***	(0.505)	(0.153)	(0.598)	(0.008) ***	(0.208)	(0.000) ***	(0.856)	(0.829)			(0.401)	(0.935)	(0.140)
AUTO	0.047	0.017	−0.018	0.000	0.001	−0.125	0.014	0.000	0.005	−0.002	0.216	0.001	0.000	288	0.824	0.694	1.832	11.287
	(0.001) ***	(0.135)	(0.658)	(0.936)	(0.029) **	(0.000) ***	(0.202)	(0.316)	(0.012) ***	(0.000) ***	(0.000) ***	(0.099) *	(0.000) ***			(0.851)	(0.176)	(0.504)
POWER	−0.007	0.005	−0.013	0.001	0.000	0.020	−0.030	0.000	0.000	−0.003	0.071	0.000	0.000	252	0.499	0.647	1.437	7.909
	(0.448)	(0.507)	(0.528)	(0.109)	(0.980)	(0.000) ***	(0.000) ***	(0.906)	(0.056) *	(0.819)	(0.000) ***	(0.875)	(0.250)			(0.874)	(0.231)	(0.792)
TEXTILE	−0.010	0.015	0.050	−0.001	N/A	0.000	0.003	0.000	0.000	−0.005	0.062	0.002	N/A	156	0.641	0.807	0.448	10.407
	(0.286)	(0.087) *	(0.175)	(0.303)		(0.462)	(0.740)	(0.028) **	(0.375)	(0.483)	(0.000) ***	(0.000) ***				(0.643)	(0.503)	(0.406)
PHARMA	0.011	−0.030	0.051	−0.003	0.004	−0.057	−0.017	0.000	0.002	0.005	0.159	N/A	N/A	336	0.122	0.852	0.341	9.279
	(0.819)	(0.367)	(0.279)	(0.459)	(0.033) **	(0.121)	(0.526)	(0.967)	(0.423)	(0.539)	(0.000) ***					(0.680)	(0.559)	(0.506)
CONSGDS	−0.100	0.061	0.044	0.001	0.003	−0.004	−0.005	0.000	0.005	−0.027	0.171	0.000	0.000	384	0.463	1.022	0.000	8.760
	(0.002) ***	(0.002) ***	(0.159)	(0.626)	(0.071) *	(0.920)	(0.733)	(0.896)	(0.107)	(0.031) **	(0.000) ***	(0.427)	(0.093) *			(0.438)	(0.991)	(0.723)
M-OTH	−0.053	0.025	0.001	0.000	0.005	−0.070	−0.003	0.000	0.000	0.008	0.108	−0.001	0.000	384	0.459	1.257	0.450	19.434
	(0.000) ***	(0.000) ***	(0.956)	(0.679)	(0.001) ***	(0.001) ***	(0.730)	(0.927)	(0.538)	(0.535)	(0.000) ***	(0.245)	(0.093) *			(0.168)	(0.502)	(0.079)
MEHH	−0.016	−0.003	−0.005	0.000	0.002	0.011	−0.027	0.000	0.008	0.010	−0.002	0.000	0.000	216	0.359	0.534	2.274	9.218
	(0.353)	(0.835)	(0.508)	(0.830)	(0.045) **	(0.066) *	(0.049) **	(0.167)	(0.000) ***	(0.011) **	(0.687)	(0.817)	(0.133)			(0.933)	(0.132)	(0.684)
S-OTHS	−0.018	0.008	−0.006	0.001	0.002	0.001	−0.014	0.000	0.000	0.061	0.002	0.000	0.000	252	0.316	1.494	1.611	23.513
	(0.279)	(0.396)	(0.002) ***	(0.395)	(0.114)	(0.717)	(0.379)	(0.531)	(0.909)	(0.000) ***	(0.259)	(0.122)	(0.000) ***			(0.085)	(0.204)	(0.024)
CONSTR	−0.011	0.008	−0.020	−0.001	0.002	0.002	−0.010	0.000	0.001	0.007	0.020	0.000	0.000	264	0.313	1.215	0.010	21.069
	(0.009) ***	(0.002) ***	(0.060) *	(0.127)	(0.001) ***	(0.300)	(0.005) ***	(0.626)	(0.000) ***	(0.133)	(0.005) ***	(0.424)	(0.848)			(0.239)	(0.921)	(0.049)
LOGISTICS	0.010	0.030	−0.002	0.001	−0.003	0.002	−0.044	0.000	0.001	0.014	0.027	0.003	0.000	228	0.611	0.902	0.153	15.415
	(0.372)	(0.010) ***	(0.947)	(0.279)	(0.000) ***	(0.710)	(0.000) ***	(0.000) ***	(0.005) ***	(0.001) ***	(0.054) *	(0.000) ***	(0.944)			(0.576)	(0.696)	(0.220)
ITTEL	−0.024	0.040	0.152	−0.002	0.001	−0.045	−0.047	0.000	0.002	0.005	0.223	0.002	0.000	312	0.550	1.262	0.334	27.815
	(0.376)	(0.1264)	(0.000) ***	(0.327)	(0.785)	(0.001) ***	(0.065) *	(0.807)	(0.101)	(0.611)	(0.000) ***	(0.155)	(0.481)			(0.186)	(0.563)	(0.006)
BANKING	0.000	−0.005	−0.002	N/A	0.000	N/A	0.002	0.005	0.000	−0.001	0.001	0.000	0.000	384	0.444	0.636	2.211	7.928
	(0.855)	(0.000) ***	(0.067) *		(0.694)		(0.021) **	(0.000) ***	(0.019) **	(0.319)	(0.001) ***	(0.000) ***	(0.805)			(0.936)	(0.137)	(0.636)
FINSER	−0.040	0.018	0.107	N/A	0.000	N/A	−0.022	0.000	0.000	−0.001	0.285	0.007	0.000	492	0.533	1.318	1.311	18.757
	(0.003) ***	(0.206)	(0.004) ***		(0.879)		(0.004) ***	(0.178)	(0.989)	(0.555)	(0.000) ***	(0.000) ***	(0.118)			(0.098)	(0.252)	(0.043)

Note: Sector is the industrial sector to which a company belongs based on CMIE classification. Numbers within parentheses show number of firms in each sector. Regression coefficients are estimated using fixed effect model for AGRO sector and using pooled ordinary least squares for the remaining sectors. Dividends divided by total assets is the dependent variable. The independent variables are as follows. Tangibility is total assets minus current assets divided by total assets. BusRisk is the standard deviation of return on investment (ROI) (lagged three years). LgSales is the natural logarithm of sales in local currency. LgMCap is the natural logarithm of market capitalization in local currency. OpProfit is the earnings before interest and tax (EBIT) divided by total sales. DebtRatio is the long-term debt divided by total assets. IntCover is EBIT divided by interest. CurRatio is current assets divided by current liabilities. ROE is Net profit after tax (NPAT) divided by net worth. ROI is EBIT divided by capital employed (CE). P/B is Market Price Per share at the end of the year divided by book value per share for the year. CFPS is net cash flow from operating activities divided by number of equity shares outstanding. The *t*-statistics are given in parentheses. *** Significant at the 1 percent level, ** Significant at the 5 percent level & * Significant at the 10 percent level.

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Exploring the Determinants of Financial Structure in the Technology Industry: Panel Data Evidence from the New York Stock Exchange Listed Companies

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Abstract: This paper aims to analyze the influencing factors on the financial structure of 51 companies listed on the New York Stock Exchange, in the technology industry, from 2005–2018. The objective is to see the impact of independent company-specific variables such as company size, tangibility of assets, growth opportunity, effective tax rate, current liquidity, depreciation, stock rotation, financial return, working capital, price to book value, price to earnings ratio, as well as the impact of governance variables and macroeconomic variables such as inflation rate, interest rate, market size, gross domestic product per capita. Using panel data and multiple linear regressions, we analyze the relationship between the independent variables listed above and the dependent variables, namely the total debt ratio, the long-term debt ratio and the short-term debt ratio. The results of the analysis showed that variables such as size, tangibility, liquidity, profitability have a significant influence on the dependent variables in accordance with the theories regarding the capital structure.

Keywords: financial structure; panel data; regression analysis

1. Introduction

The first decade of the 21st century has undergone major changes in the recession and boom periods. These cycles in the economy have had an important impact on the value of the company. Seeing as how an enterprise is also evaluated from the point of view of investments, both those of the past and those of the future, and in order to support these investments, it is essential to choose a financial mix. The financial decision depends on the dynamics of the business environment, whether it is in a period of growth or decrease. When a financial crisis occurs, the creditors dictate their preferred method of financing to companies. If a manager searches for capital, he should be aware of the preferences of investors and precisely respond to the conservative behavior of creditors, because they face a big dilemma, to invest or not. The firm's manager should understand their dilemma and try to attract the confidence of the investors through the firm-specific features. The effects of the Euro Crisis resulted significantly negatively related to leverage in the study of Moradi and Paulet (2019). During the financial crisis, firms which are vulnerable to the shocks in the financial markets absorb the negative impact earlier than other firms. Hence, financial difficulties can lead to bankruptcy and can be the result of wrong decisions in choosing the financial structure. The financial structure is the result of some decisions that managers take in order to support long-term investments, identifying appropriate sources of financing to contribute to the optimal development of the company. Investments were affected after the economic crisis in 2008 in different ways, depending on firm's debt structure and whether firms had access to the public debt market. Iwaki (2019) found that accessibility to the public debt market, as well as, the differences in debt structures have an important influence in investment. The author underlined the fact that bank-dependent firms faced more underinvestment after crisis

than firms with access to public debt market. Thus, the capital structure is a fundamental element of the organization. Financial resources can be divided into two broad categories, namely, equity and debt, and the financial structure can be defined as a merger between the two, more precisely, a ratio in which they are allocated. An optimal combination of these results in a reduction in the price of capital.

The empirical literature highlighted the effects of firm-specific and country-specific factors on firm leverage, such as size, growth, asset tangibility, profitability, tax shields, liquidity, earnings volatility and interest rate, inflation rate, gross domestic product etc. Capital structure decisions are affected by the firm's own characteristics and country characteristics. Previous research demonstrated that the effects of capital structure determinants are not equal across countries. Ramli et al. (2019) emphasized that the impact of firm-specific factors and country-specific differ in terms of significance, sign and intensity level in Malaysia and Indonesia. Industry-specific factors have also a contribution to capital structure decisions. Li and Islam (2019) showed that industry-specific factors can both directly and indirectly affect the capital structure choice. In terms of direct impacts, the authors showed that GDP significantly influences the capital structure. In terms of indirect impacts, their findings showed that companies tend to be more leveraged, if they operate in economically significant industries.

It is important to study which factors have an influence on the financial structure, as this in turn has an influence on the economic performance of the company. Identifying an optimal financial structure is relevant to reduce risk and increase performance. An imbalance in loans and their ability to generate financial efficiency can lead to bankruptcy. Therefore, it is vital to have a balanced report on the use of equity and borrowed capital as sources of financing, but also to know the factors and their influence in order to make a precise delimitation of the proportions. The database consists of 51 companies from the technology industry listed on the New York Stock Exchange. The companies in this sector are constantly evolving and they contribute to the change of human culture and it seems relevant to study which factors have an influence on financial structure of these companies. The studied period of time 2005–2018 is also relevant because it includes the recession period as well as the post-recession period, when the companies had to take important financial decisions in order to survive in front of the crisis

The rest of the paper proceeds as follows. Section 2 discusses the existing theories and related literature. Section 3 presents the database, selected variables and quantitative techniques. Section 4 reveals the empirical findings. The last section concludes the study.

2. Literature Review

The first theories were formulated by Modigliani and Miller (1958), who wrote in an early article that the structure of capital does not influence the value of the firm. In their article MM started from the premises that the market is perfect and there are no factors that significantly influence the market, taxation does not exist, trading costs and bankruptcy are absent. In reality this theory is not valid because the perfect market does not exist and taxation is present. After the criticisms received regarding the first theory, a few years later, Modigliani and Miller (1963) considered the possibility of revising the first hypotheses, introducing taxation and developing the first theory. MM acknowledged that taxation has an effect on debt and capital and has some advantages since interest is deductible.

Agent theory developed by Jensen and Meckling (1976) captures the idea of agency costs that arise as a result of conflicts between managers, shareholders, and creditors. These conflicts are supposed to arise due to the inconsistency of interests. Managers tend to use the firm's resources in projects that bring more personal benefits than maximizing the value of the company. Shareholders can discourage such a behavior through monitoring and control activities. However, these actions also involve costs, called agency costs. Debt can reduce agency costs and affect the performance of the company at the same time, by determining the managers to act in the interest of the company rather than in their own interest. Thus, the option of a company to be financed through debt reduces the cash flow available at the discretion of managers, reducing agency costs.

Following the same line of thinking, the trade-off theory takes into account industry-level effects, taxes, bankruptcy costs and agency issues. Kraus and Litzenberger (1973) are the ones who grounded

this theory and argue that a firm can determine its financial structure by balancing the costs and benefits related to external financing. In this theoretical approach, the leverage is considered to bring advantages, under certain conditions, and managers prefer to use debt as a source of financing instead of the available internal funds. If a company becomes too indebted, the tax savings will be higher and therefore bankruptcy costs will rise. That is why it is recommended in theory to avoid over-indebtedness and to rationalize the indebtedness index. This theory starts from the premise that there is a positive relationship between the capital structure and the performance of the enterprise.

In contrast to previous theories, the pecking order theory developed by Myers and Majluf (1984) implies an ordering of financing sources, which presents greater flexibility and lower trading costs and is based on information asymmetry between companies and creditors. Due to the fact that the company has more information about the future than the creditors, the need for monitoring increases the borrowing costs, and this encourages companies to finance with their own funds, thus the first source would be internal financing. The second source is the external financing if it is required after the exhaustion of the internal funds, first resorting to the most secure sources, that is to say, the debt, then issues of securities. As soon as the internal funds become available, it is preferable to cancel the debt before maturity. The last source is the capital increase through the issue of shares. Therefore, the pecking order theory suggests that debt has an adverse effect on performance.

Unlike the pecking order theory, where firms use internal funds to eliminate the problems of adverse selection and loss of value, where they cannot show their quality using the financial structure, the signal theory, developed by Ross (1977), which uses the capital structure as a signal of private information, starts from the information asymmetry and underlines that the managers know the truth regarding the distribution of the company's results, but the creditors do not have this information. Investors see a high degree of debt as a signal of performance, because the company is considered to have the ability to repay the debt at maturity. Therefore, by contracting a loan, managers give a signal on the market to potential investors, as well as existing ones.

The market timing theory, developed by Baker and Wurgler (2002), starts from the idea that raising capital by issuing shares depends on market performance. In corporate finance, market timing involves in practice, issuing high-priced shares and repurchasing them at a lower price, in order to benefit from fluctuations in the ratio between the cost of equity and other forms of capital.

From most of the studies I have included in this paper, I have looked at the main indicators that have proved to be of undeniable importance and influence. Among them, indicators such as tangibility, profitability, liquidity and so on can be listed.

2.1. Tangibility

A company may choose to have higher debt if it has a high tangibility ratio. A high tangibility ratio will probably also have low financial costs according to the trade-off theory. (Chaklader and Chawla 2016; Cortez and Susanto 2012; Rajan and Zingales 1995; Song 2005) obtained in their papers a positive association between tangibility and indebtedness. (Chittenden et al. 1996; Demirgüç-Kunt and Maksimovic 1999; van der Wijst and Thurik 1993) obtained a negative relationship.

2.2. Profitability

A high degree of profitability leads to a decrease in the degree of indebtedness, as it is assumed that firms will resort to indebtedness to prevent managers from spending from the available cash flow. A high level of rentability also means the ability of the company to borrow more easily. (Cortez and Susanto 2012; Krishnan and Moyer 1996; Psillaki and Daskalakis 2009; Rajan and Zingales 1995; Titman and Wessels 1988) obtained a negative association between profitability and indebtedness, while (Alipour et al. 2015; Song 2005) obtained a positive one. Chaklader and Chawla (2016) show an insignificant relationship.

2.3. Liquidity

A high degree of liquidity implies a lower degree of debt. An optimal level of liquidity presumes less requirement for borrowing and external funds, according to pecking order theory and agency theory. In contrast, based on trade-off theory, the companies should ensure an optimal level of liquidity in order to fulfil their engagement. Chadha and Sharma (2015) found that liquidity is statistically insignificant. Alipour et al. (2015) obtained a negative relationship between liquidity and leverage.

2.4. Size

It is assumed that there is a positive relationship between firm size and debt, according to trade-off theory, because larger firms are more diversified and tend to have lower variance of profits, allowing them to tolerate higher debt ratios. In contrast, pecking order theory predicts a negative relationship, due to the fact that larger firms deal with lower adverse selection and have the ability to issue equity more easily compared to small businesses. (Chaklader and Chawla 2016; Psillaki and Daskalakis 2009; Rajan and Zingales 1995; Song 2005) achieved a positive association. Alipour et al. (2015) obtained an inverse relationship, concluding that small companies have no option but to resort to bank loans. (Cortez and Susanto 2012; Viviani 2008) found the relationship between size and debt ratio insignificant.

2.5. Growth

The pecking order theory states that there is a positive relationship between growth and debt. Companies with high growth rates need sufficient funds to support their investment opportunities and internal funds are unlikely to be enough to support them. Trade-off theory states that there is a negative relationship, assets intangibility of firms with high growth rates implies the risk of losing value in case of financial distress. (Chaklader and Chawla 2016; Psillaki and Daskalakis 2009) showed that the growth variable is statistically insignificant, contrary to (Alipour et al. 2015; Cortez and Susanto 2012) who concluded that the relationship between the growth variable and the dependent variable is significantly negative.

2.6. Inflation

Chadha and Sharma (2015) found that inflation is statistically insignificant. Bokpin (2009) obtained a significant relationship. In most cases, firms will resort to internal sources of financing during periods when inflation is high, as this pressure will increase the cost of obtaining capital from creditors.

2.7. Gross Domestic Product Per Capita

The improvement of the general economy determines the companies to resort to internal sources of financing to the detriment of external sources. Bokpin (2009) obtained an inverse relationship, contrary to Bas et al. (2010), who obtained a significant positive relationship with the debt, explaining that an economic growth determines the companies to be more willing to contract the loans in order to be able to support the new investments.

2.8. The Interest Rate

The effect of the interest rate on the financing option is certainly not to be neglected, because the costs of external financing reflect the weighted average cost of capital of firms. Increasing the interest rate positively influences the choice of short-term funds, rather than opting for long-term debt. (Bas et al. 2010; Bokpin 2009) obtained a positive but statistically insignificant relationship between the two.

2.9. Effective Tax Rate

A company that has a high effective rate of corporate income tax will seek external financing to benefit from the tax deduction of interest expenses. Alipour et al. (2015) show a positive association.

2.10. Risk

Trade-off theory states that risky businesses should not be highly levered, according to this theory, there is a negative relationship between risk and debt. From pecking order theory perspective there is also a negative association between operating risk and debt. A company with high volatility in earnings is more likely to face a debt burden and to go bankrupt. Psillaki and Daskalakis (2009) obtained a negative relationship.

2.11. Corporate Governance Variables (Board Size, CEO Status)

There is a positive relationship between board size and debt. Companies with large boards are much more capable to find external funds and at the same time, financial institutions are more confident while lending firms with large size boards. Sheikh and Wang (2012) obtained a positive and statistically significant relationship between board size and debt. CEO status refers to duality of the CEO, namely when the CEO of the company serve as chairman in the board. It is expected that there is a conflict of interest when the same person serves in both positions, because that gives too much power and control. Buvanendra et al. (2017) obtained a negative statistically significant relationship between CEO duality and debt.

In all the abovementioned studies, there can be observed a pattern to be observed, since all included independent variables are related to the structure of assets, profitability, taxation. Only in a few works there were macroeconomic variables included such as inflation rate, interest rate or even the gross domestic product. The results are similar and showed that the tangibility, the profitability, the increase in size, for example, are factors with a significant influence on the financial structure. There were also variables that proved to be insignificant, but these results are also influenced by the chosen database and the processing of data in advance. Theoretically, from a broader perspective, the choice of capital structure must be viewed from three perspectives: the advantage of tax exemption, the risk assumed and the quality and type of assets. This indicates that a low-risk, high-profit firm with few intangible assets and robust growth opportunities should find a relatively high ratio between debt and equity less attractive.

3. Data and Methodology

The process of forming the database for analyzing the influencing factors on the financial structure consisted in the initial collection of the financial data of 75 companies listed on the New York Stock Exchange, companies that are part of the technology industry. Because there was not enough data for the analyzed period, 2005–2018, the database consists of only 51 companies. The financial data was taken from the Thomson Reuters databases, respectively The World Bank, from which the independent variables such as inflation rate, interest rate, gross domestic product per capita were taken.

3.1. Database Construction and Variables Presentation

The dependent variables included in the analysis are included in Table 1. I chose three dependent variables, which explain to a certain extent the financial structure, namely, the rate of total debt, the rate of long-term and short-term debt. These debt ratios show which proportion of assets are financed by debt. A high value of these ratios reveals the leverage of the company, and also the financial risk. Debt ratios vary across industries, businesses with intensive capital such as transportation sectors or telecommunications have higher debt than other industries such as technology sector.

Table 1. Dependent variables included in the empirical study.

Variable Name	Symbol	Formula	Authors
Total debt rate	TD	Total debts/total assets	Bokpin (2009), Chaklader and Chawla (2016), Psillaki and Daskalakis (2009), Su (2010), Viviani (2008)
Long-term debt rate	LTD	Long-term debt/total assets	Amidu (2007), Eldomiaty and Azim (2008), Ezeoha (2008), Hall et al. (2004), Titman and Wessels (1988), van der Wijst and Thurik (1993), Viviani (2008)
Short-term debt rate	STD	Short-term debt/total assets	Amidu (2007), Eldomiaty and Azim (2008), Ezeoha (2008), Hall et al. (2004), van der Wijst and Thurik (1993)

Source: Author's own work.

Estimating separate relationships for long-term and short-term debt rates (long-term and short-term debt over total assets) allows for an influence on the maturity of the debt structure as well as the leverage. Total assets are included as a size variable to test scale effects in the ratio of debt to total assets.

Table 2 below shows the independent variables classified according to the level of influence, namely, microeconomic, macroeconomic and corporate governance indicators.

(Barton et al. 1989; Titman and Wessels 1988) agreed that companies with high rates of profit will maintain a low rate of debt, because they are able to generate funds from internal sources, so the profitability indicator was included as a variable. Companies with very high growth rates will seek external sources of funding to support their growth rate. Auerbach (1985) also argues that the leverage is inversely proportional to the growth rate, because the tax deduction of interest expense is not significant for fast-growing firms. Michaelas et al. (1999) found a positive expected growth related to leverage and long-term debt, while (Chittenden et al. 1996; Jordan et al. 1997) found mixed evidence. Graham (1996) concluded that, in general, taxes affect the financial decisions of enterprises, but the impact is not major. Myers (1977) argues that tangible assets, such as fixed assets, can support a higher level of debt compared to intangible assets. Assets can be used as collateral to reduce potential agent costs associated with borrowing (Smith and Warner 1979; Stulz and Johnson 1985). The size of the company plays an important role in determining the financial structure of a company. Researchers have found that large firms are less likely to go bankrupt because they tend to be more diverse than smaller companies (Ang et al. 1982; Marsh 1982; Smith and Warner 1979; Titman and Wessels 1988) report a negative relationship between the debt and the size of the firms. Marsh (1982) argues that small firms, due to their limited access to the capital market, tend to rely heavily on loans. Titman and Wessels (1988) argue that small firms are less reliant on equity because they may face a higher cost per issue unit. Ooi (1999) argues that firms with relatively higher operational risk will have incentives to have a lower leverage than firms with more stable incomes. Öztekin and Flannery (2012) have observed that firms that have more liquid assets can use them as an internal alternative of funds instead of debt. I included four macroeconomic indicators, GDP per capita, inflation rate, interest rate, and market size in the study (Bartholdy and Mateus 2008; Demirgüç-Kunt and Maksimovic 1996, 1999). I also included the GDP per capita because with its growth, the countries become richer and implicitly there are more financing resources. Thus, I expect this indicator to be positively correlated with debt. Inflation provides a perspective on the stability of the national currency. Countries with a high inflation rate are associated with a high degree of uncertainty. In general, loans are nominal value contracts, and the inflation rate influences the value of loans, making them riskier. I expect the inflation rate to be negatively correlated with debt. When the interest rate increases, companies are no longer willing to resort to bank loans, because the cost of the loan is higher. Therefore, I expect the interest rate to be inversely proportional to the debt. The size of the market was included because it indicates how easy it is to access the market. The corporate governance indicators were also included in the empirical study to see if they influence the financial structure. Vintilă and Gherghina (2012) obtained mixed results regarding the relationship between the size of the board and the performance of the company. The paper had a database of 155 US companies listed from different industries and investigated the relationship between corporate governance mechanism, CEO characteristics and

company performance. It turned out that the number of board members is in a negative relationship with Tobin's Q, but in a positive relationship with ROA. From the point of view of the status of the CEO, no results have been obtained that suggest a relationship with the performance of the company, whether or not he is chairman of the board. Therefore, I expect that the size of the board, the status of the CEO and the existence of the committees will not influence the financial structure.

Table 2. Independent variables included in the empirical study.

Variable Name	Symbol	Formula	Authors
		● ***Microeconomic Indicators***	
The size of the company	Size	Natural logarithm of total assets	Chaklader and Chawla (2016), Psillaki and Daskalakis (2009), Su (2010)
Tangibility of assets	Tang	Tangible assets/total assets	Bokpin (2009), Chaklader and Chawla (2016), Cortez and Susanto (2012), Su (2010), Titman and Wessels (1988)
Growth opportunity	Growth	Sales variation	Eriotis et al. (2007), Karadeniz et al. (2009), Ooi (1999), Psillaki and Daskalakis (2009)
Effective tax rate	Etax	Tax/earnings before taxes	Karadeniz et al. (2009)
Current liquidity	Liq	Current assets/current debt	Bokpin (2009), Chaklader and Chawla (2016)
Depreciation	Depr	Depreciation of total assets (adjustments)	van der Wijst and Thurik (1993)
Stock rotation	Stock	(Stocks/turnover) × 360	van der Wijst and Thurik (1993)
Size / Proportion	Prop	Natural logarithm of turnover	Own considerations
Financial return	ROE	Net income/equity	Chaklader and Chawla (2016)
Price earnings ratio	PER	Market capitalization/net income	Own considerations
Price to book value	PBV	Market capitalization/equity	Own considerations
Working capital	WC	Current assets—current liabilities	Own considerations
		● ***Macroeconomic Indicators***	
Inflation rate	Inf_r	Inflation rate	Bokpin (2009)
Interest rate	Int_r	Interest rate—annual percentage rate	Bokpin (2009)
Gross domestic product per capita	GDP_cap	Gross domestic product/number of inhabitants	Bokpin (2009)
Market size	M_size	Market value/gross domestic product	Bokpin (2009)
		● ***Corporate governance indicators***	
Board size	Board	Number of board members	Own considerations
Remuneration Committee	C_r	Dummy variable If there is a remuneration committee = 1 If there is no remuneration committee = 0	Own considerations
Audit Committee	C_a	Dummy variable If there is an audit committee = 1 If no audit committee = 0	Own considerations
Nomination Committee	C_n	Dummy variable If there is a nomination committee = 1 If there is no nomination committee = 0	Own considerations
CEO Status	S_CEO	Dummy variable If the CEO is the chairman of the board = 0 If the CEO is not the chairman of the board = 1	Own considerations

Source: Author's own work.

The general objective is to analyze the factors which have an influence on the financial structure. Firstly, I will start from a set of hypotheses, which will be tested afterwards, in accordance with the studies mentioned above.

Hypothesis 1 (H1). *There is a positive relationship between size and debt ratio (Chaklader and Chawla 2016; Cortez and Susanto 2012; Song 2005).*

Hypothesis 2 (H2). *There is a positive relationship between tangibility and debt ratio (Chaklader and Chawla 2016; Cortez and Susanto 2012; Song 2005).*

Hypothesis 3 (H3). *There is a negative relationship between growth opportunity and debt ratio (Alipour et al. 2015; Cortez and Susanto 2012; Psillaki and Daskalakis 2009).*

Hypothesis 4 (H4). *There is a negative relationship between liquidity and debt ratio (Alipour et al. 2015; Chaklader and Chawla 2016).*

Hypothesis 5 (H5). *There is a positive relationship between the tax rate and debt ratio (Alipour et al. 2015).*

Hypothesis 6 (H6). *There is a negative relationship between profitability and debt ratio (Alipour et al. 2015; Chaklader and Chawla 2016; Cortez and Susanto 2012; Nenu et al. 2018).*

Hypothesis 7 (H7). *There is a negative relationship between inflation rate and debt ratio (Bokpin 2009; Chadha and Sharma 2015; Demirgüç-Kunt and Maksimovic 1999).*

Hypothesis 8 (H8). *There is a negative relationship between interest rate and debt ratio (Bartholdy and Mateus 2008; Chadha and Sharma 2015; Demirgüç-Kunt and Maksimovic 1999).*

Hypothesis 9 (H9). *There is a positive relationship between GDP and debt ratio (Demirgüç-Kunt and Maksimovic 1996).*

Hypothesis 10 (H10). *There is a negative relation between board size and debt ratio (own consideration).*

Hypothesis 11 (H11). *There is a negative relation between presence of audit committee and debt ratio (own consideration).*

Hypothesis 12 (H12). *There is a negative relation between presence of nomination committee and debt ratio (own consideration).*

Hypothesis 13 (H13). *There is a negative relation between presence of remuneration committee and debt ratio (own consideration).*

Hypothesis 14 (H14). *There is a negative relation between CEO Status and debt ratio (own consideration).*

3.2. Econometric Framework

The influence factors were studied based on multiple regression model, using the method of least squares, data being structured as panel type:

$$Financial\_structure_{i,t} = \alpha_0 + \alpha_1 \times Depr_{i,t} + \alpha_2 \times PBV_{i,t} + \alpha_3 \times WC_{i,t} + \alpha_4 \times Prop_{i,t} + \alpha_5 \times ROE_{i,t} + \alpha_6 \times Inf\_r_{i,t} + \alpha_7 \times C\_a_{i,t} + \varepsilon_{i,t} \quad (Model\ 1)$$

$$Financial\_structure_{i,t} = \alpha_0 + \alpha_1 \times Liq_{i,t} + \alpha_2 \times Tang_{i,t} + \alpha_3 \times M\_size_{i,t} + \alpha_4 \times GDP\_cap_{i,t} + \alpha_5 \times Int\_r_{i,t} + \alpha_6 \times C\_n_{i,t} + \alpha_7 \times S\_CEO_{i,t} + \varepsilon_{i,t} \quad (Model\ 2)$$

$$Financial\_structure_{i,t} = \alpha_0 + \alpha_1 \times Growth_{i,t} + \alpha_2 \times PER_{i,t} + \alpha_3 \times Stock_{i,t} + \alpha_4 \times Size_{i,t} + \alpha_5 \times Etax_{i,t} + \alpha_6 \times C\_r_{i,t} + \alpha_7 \times Board_{i,t} + \varepsilon_{i,t} \quad (Model\ 3)$$

where *Financial_structure* = TD, LTD, STD; α_0 = constant; $\alpha_1 \ldots \alpha_7$ = coefficients of the parameters; ε = error term; $t = 2005 \ldots 2018$; $i = 1, 2, \ldots, 51$.

The regression models are built based on the correlation matrix. The corporate governance variables are strongly correlated with each other and they were separated in three models. This situation is similar for the size indicator, which was calculated once as natural logarithm from total assets and once as natural logarithm from turnover. A macroeconomic indicator was also included in each model.

4. Empirical Findings

4.1. Summary Statistics and Correlations

Table 3 presents the descriptive analysis of the variables. The indebtedness rates of the companies are neither very small nor very high, to signal an alarming situation. The average of long-term debt is 35%, while the average of short-term debt is 21%, so the proportion of long-term debt is higher than that of short-term debt. The maximum values, respectively the minimum, the median and the standard deviation are presented in the table for statistical inferences.

Table 3. Descriptive statistics.

Variable	Observations	Mean	Median	Maximum	Minimum	Std. Dev.
TD	714	0.56	0.18	11.31	0.02	1.36
LTD	714	0.35	0.16	11.28	0.00	1.19
STD	714	0.21	0.11	2.92	0.02	0.29
Growth	714	1.22	0.10	286	−0.94	15.30
Depr	714	17,427.7	36.50	980,101	0.10	99,342.38
WC	714	200,976.9	135.40	48,789,450	−21,487,305	413,645
Liq	714	2.56	1.88	34.93	0.14	3.01
Prop	714	7.31	7.01	17.36	−2.30	2.85
Size	714	7.52	7.18	18.60	2.19	2.84
M_size	714	0.000463	0.000448	0.000847	0.000133	0.000105
Board	714	8.55	8.00	16.00	4.00	2.20
PBV	714	−9.87	2.03	526.09	−2843.21	190.92
PER	714	−155.34	15.18	5538.66	−64,217.32	3067.12
GDB_cap	714	52,104.38	51,556	62,996	44,026	5505.14
Inr_r	714	0.14	0.14	0.16	0.13	0.01
Etax	714	−0.57	0.27	6.86	−511.33	19.31
Inf_r	714	0.02	0.02	0.04	0.001	0.01
ROE	714	−221.10	0.10	2.43	−58,695	3077.75
Stock	714	61.31	55	629.70	0.70	51.03
S_Ceo	714	0.78	1.00	1.00	0.00	0.41
Tang	714	0.30	0.21	1.21	0.0022	0.27
C_a	714	0.75	1.00	1.00	0.00	0.43
C_n	714	0.64	1.00	1.00	0.00	0.48
C_r	714	0.74	1.00	1.00	0.00	0.44

Source: Author's own work.

The rate of financial return is somewhere at 10% and is negatively correlated with all debt rates, the strongest correlation being with the long-term debt rate. Price to earnings ratio and price to book value are also negatively correlated with debt ratios. Debt can create artificial increases in price to book value. Price to earnings ratio, as well as price to book value, does not help investors in comparisons regarding companies' debts to make certain decisions, although debt has a major impact on company performance, illustrated by the financial leverage effect, that can be both positive or negative.

The average duration of the stock rotation is 66 days, meaning that the products stay about 2 months in stock until they are sold. According to Table 4 there is no significant association between the working capital and the total indebtedness rate, respectively on the long term, but there is a negative correlation between this and the short-term indebtedness rate. There is also a negative correlation between current liquidity and debt ratios, most companies having optimal liquidity, if we look at the median that is around 1. The technology sector requires a longer period of time to use the products, thus a value less than 1 should not be a negative signal.

Table 4. Correlation of variables.

Variable	1 TD	2 LTD	3 STD	4 Growth	5 Depr	6 WC	7 Liq	8 Size	9 Prop	10 M_Size	11 Board	12 PBV	13 PER	14 GDP_cap	15 Int_r	16 Etax	17 Inf_r	18 ROE	19 Stock	20 S_CEO	21 Tang	22 C_a	23 C_n	24 C_r
1	1	0.90	0.18	0.03	−0.01	0.00	−0.07	−0.20	−0.29	0.07	−0.06	−0.64	−0.05	−0.12	0.04	0.00	0.06	−0.13	0.03	0.12	−0.03	−0.25	−0.18	−0.23
2	0.90	1	0.23	0.03	−0.02	0.00	−0.08	−0.23	−0.31	0.10	−0.04	−0.52	−0.32	−0.14	0.05	0.00	0.07	−0.25	0.04	0.12	−0.06	−0.28	−0.21	−0.26
3	0.18	0.23	1	−0.04	−0.08	−0.03	−0.31	−0.26	−0.16	0.02	−0.17	−0.12	−0.09	−0.12	0.06	0.02	0.07	−0.08	−0.11	0.02	−0.20	−0.27	−0.23	−0.26
4	0.03	0.03	−0.04	1	−0.01	0.00	−0.04	−0.02	−0.08	0.06	−0.02	−0.01	−0.04	−0.09	0.03	0.02	0.07	0.00	0.01	0.04	0.11	0.03	0.04	0.03
5	−0.01	−0.02	−0.08	−0.01	1	0.36	0.03	0.64	0.59	0.35	0.28	0.01	0.01	0.11	0.03	0.01	−0.03	0.01	−0.16	−0.01	−0.14	0.01	−0.16	0.01
6	0.00	0.00	−0.03	0.00	0.36	1	0.02	0.19	0.17	0.08	0.09	0.00	0.00	0.06	0.00	0.00	−0.02	0.00	−0.05	0.03	−0.04	0.03	−0.04	0.03
7	−0.07	−0.08	−0.31	−0.04	0.03	0.02	1	−0.05	−0.05	−0.09	−0.18	0.03	0.04	0.02	−0.06	−0.04	−0.05	0.04	0.01	0.11	0.23	0.13	0.14	0.12
8	−0.20	−0.23	−0.26	−0.02	0.64	0.19	−0.05	1	0.95	0.63	0.56	0.10	0.07	0.15	−0.01	0.01	−0.06	0.08	−0.16	−0.20	−0.02	0.15	0.01	0.14
9	−0.29	−0.31	−0.16	−0.08	0.59	0.17	−0.05	0.95	1	0.59	0.50	0.15	0.11	0.14	−0.02	0.02	−0.07	0.07	−0.24	−0.21	−0.05	0.17	0.03	0.16
10	0.07	0.10	0.02	0.06	0.35	0.08	−0.09	0.63	0.59	1	0.40	−0.05	−0.08	−0.38	−0.01	0.01	0.18	−0.06	−0.24	−0.21	−0.17	−0.21	−0.20	−0.25
11	−0.06	−0.04	−0.17	−0.02	0.28	0.09	−0.18	0.56	0.50	0.40	1	0.04	0.00	0.19	0.01	0.03	−0.07	−0.03	−0.13	−0.13	0.11	0.06	−0.05	0.04
12	−0.64	−0.52	−0.12	−0.01	0.01	0.00	0.03	0.10	0.15	−0.05	0.04	1	−0.14	0.07	−0.03	0.00	−0.05	−0.04	−0.01	−0.03	0.04	0.13	0.10	0.13
13	−0.05	−0.32	−0.09	−0.04	0.01	0.00	0.04	0.07	0.11	−0.08	0.00	−0.14	1	0.07	−0.04	−0.01	−0.04	0.00	−0.03	−0.03	0.05	0.09	0.07	0.09
14	−0.12	−0.14	−0.12	−0.09	0.11	0.06	0.02	0.15	0.14	−0.38	0.19	0.07	0.07	1	0.14	−0.07	−0.36	0.05	0.04	0.26	0.01	0.49	0.29	0.50
15	0.04	0.05	0.06	0.03	0.03	0.00	−0.06	−0.01	−0.02	−0.01	0.01	−0.03	−0.04	0.14	1	−0.09	0.37	0.00	−0.01	−0.04	0.05	−0.11	−0.05	−0.11
16	0.00	0.00	0.02	0.02	0.01	0.00	−0.04	0.01	0.02	0.01	0.03	0.00	−0.01	−0.07	−0.09	1	0.00	0.00	0.00	−0.02	0.04	−0.01	−0.02	−0.02
17	0.06	0.07	0.07	0.07	−0.03	−0.02	−0.05	−0.06	−0.07	0.18	−0.07	−0.05	−0.04	−0.36	0.37	0.00	1	−0.04	−0.02	−0.12	0.02	−0.23	−0.13	−0.24
18	−0.13	−0.25	−0.08	0.00	0.01	0.00	0.04	0.08	0.07	−0.06	−0.03	−0.04	0.00	0.05	0.00	0.00	−0.04	1	−0.04	−0.04	0.06	0.08	0.06	0.08
19	0.03	0.04	−0.11	0.01	−0.16	−0.05	0.01	−0.16	−0.24	−0.24	−0.13	−0.01	−0.03	0.04	−0.01	0.00	−0.02	−0.04	1	0.10	0.16	0.03	0.02	0.06
20	0.12	0.12	0.02	0.04	−0.01	0.03	0.11	−0.20	−0.21	−0.21	−0.13	−0.03	−0.03	0.26	−0.04	−0.02	−0.12	−0.04	0.10	1	0.03	0.49	0.42	0.47
21	−0.03	−0.06	−0.20	0.11	−0.14	−0.04	0.23	−0.02	−0.05	−0.17	0.11	0.04	0.05	0.01	0.05	0.04	0.02	0.06	0.16	0.03	1	0.18	0.27	0.19
22	−0.25	−0.28	−0.27	0.03	0.01	0.03	0.13	0.15	0.17	−0.21	0.06	0.13	0.09	0.49	−0.11	−0.01	−0.23	0.08	0.03	0.49	0.18	1	0.78	0.97
23	−0.18	−0.21	−0.23	0.04	−0.16	−0.04	0.14	0.01	0.03	−0.20	−0.05	0.10	0.07	0.29	−0.05	−0.02	−0.13	0.06	0.02	0.42	0.27	0.78	1	0.74
24	−0.23	−0.26	−0.26	0.03	0.01	0.03	0.12	0.14	0.16	−0.25	0.04	0.13	0.09	0.50	−0.11	−0.02	−0.24	0.08	0.06	0.47	0.19	0.97	0.74	1

Source: Author's own computation.

The size of the company is negatively correlated with the indebtedness rates, as well as the tangibility, which from a statistical point of view, shows that the companies have fixed assets with an average proportion of 30%. The sales growth rate is positively correlated with the total indebtedness rate, respectively on the long term and negative with the short term one. Although the technology sector is a sector in continuous development, registering very high growths, the median shows that the growth rate is at the level of 10%. The median of the variable working capital fund suggests that most companies have a financial balance, managing to finance their fixed assets from permanent capital.

The corporate governance dummy variables have the median 1, regarding the duality of the CEO it can be said that the CEO is not the chairman of the board of directors, regarding the presence of the three committees, remuneration, audit and nomination, we can also affirm in this is the case that most companies have these committees in their structure, with the average number of board members being around 8. These are negatively correlated with debt ratios.

Macroeconomic indicators such as interest rate, inflation rate and market size are positively correlated with debt ratios, only the gross domestic product per capita is negatively correlated with them.

4.2. The Outcomes of Panel Data Regression Models

After analyzing the influence of the variables, placed in different models, on the three dependent variables, we can say whether we accept or reject the hypotheses that have been initially formulated. Based on the outcomes out of Table 5, the working capital and the inflation rate variables have a statistically negative but insignificant relationship with the dependent variables. The first hypothesis states that there is a positive relationship between the size of the company and the indebtedness rates, the results of the regressions showed that there is a negative relation, so we can conclude that we reject H1. The second hypothesis states that there is a positive relationship between tangibility of assets and indebtedness rates, the results of the regressions showed that there is a positive relation with the total indebtedness rate and with the long-term indebtedness rate, and negative with the long-term indebtedness rate in short, so we can accept H2.

The third hypothesis argues that there is a negative relationship between growth opportunity and debt, results of regressions showing that growth opportunity is in a positive relationship with the total and long-term debt ratio, and a negative relationship with the short-term one. In short, we can reject H3. The fourth hypothesis states that there is a negative relationship between liquidity and debt while the results of the regressions have shown that there is a negative relationship with all three rates, thus H4 is accepted. Hypothesis 5 states that there is a positive relationship between the effective tax rate and indebtedness, the results of the regressions showed that there is a negative relationship, thus, H5 is rejected. Theoretically, a company that has a high effective tax rate will benefit, by contracting debts, from maximizing the tax deduction. In our case, the negative relationship can be explained by the fact that companies with long-term debt have a reduced effective rate.

The sixth hypothesis argues that there is a negative relationship between financial return and debt, the coefficient came out negative in relation to all debt rates, so H6 can be accepted. The negative coefficient of ROE underlines that the debt rate decreases as profitability increases, so companies follow the theory of hierarchical financing sources, using profit first to finance operations, and then debt. The following hypothesis states that there is a negative relationship between the rate of inflation and debt. The coefficient came out negative in relation to the total and long-term debt rate, and positive to the short-term debt rate, so we can accept H7. Hypothesis 8 states that there is a negative relationship between the annual interest rate and debt, the results of the regressions showed a positive relationship, so H8 is rejected.

Table 5. Estimated coefficients for all three models.

Variable	(1)			(2)			(3)		
	TD	**LTD**	**STD**	**TD**	**LTD**	**STD**	**TD**	**LTD**	**STD**
Growth							0.002 (1.05)	0.002 (0.78)	−0.0006 (−1.02)
Depr	1.77×10^{-6} *** (4.17)	2.29×10^{-6} *** (4.44)	-4.71×10^{-8} (−0.33)						
WC	-1.47×10^{-9} (−0.17)	-1.80×10^{-9} (−0.17)	2.16×10^{-10} (−0.07)						
Liq				−0.027 * (−2.50)	−0.03 ** (−2.18)	−0.02 *** (−7.72)			
Prop	−0.10 *** (−7.49)	−0.14 *** (−8.23)	−0.009 * (−2.05)						
Size							−0.08 *** (−4.62)	−0.10 *** (−5.44)	−0.02 *** (−4.98)
M_size				381.07 *** (4.04)	713.10 (1.41)	210.07 * (−1.98)			
Board							0.03 (1.43)	0.05 * (2.26)	0.008 (−1.43)
PBV	−0.003 *** (−21.56)	−0.0033 *** (−15.99)	−0.000121 * (−2.14)						
PER							−0.000141 *** (−12.46)	−0.000127 *** (−8.40)	-6.42×10^{-6} * (−1.90)
GDP_cap				-2.24×10^{-5} * (−2.54)	-2.19×10^{-5} ** (−2.92)	-6.31×10^{-6} ** (−3.00)			
Int_r				6.51 (1.28)	9.50 * (1.65)	-6.31×10^{-6} ** (−3.00)			
Etax							-1.95×10^{-5} (−0.008)	−0.0003 (−0.14)	−0.003 (−0.62)
Inf_r	−2.16 (−0.70)	−1.82 (−0.48)	0.11 (0.10)						
ROE	-5.09×10^{-5} *** (−4.89)	−0.000103 *** (−8.15)	-5.30×10^{-6} (−1.53)						
Stock							0.0003 (0.35)	0.0006 (0.71)	−0.0008 *** (−4.05)
S_Ceo				0.76 *** (6.62)	0.94 *** (7.22)	0.09 *** (3.62)			
Tang				0.37 ** (2.85)	0.33 * (2.32)	−0.10 * (−2.49)			
C_a	−0.32 *** (−4.28)	−0.46 *** (−4.98)	−0.15 *** (−6.02)						
C_n				0.63 *** (−6.15)	−0.77 *** (−6.54)	−0.11 *** (−4.78)			
C_r							0.03 (1.43)	0.05 * (2.26)	0.008 (−1.43)
R^2	0.49	0.43	0.089	0.099	0.12	0.16	0.08	0.199	0.14
F-statistic	98.71 ***	76.05 ***	9.96 ***	11.17 ***	13.86 ***	19.80 ***	9.69 ***	24.67 ***	16.74 ***

Source: Author's own computation. ***, **, * denotes statistical significance at the 1%, 5%, and 10% significance level, respectively.

Hypothesis 9 argues that there is a positive relationship between the gross domestic product per capita and debt, the results of the regressions showed a negative relation with all the three rates of debt, so H9 is rejected. The latter hypothesis argues that there is a negative relationship between governance and debt indicators. The audit, remuneration and nomination committees are in a negative relationship with all three indebtedness rates, so H11, H12 and H13 are accepted. The status of the CEO is in a positive relationship, so Hypothesis 14 is rejected. Between board size and debt ratio is a positive relationship, H10 is rejected. The presence of the audit committee in the company structure signifies an efficient control of internal processes and activities, as well as combating information asymmetry, resulting in the reduction of agency costs. The presence of the nomination committee in the organizational structure of the company helps to nominate capable people in the management structure, who take decisions that do not lead to increasing debt when looking for alternative funding sources. The presence of the remuneration committee can lead to effective decisions to motivate and ambition the board directors so that they can run the company efficiently without suffocating it in debt. The CEO's status is in a positive relationship with the dependent variable, the fact that the CEO is or is not the president, has an impact on the debt.

The Prop variable which measures the size of the company and is calculated as a natural logarithm of the turnover, is in a significantly negative relation with the indebtedness rates and respects the principles of pecking order theory. Thus, with the increase in size, the company will use in the first phase, as a source of financing, its own earnings. Depreciation is in a positive and significant relationship with the long-term and total indebtedness rate and in an insignificant relationship with the short-term indebtedness rate. Price to book value has a significant negative impact on indebtedness rates, so when this indicator increases, it means that the value of the market shares compared to the book value increases, and the investments will be financed by the shareholders, which leads to the reduction of bank loans. The size of the market, a variable calculated as a ratio between market capitalization and gross domestic product, is in a positive and significant relationship with the total indebtedness rate, respectively with the short term rate, suggesting that easy access on the market to financial sources, information, etc., allows companies to access new sources of external financing, such as the issue of shares or bank loans. The more developed the market, in our case, the technology services and information industry, the more the companies are inclined to turn to external sources to support their short-term operations. In relation to the long-term debt ratio, a statistically insignificant relationship resulted. Price to earnings ratio is in a statistically negative and significant relationship with all three debt ratios. Thus, when a company borrows from banks, for example, it will have to pay interests, and this will lead to a decrease in the net result of the firm, and implicitly of the PER. It is also true that depending on what purpose the debt is made, if it is done with the purpose of making a strategic investment, acquiring another company for example, this will have a positive influence on the PER. The duration of the stock rotation has a positive coefficient, but it is insignificant, except for the short-term debt ratio, in relation to which it is in a significant relationship. A positive relationship between this and the dependent variable can be explained by the fact that a longer duration of stock exit means that the sales are not very high and the company has to borrow in order to support its expenses.

5. Concluding Remarks

The purpose of this paper was to investigate the main factors which have an influence on financial structure at the enterprise level, using a sample of 51 American companies listed on the New York Stock Exchange. The relationships that were analyzed between debt and the most important factors, promoted by the traditional theories of capital structure, are similar to those which were observed and analyzed in other research papers from previous years. The dependent variables chosen, namely the total indebtedness rate, the long-term indebtedness rate and the short-term indebtedness rate were chosen because they are factors that influence more or less each of the three. The factors were grouped into three categories, company specific factors, macroeconomic factors and corporate governance factors. These factors have an impact that can be more or less significant. It was demonstrated once

again that factors such as tangibility, growth, size, liquidity etc. have an important influence on the financial structure. In conclusion, the results of the analysis show that the principles of the pecking order theory apply in this case, because the tendency of firms is to be financed internally rather than externally. External finance is also a possibility, but as soon as the internal funds become available, the companies prefer to use them.

This work is limited because the database consists of 51 companies and for a relatively short period of time. The companies were taken from only one sector of activity and only from one country, and this limits the applicability. Future research that includes more countries and a larger sample of companies would better explain the determinants, as, as we have seen, there are also country-specific factors that influence decisions in choosing the optimal financial structure.

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Article

How Long Does It Last to Systematically Make Bad Decisions? An Agent-Based Application for Dividend Policy

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Abstract: Bad decisions have harmful effects on the quality of human life and an increase of their duration expands these undesirable effects. Systematic bad decisions related to dividend policy can affect the investors' quality of life in the long-term. We propose an agent-based model for the estimation of the duration of systematically making bad decisions, with an application on dividend policy. We propose an algorithm that can be used in modelling the interaction between different classes of shareholders and for predicting this duration. We perform numerical simulations based on this model using NetLogo 6.0.4. We prove that, as a result of agents' interaction, in some conditions, the duration of systematically making bad decisions can be very long: some numerical simulations suggest that, in some circumstances, this duration can significantly exceed the human lifetime. Additionally, in some conditions, the company can fail before the power is switched. This duration can increase dramatically if the shareholders have a great level of trust in the management's decisions. As an implication, a greater concern for the quality of financial education, and more performant instruments for controlling the power's decisions are required.

Keywords: agent-based models; decision-making; systematically making bad decisions; dividend policy; investors' behavior; simulation

1. Introduction

At least for some persons, it seems very easy to define a decision as being good or bad. For instance, a religious, racist, or nationalistic individual can have no doubt that all he or she does in the name of his or her faith is a good decision, and what is contrary to the accepted dogma is a bad decision. On the other hand, other persons would consider, without any doubt, that the decisions made in the name of the same values are bad decisions, which affect the life and its quality of many innocent people (e.g., children, victims of different kinds of discrimination), science, education, etc. Finally, all the parties can produce different arguments for supporting their values and can refuse the others' arguments. In other cases, even the negative effects can be identified by everyone, the parties involved in making decisions support one decision as being the only one acceptable. For instance, for some persons it is difficult to support measures for protecting the environment and reduce emissions, since the GDP/capita is too small and not enough railways and factories are present in the region. For others, sustainable development is a necessity (e.g., Lele 1991; Doyle and Stiglitz 2014; Armeanu et al. 2018). Unfortunately, the incapacity to provide a unanimous final answer for the best decision, and if one decision is definitely bad (at least for some people) it does not mean that the problem is not important. Even more, even if consensus between parties is not achieved, it does not mean that the problem does not exist.

For some reasons, finance can be a safer place for defining a bad decision. One main advantage is that finance has a clear ideology (e.g., the search for maximizing the shareholders' wealth) (Ross et al. 2010; Belghitar et al. 2019), and also clear instruments for monitoring the deviations from it. If one decision determines a loss (e.g., a decrease in shareholders' wealth), it is a bad decision. Additionally, if a decision determines a lower return than another, it can be reasonably considered that selecting this one was worse. Probably for this reason the presence of making bad decisions is well documented in economics and finance in different contexts (e.g., De Bondt and Thaler 1995; Rubinstein 2001; Ariely 2009; Campbell et al. 2009; Taleb et al. 2009; Gennaioli et al. 2015, etc.). However, all these conclusions can be formulated only after these decisions produce their outcomes (ex post) (Campbell et al. 2009). Initially, most of them are decisions in a risk-context, which can be better or worse than the others. For instance, making decisions based on the assumed knowledge at one moment, using the classical model, based on Gaussian distribution for modelling return distribution and, thus, neglecting the extreme values, determined losses which were unexpected initially (Taleb 2007; Taleb et al. 2009). It was a bad decision to use the Gaussian distribution but, for the most part, the deciders were convinced that using the Gaussian distribution for modelling returns is a good, normal, one.

In some cases, these decisions can become systematic. Human history provides many examples of making systematically bad decisions, sometimes after a long time of making good decisions (Gilbert 2011; Lucero et al. 2011; Harari 2015). In this paper, we analyze the duration of systematically making bad decisions, defined as the length in time of making erroneous mistakes, based on the same mental algorithm. The end of making bad decisions can be decided by other parties; from this perspective, the end of making bad decisions can be the end of the decider's position.

In corporate finance theory, based on the principle of maximizing the shareholders' wealth (Ross et al. 2010; Belghitar et al. 2019), the impact of the existence of one decider that make systematic bad decisions is only marginally considered. However, in some cases, the quality of different decisions can be disputable (Morgan and Hansen 2006). Moreover, this issue becomes more complicated if multi-objective optimization is considered (Lovric et al. 2010). In the same line, different cultural (not financial) values can have an impact on financial decisions (Fidrmuc and Jacob 2010; Ucar 2016). These different values can result in contrary decisions, which can be considered "good" or "bad", depending on each culture's perspective.

In certain cases, some agents can make good decisions, but they have to accept the viewpoint imposed by some other agents, which make bad decisions. For instance, at the corporate level, dividend policy is decided by vote, democratically. Some bad decisions made by the dominating group of voters can affect the rational shareholders' wealth. People are different, thus, different features (e.g., overconfidence, pattern recognition, etc.) of some agents can affect the wealth of other shareholders (Campbell et al. 2009). Bad decisions, but, even more, systematic bad decisions, can affect the investors' quality of life in the long-term (and sometimes, probably irreversible; for instance, in the case of retired employees, regarding their pension plans).

Shareholders' wealth can be affected by dividend policy. Dividend policy is discussed in many papers and is approached from different perspectives (Graham and Dodd 1951; Lintner 1964; Miller and Modigliani 1961; Miller and Scholes 1978; Easterbrook 1984; La Porta et al. 2000a, 2000b; Fidrmuc and Jacob 2010; Shao et al. 2010; Ucar 2016; Jiang et al. 2017, etc.). The discussions regarding an optimal dividend policy still continue. Contrary viewpoints can be considered good or bad, depending on each side's perspective. Thus, the dividend payout decision is a possible fruitful field for analyzing the duration of systematically making bad decisions.

In this paper, we propose a model in which shareholders are not aware instantly about a bad decision made by the shareholders that dominate annual general meetings of shareholders (hereafter, AGM; in Table 1 are provided all the abbreviations and notations). In our paper, we consider a non-homogenous behavior of the shareholders implied in setting a dividend policy at an AGM (and supporting or not the power) through agent-based models (Zambrano and Olaya 2017; Negahban and Smith 2018; McGroarty et al. 2019, etc.). Especially, due to the diversity of the conclusions

regarding dividend policy, this is a good field for analysis of the impact of systematically making bad decisions. It is very difficult to state a priori that a decision is bad or not, because each dividend policy can be considered right for some reasons, and wrong for others. For this reason, considering a non-homogenous behavior for the shareholders can be a contribution to the existent literature. Some studies consider, in other contexts, different classes of shareholders, for instance, controlling shareholders versus minority shareholders (La Porta et al. 2000a), each one having specific interests. In our paper, we consider a more general case, in which shareholders can follow the same objective, but having different opinions about the manner of action, or having different perceptions about the company's perspectives. Moreover, we consider that the option of different shareholders for supporting one of another policy can be reversible in time.

Bad decisions have an impact on the company's performance. However, their impact is not instant. One issue that complicate even more the problem in some cases is the long period between the moment of making the decision and the moment when the outputs can be checked (see Figure 1). A bad decision is difficult to be identified in earliest stages, but only after a long period. In general, decisions regarding dividend payout (DPR_t) are made considering exclusively expected levels for indicators, for example comparing the expected internal rate of return of the proposed investment project ($E_t(IRR_{t+1})$) with the expected required rate of return ($E_t(k_{D,t+1})$).

In this paper, we propose a model, which can be used in simulations, regarding the impact of systematically making bad decisions. We use this model for the estimation of the *duration of systematically making bad decisions* (hereafter, DSMBD). Some of the issues considered in our study can be found in Dragotă (2016). However, comparative to Dragotă (2016), this study proposes an application for financial management. This application concerns the dividend policy.

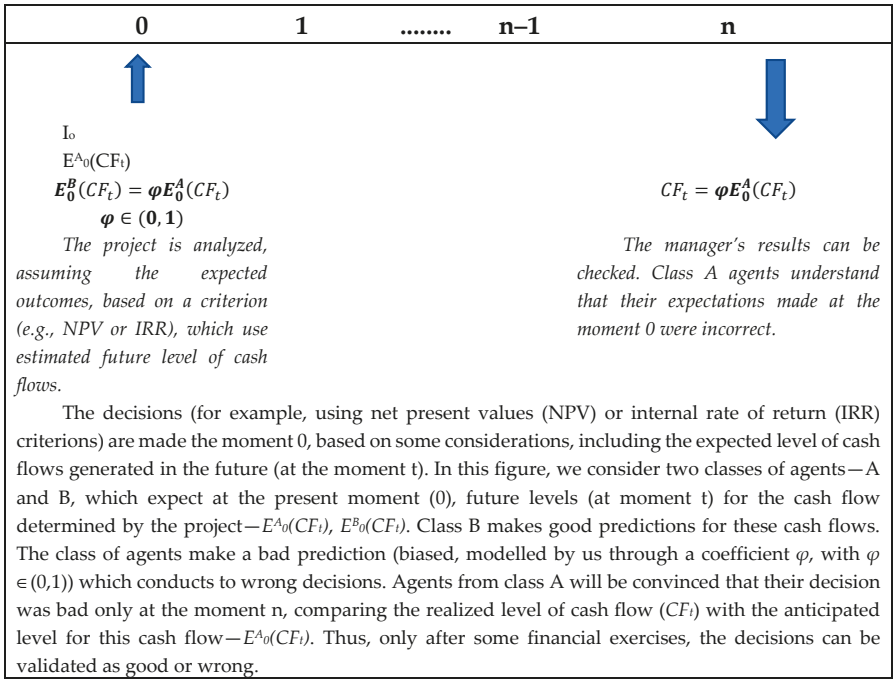

Figure 1. The long period between the decision-making process and the control of its result.

Table 1. Notations used in the text.

Indicator	Notation	Relation or Definition	Observations
Annual general meeting of shareholders	AGM_t		
Average ROE calculated for the past five years	$APROE_t$	$APROE_t = \frac{1}{5}\sum_{t=t-5}^{t-1} ROE_t$	Used in ROE^* estimations
Cash flow	CF	Difference between cash in-flows and cash out-flows.	
Coefficient of impact of bad decisions	bd		It can take values between 0 (this means the forecast is optimal) and 1 (this means that the forecast is totally inadequate).
Coefficient of intolerance for the manager's performance	τ		$\tau \in [0, 1]$. If this tolerance is maximal, $\tau = 0$. Input in the model.
Cost of investment	I_0		
Decision made by the management	DEC_t		
Discount rate	k	The shareholders' required rate of return.	
Dividend payout ratio	DPR_t	$DPR_t = \frac{DIV_t}{NE_t}$	
Dividends paid to shareholders	DIV_t		
Duration of systematically making bad decisions	$DSMBD$		Output of the model.
Internal rate of return for the investment projects	IRR_t	It is the discount rate (k) (solution of the equation) for NPV = 0 (k = IRR).	
Magnitude of interest to change the power	M		$M \in [0, 1]$. Input in the model.
Net earnings	NE_t		
Net present value	NPV	$NPV = -I_0 + \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} + \frac{RV_n}{(1+k)^n}$	
Percentage of shareholders per Class of shareholders	${x^i}_t$		In this paper, we consider $n = 4$ classes of shareholders (i = A, B, C, D), defined in Section 3.2. $\sum_{i=1}^{n} x_t^i = 1$.
Residual value	RV	The cash flow resulted at the end-life of the investment project	

Table 1. *Cont.*

Indicator	Notation	Relation or Definition	Observations
Realized capital market return	kM_t	Random variable, normal distributed, with a mean $[E_{t-1}(kM_t)]$ and a finite standard deviation	
Realized internal rate of return	IRR_t	Random variable, normal distributed, with a mean $[E_{t-1}(IRR_t)\cdot(1-bd)]$ and a finite standard deviation	
Realized rate of return on assets	ROA_t		In this paper, $ROA = ROE$
Realized rate of return on equity	ROE_t	$ROE_t = \frac{NE_t}{TA_{t-1}}$	In this paper, $ROA = ROE$
Required rate of return on equity	$ROE^*{}_t$	$ROE_t^* = \tau \cdot max(APROE_t;\ E_{t-1}(IRR_t); kM_t)$	
Total assets	TA_t		In this paper, $TA = TE$. Input in the model.
Total equity	TE_t		In this paper, $TA = TE$. Input in the model.
Shareholders' wealth	W_m		

We propose an agent-based model for the estimation of DSMBD. We use NetLogo 6.0.4 (https://ccl.northwestern.edu/netlogo/), which offers an easy-to-understand programming language and a graphical interface, where the changes in the simulated environment can be observed in real-time.

In the proposed model, we consider four classes of shareholders, each of them with a specific behavior (Dragotă 2016). We propose an algorithm that can be used in modelling their interaction and for predicting DSMBD, considering variables used in the practice of making decisions regarding dividend policy. Thus, the changes in voting structure can be followed in real-time.

We perform some simulations based on the proposed model. We prove that, as a result of agents' interaction, in some conditions, DSMBD can be very long. Thus, some numerical simulations suggest that, in some circumstances, this duration can significantly exceed the human lifetime. Additionally, in some conditions, the company can fail before the power is switched. DSMBD can increase dramatically if the shareholders have a great level of trust in the management's decisions. The democratic voting process and the good intentions are not sufficient conditions for making good decisions. As an implication, a greater concern for the quality of financial education, and more performant instruments for controlling the power's decisions, are required.

Considering its implications, this paper can be useful both for academics and for practitioners. A better understanding of the process of systematically making bad decisions can be beneficial for the academic literature. Highlighting the determining factors that can determine an increase of DSMBD and performing simulations for finding their impact can be a contribution in understanding a less studied process. As far as we know, this approach is new in analyzing dividend policy. For practitioners (e.g., investors in capital markets, other shareholders), it provides a decisional tool for anticipating some possible problems in the decision-making process, for a better control at the corporations' level. A systematic bad decision can affect the investor's wealth, with potentially disastrous effects in the long-term. For instance, a person can find that his or her pension funds are negatively affected when it is too late to make adjustments in portfolios.

The remainder of this paper is organized as follows. The next section presents the theoretical background. For our purpose, we have proposed a model for the estimation of DSMBD. Section 3 provides the model design and describes its implementation in NetLogo 6.0.4. Some numerical results are presented and discussed in Section 4. Section 5 concludes this paper.

2. Theoretical Background

Our study is concerned with analyzing the impact of making a systematic bad decision (for the estimation of DSMBD) in AGM, when deciding if the financial resources are directed through dividends or for investments in the company. We propose an agent-based model, which is implemented in NetLogo 6.0.4. Below, the theoretical background related to this issue is presented.

The literature regarding bad decisions made by individuals is vast (e.g., Shefrin and Statman 1985; De Bondt and Thaler 1995; Odean 1998; Rubinstein 2001; Hirshleifer 2001; Campbell et al. 2009; Gennaioli et al. 2015; Morgan and Hansen 2006; Dragotă 2016; Pikulina et al. 2017). In this paper, we consider the impact of making systematically bad decisions in connection to setting a dividend policy. Dividend policy, respectively fixing the portion of the net earnings paid to shareholders, can be an interesting application for analyzing DSMBD. A dividend policy can be considered as optimal from some perspectives, but non-optimal from others. For instance, paying dividends can be a sign of the companies' interest of protecting the shareholders' rights (La Porta et al. 2000b), but can also be interpreted as a smaller amount of financial resources for adopting profitable investment projects. For this reason, the discussions in AGM can determine different solutions, which can be optimal, or, to the contrary, wrong, even if they are made with very good intentions and based on rational arguments (sometimes, with sound foundations in financial literature). The harmonization between these contradictory viewpoints can be impossible. For this reason, some agents can be convinced that their decisions are good and can persist in making bad decisions.

At the AGM, shareholders decide the amount that will be paid as dividend. The decision regarding dividend payment consists in fixing a percent p from the net earnings (dividend payout ratio, DPR)

to be paid as dividend (a percent equal to $(1 - p)$ is allocated for investments)[1]. Shareholders are different from many perspectives. A large amount of financial literature analyzes the relations between large (controlling) shareholders and minority shareholders (Shleifer and Vishny 1986; Holderness 2003). Many papers analyze the controlling shareholders' behavior in connection with dividend policy, mainly related to agency problems (Easterbrook 1984; La Porta et al. 2000b; Fidrmuc and Jacob 2010). Additionally, in their decision, shareholders are (or at least, can be) influenced by the managers proposals regarding the dividend proposed to be paid. Usually, they approve (or not) DPR proposed by management. This can determine also agency costs (Jensen and Meckling 1976). Another segmentation of shareholders in different groups can be made considering some socio-cultural factors. Some papers provide evidence between dividend policies across the world, considering different socio-cultural as determinants of dividend policy (Fidrmuc and Jacob 2010; Shao et al. 2010; Ucar 2016). As an effect, a segmentation in different groups (dominant or not) can be useful in modelling shareholders' behavior.

Many papers are concerned about dividend policy. Dividend policy is approached from many perspectives (Graham and Dodd 1951; Walter 1956; Miller and Modigliani 1961; Miller and Scholes 1978; Bhattacharya 1979; Kalay 1980; Easterbrook 1984; La Porta et al. 2000a, 2000b; Fidrmuc and Jacob 2010; Shao et al. 2010; Ucar 2016; Jiang et al. 2017, etc.). Some classical papers propose rules in recommending an optimal dividend payout (Graham and Dodd 1951; Walter 1956). Other studies identify the factors that influence the dividend payment (Lintner 1964; La Porta et al. 2000a; Fidrmuc and Jacob 2010; Jiang et al. 2017). Miller and Modigliani (1961) prove, under some restrictive assumptions, the irrelevance of dividend payout on shareholders' wealth. Different real-life factors challenge the implications of Miller and Modigliani theorem: agency problems (Easterbrook 1984; La Porta et al. 2000a), behavioral and cultural influences (Shao et al. 2010; Ucar 2016), imperfect information and signaling effects (Bhattacharya 1979; Kalay 1980), taxation (Miller and Scholes 1978; Hanlon and Hoopes 2014), etc.

Many papers provide recommendations regarding an optimal dividend policy, contrary to the irrelevance theorem of Miller and Modigliani (1961). For instance, Walter (1956) proposes that dividends should be paid only in the case in which the company can't offer to its shareholders a rate of return higher than the required rate of capital. Other papers suggest that dividends should be paid if the company is interested by the minority shareholders' interests (Graham and Dodd 1951; La Porta et al. 2000b). The list of papers providing more or less advices regarding an optimal dividend policy also provide a multitude of divergent advice: pay, do not pay, or it does not matter. Thus, the literature on dividend policy does not produce a consensus for an optimal dividend policy. For this reason, we can reasonably assume that, even if they are convinced that their arguments have sound theoretical foundations, some agents will make, depending by case, a bad decision, and they would not be able to consider their decision is bad. Practically, they will not be able to characterize their decisions as being bad. This situation will conduce to making systematically bad decisions. It is very possible (and reasonably plausible) to appear a segmentation between two classes of agents, respectively the ones that are making good decisions (being convinced that they are making a good decision) and the ones that are making a bad decision (but being also convinced that they are making a good decision).

Over the last years, applications using agent-based modelling have been successfully used in various research fields such as: supply chain management (Walsh and Wellman 2000; Pan and Choi 2016), strategic simulation (Bunn and Oliveira 2003; Wang et al. 2016; Negahban and Smith 2018), operational risk and organizational networks (Frels et al. 2006), decision-making (Rai and Allada 2006;

[1] De facto, a dividend is defined as apart from net income, and the dividend payout decision is conditioned by the available cash flows, and not by net earnings. If one company records net earnings, but do not record a higher (or equal) amount of cash flows, as long as both dividends and financing investment projects require cash payments, the dividend policy is only a matter of (theoretical) accounting (Dragotă et al. 2019). In this study, we will consider a simplified case, respectively, profit ≡ cash flow. Signaling theories on dividends (e.g., Bhattacharya 1979; Kalay 1980) state that companies that pay dividends signal that they have sufficient cash for paying them, while non-payers can be suspected as not having it.

Dougherty et al. 2017; Zambrano and Olaya 2017), customers flows (Tan et al. 2008), algorithmic trading strategies (McGroarty et al. 2019), transport systems (Delcea et al. 2018a, 2018b; Monteiro et al. 2014), etc. The main advantage of agent-based models is their ability to take into account the heterogeneity of agents (McGroarty et al. 2019), meaning that each agent can have his or her own characteristics and can make decisions in accordance with them. Additionally, one agent can observe the environment and the actions/decisions made by other agents and he or she can decide which course of the action will be taken in the following. The adaptability and the responsiveness capacities of the agents make them actively observe and interact with the environment and with other agents. Moreover, the bounded-rationality property that the agents possess make them act as human beings while facing a decision situation, namely, they are just partially and not completely rational (Wilensky and Rand 2015). The abilities and the properties of the agents make the agent-based modelling proper to human-behavior modelling. Strictly related to the AGM situation, the agent-based modelling can be very useful for modelling the shareholders' behavior if we consider they do not share the same opinion in the context of a democratic vote. In this particular context, the agent-based modelling approach enables us to define several categories (named "classes" in our paper) to which the decision persons might belong to. Depending on one's class, several properties are enabled, which ensure that the agent is acting according to the assumed behavior of its class. From the interaction among the agents, different emerging behaviors and decisions can be observed and analyzed in depth.

Regarding the usage of the agent based modelling in the research area through the use of NetLogo platform, between 2003–2018, 512 papers using NetLogo have been published in ISI Web-of-Science in areas such as: operations research and management, business economics, finance, computer science, engineering, education and educational research, social sciences, mathematics, environmental sciences and ecology, etc. Thus, we have decided to use NetLogo for conducting the simulations as it offers a friendly user interface and an easy-to-write and understand syntax (Wilensky and Rand 2015). Among the characteristics of NetLogo, which differentiate it from other agent-based modelling software, one can underline that it is a free software, easy to use, and easy to understand even by persons outside the programming area, with a visual interface which allows one to see the changes in agents' properties in real-time, while the program is running, and which provides an extensive and up-to-date documentation.

The next section presents our model.

3. The Model

This section presents a model for the estimation of DSMBD. We structured this section in six sub-sections. The problem is defined in Section 3.1. We considered four classes of shareholders. Their behavior is described in Section 3.2. In Section 3.3 we discuss the evolution of the company's performance when making bad decisions persists. The agents' behavior is strongly influenced by the differences between the realized rate of return and their required rate of return. The manner of the estimation of the required rate of return is discussed in Section 3.4. We discuss the model inputs in Section 3.5. Section 3.6 presents the implementation in NetLogo. The decision-making process can be followed sequentially in Table 2.

We have chosen the agent-based modelling for representing, analyzing and simulation of this situation as in this type of modelling, each agent, representing a shareholder, can be endowed with a series of properties that makes it unique comparative to the other agents. Even more, as each different groups of shareholders have different expectations and points of view related to the company's efficient management, the inter-group properties of these agents are easy to model and represent. Even more, the NetLogo software offers a specific tool which enables one to conduct several experiments under different conditions and to observe, in real-time, the agents' behavior, as individuals and as a part of a particular group.

Table 2. The sequence of the decision-making process.

Financial Exercise (Year)	Phase	Content
0		
1	1.1	The company records output results: ROE_1 and NE_1.
	1.2	If $NE_1 \leq 0$, $DIV_1 = 0$. Otherwise, the management (the controlling shareholder) anticipates $E_{t-1}(IRR_t)$, respectively $E_1(IRR_2)$
	1.3	AGM: The management (the controlling shareholder) proposes a dividend policy: If $E_1(IRR_2) \geq E_1(kM_2)$, then: $DIV_1 = 0$ If $E_1(IRR_2) < E_1(kM_2)$, then: $DIV_1 = NE_1$
	1.4–1.5	AGM: shareholders analyze the performance of the company at the present moment, as a proxy for the quality of the management's decisions. We consider that, at this moment, the power remains in function.
2	2.1	The company records output results: ROE_2 and NE_2.
	2.2	If $NE_2 \leq 0$, $DIV_2 = 0$. Otherwise, the management (the controlling shareholder) anticipates $E_{t-1}(IRR_t)$, respectively $E_2(IRR_3)$
	2.3	AGM: The management (the controlling shareholder) proposes a dividend policy: If $E_2(IRR_3) \geq E_2(kM_3)$, then: $DIV_2 = 0$ If $E_2(IRR_3) < E_2(kM_3)$, then: $DIV_2 = NE_2$
	2.4	AGM: shareholders analyze the performance of the company at the present moment, as a proxy for the quality of the management's decisions: $if \begin{cases} ROE_2 \geq ROE_2^*, \text{ then}: x_2^C \leq x_1^C \\ ROE_2 < ROE_2^*, \text{ then}: x_2^C \geq x_1^C \end{cases}$ Notes: $ROE_t^* = (1-\tau)\cdot\max(ROE_0; E_{t-1}(IRR_t); kM_t)$ $x_t{}^C = x_{t-1}{}^C + \alpha_t \cdot M_t\,(1 - x^A - x^B - x_{t-1}{}^C) = x_{t-1}{}^C\,(1 - \alpha_t \cdot M_t) + (1 - x^A - x^B)\alpha_t \cdot M_t$
	2.5	AGM: vote: $x_2{}^B + x_2{}^C \leq 0.5$, the management remains in power If $x_2{}^B + x_2{}^C > 0.5$, then the power is switched (the end of the discussion)
3	3.1	The company records output results: ROE_3 and NE_3.
	3.2	If $NE_3 \leq 0$, $DIV_3 = 0$. Otherwise, the management (the controlling shareholder) anticipates $E_{t-1}(IRR_t)$, respectively, $E_3(IRR_4)$
	...	...

Table 2. *Cont.*

Financial Exercise (Year)	Phase	Content
t	t.1	The company records output results: ROE_t and NE_t.
	t.2	If $NE_t \leq 0$, $DIV_t = 0$. Otherwise, the management (the controlling shareholder) anticipates $E_{t-1}(IRR_t)$, respectively, $E_t(IRR_{t+1})$
	t.3	AGM: The management (the controlling shareholder) proposes a dividend policy: If $E_t(IRR_{t+1}) \geq E_t(kM_{t+1})$, then: $DIV_t = 0$ If $E_t(IRR_{t+1}) < E_t(kM_{t+1})$, then: $DIV_t = NE_t$
	t.4	AGM: shareholders analyze the performance of the company at the present moment, as a proxy for the quality of the management's decisions: $if \begin{cases} ROE_t \geq ROE_t^*, \text{ then : } x_t^C \leq x_{t-1}^C \\ ROE_t < ROE_t^*, \text{ then : } x_t^C \geq x_{t-1}^C \end{cases}$ Notes: $ROE_t^* = (1-\tau)\cdot\max(ROE_0;\ E_{t-1}(IRR_t); kM_t)$ $x_t{}^C = x_{t-1}{}^C + \alpha_t \cdot M_t\ (1 - x^A - x^B - x_{t-1}{}^C) = x_{t-1}{}^C\ (1 - \alpha_t \cdot M_t) + (1 - x^A - x^B)\alpha_t \cdot M_t$
	t.5	AGM: vote: $x_t{}^B + x_t{}^C \leq 0.5$, the management remains in power If $x_t{}^B + x_t{}^C > 0.5$, then the power is switched (the end of the discussion; DSMBD is determined)
...	...	...
...	...	...

3.1. The Problem

Shareholders, and also managers, analyze the company's performance from different viewpoints and use different indicators to measure it. This performance is the result of many different decisions, so the extraction of a single, unique, bad one, for analyzing its impact can be difficult. We have chosen the moment of the AGM for shareholders to simultaneously consider two issues: (1) deciding if the manager is maintained in function; and (2) deciding the amount paid as dividend.

We can present sequentially the series of decisions as:

$$DEC_{-t},\ DEC_{-t+1}, DEC_{-t+2}, \ldots,\ DEC_0, DEC_1, DEC_2, DEC_3, \ldots,\ DEC_n$$

The decisions made by the management (DEC_t) are right for the period [−t, 0]:

$$DEC_{-t},\ DEC_{-t+1}, DEC_{-t+2}, \ldots,\ DEC_0,$$

In the period [1, n], decisions are systematically wrong:

$$DEC_1, DEC_2, DEC_3, \ldots,\ DEC_n$$

The problem is to find n (the moment in which the manager is switched). In other words, we estimate the *duration of making systematically bad decisions* (DSMBD) in setting one dividend policy. This duration expresses the length in time of making an inappropriate decision regarding dividend policy. This decision is supported by some agents (some shareholders which sustain this decision) even it is wrong. The supporters of the good decision are in minority (they do not reach more than 50% from the votes even they are right). The switch in sustaining the bad decision can be considered synonymous with a switch in power (Dragotă 2016). The manager is switched when the percent of shareholders that support them is lower than 50%. We consider four classes of shareholders, described in Section 3.2.

Dividend policy (respectively, the percent of the net earnings paid as dividend, or, alternatively, the percent invested in the company) is decided in AGM (at the moment $t + 1$), usually based on the manager's recommendation, only if $NE_t > 0$. If $NE_t \leq 0$, we cannot discuss about a dividend policy.

The manager (supported by the controlling shareholders) (Class A agents in our model, see Section 3.2) proposes a dividend policy based on her or his expectations regarding the internal rate of return for the investment projects proposed to be financed from the retained earnings—$E_{t-1}(IRR_t)$ and on their expectation regarding the evolution of the market—$E_{t-1}(kM_t)$ (this is the market return for projects with a similar risk[2]):

If $E_1(IRR_2) \geq E_1(kM_2)$, then: $DIV_1 = 0$

If $E_1(IRR_2) < E_1(kM_2)$, then: $DIV_1 = NE_1$

In other words, the dividend payout ratio (DPR) is:

$$DPR_t = \begin{cases} 0\%\ if\ E_{t-1}(IRR_t) > E_{t-1}(kM_t) \\ 100\%\ if\ E_{t-1}(IRR_t) \leq E_{t-1}(kM_t) \end{cases} \quad (1)$$

In our paper, this decision-making process is based on Walter (1956), sometimes defined as the "residual" dividend policy. This policy is widely recognized by practitioners, but also in the financial literature (Aivazian et al. 2006; Kim and Kim 2019).

In practice, the dividend payout ratio follows a Tweedie distribution (Dragotă et al. 2019). This distribution is characterized by a modal value of 0%. This modal value of 0% is confirmed by other

[2] It can be noted that this rate of return is not a realized one. Investors expect to record this promised rate of return, so an adequate notation is still $E_{t-1}(kM_t)$.

studies (Denis and Osobov 2008; Fama and French 2001; von Eije and Megginson 2008; Fatemi and Bildik 2012; Kuo et al. 2013). In our paper, the option between 0% and 100% DPR is considered only for simplifications reasons. It is not the purpose of our paper to justify an optimal dividend policy, but to analyze the impact of a bad decision.

As long as the supporters of the power are dominant (respectively, more than 50% votes), the decision proposed by the management will be adopted.

The decisions made by the management (DEC_t) are right for the period $[-t, 0]$. They are determining a stock of wealth for shareholders, which can induce in shareholders a status of safety and also a state of trust for the manager's performance. A company's return is, to a large extent, the effect of some decisions made in the past. As an effect, investors can judge one manager's performance (the return in one year, source for dividend payments) even if this is the effect of the choices made in the past. Moreover, even the results of some projects are not desirable from a financial viewpoint, in real life their effects are combined with the other projects' effects, finally, the shareholders having access only to some synthetic indicators at the company's level (like cash flows, net earnings or return on equity). The initial stock of wealth allows the management to make some wrong decisions because their impact is not fatal for the company.

For simplification, in our paper, we assume that no agency problems occur in making the dividend payment decisions, even if they are documented in financial literature (Easterbrook 1984; La Porta et al. 2000a; Kim and Kim 2019) and they can be an interesting field of study. We also assumed that information is symmetrical (Dragotă 2016) and we ignored the impact of taxation[3].

We assume, as in Dragotă (2016), that the decisions regarding dividend payments are made democratically, in AGM. The decisions are based on the principle one share, one vote[4]. The ownership structure is assumed to be dispersed. We consider that all the shareholders are exercising their vote. The dividend payout decision requires a simple majority (respectively, more than 50% votes). In our study, we consider that the decisions are made in each financial exercise and we consider in each financial exercise only one round of votes (we consider the final vote for each AGM).

For modelling reasons, we consider that the shareholders do not sell their shares in the considered period and, also, no new shares are issued in this period[5]. As an effect, the total number of shares and the initial number of shareholders remain constant.

3.2. Shareholders' Typology and Behavior

We consider four classes of shareholders (agent types) (Dragotă 2016) (denoted A, B, C, and D), with ${x_t}^i$ is the percent in total shares (which correspond to the voting power), with ${x_t}^A + {x_t}^B + {x_t}^C + {x_t}^D = 1$. Each of classes of shareholders (agents) is characterized by some features, described below.

Class A represents the decider (the power). In our study, they are the group of shareholders that make systematically bad decisions, until the power is switched. Agents from this class are overconfident in their decisions (De Bondt and Thaler 1995; Hirshleifer 2001), even if they are wrong. Due to the outputs produced, the behavior of this class of shareholders can be suspected by agency problems, even if they are not real. Additionally, it seems reasonable to anticipate that Class A will suggest that the other shareholders should support their decisions, probably insisting on arguments like *trust the expertise of the management which is acting in the benefits of the other shareholders*.

Class B represents the opposition, respectively, the group of shareholders that understand that the decisions of the Class A are bad, but are not in power. Their rationality is useless for convincing

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[3] Taxation can have an impact on dividend payments (Dragotă et al. 2009). Walter (1956) analyzes the impact of taxation, too.

[4] The model can be easily generalized for the case of multiple classes of shares, with different voting power, according to the company's statute (see, for instance, (Nenova 2003), for the case of dual classes of shares).

[5] A similar result occurs if the new shareholders (the buyers) replicate the behavior of the former shareholders (the sellers).

agents from Class A, and even Class B can be associated with keywords like *financial rationality*, *abilities*, or *literacy*[6].

As an observation, each rational agent probably knows that that the expected level of one indicator can be different from its realized level (see Figure 2). As an effect, it can be very difficult to argue that one forecast is, indeed, wrong.

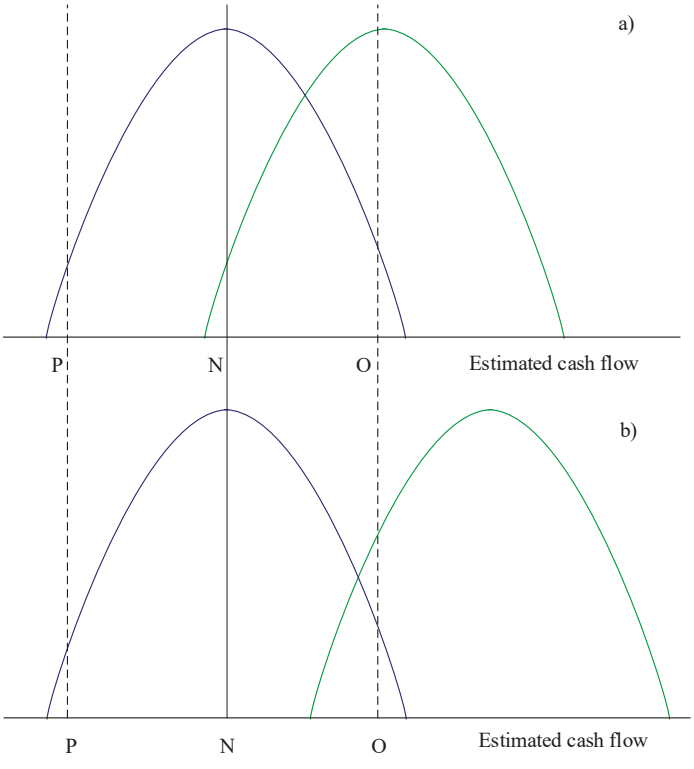

Figure 2. Two forecasts for future level of cash flows–for each class of agents—A (with green) and B (with blue). The two classes estimate the level of indicator (the estimated cash flow) through its probability distribution. The forecast made by one class of agents (B—in the left, with blue) is better than the second one (A—in the right, with green). In (**a**), if the realized cash flow is N (from normal, very plausible for the first class of agents' forecast), it can be interpreted by the second class of agents as an unfavorable scenario of evolution (but still plausible, according to their forecast). A realized cash flow equal to O (from optimistic) should confirm the good forecast made by class A (even it is only a relatively unusual good performance based on the forecast made by class B). (**b**) depicts an even greater dissonance between the two forecasts. In this case, if the realized cash flow is N, class A can realize that the forecast was indeed wrong, but, also, they can consider that an extreme event occurred.

[6] As observation, when the impact of factors like financial literacy or education is discussed, it has to be interpreted cautiously. For instance, Mare et al. (2019) found that insurance literacy has an impact on financial decisions, but education (in general) does not.

Class C includes the shareholders that can change their decision. They can learn from past errors (for them, *evolution* is the keyword). Initially, $x_t{}^C = 0$. Firstly, they support the power (they are in Class D), but they change their vote.

Class D is a residual in this model: $x_t{}^D = 1 - x^A - x^B - x_t{}^C$. Initially, we assume that they support the power, but they can migrate to Class C.

According to these assumptions, x^A and x^B are fixed (constant in time), with $x^A \in (0, 0.5)$ and $x^B \in (0, 0.5)$, and x^C and x^D are variable. Initially, $x_0{}^C = 0$.

The power is switched democratically when the number of voters against the power is higher than 50% (respectively: $x^B + x_t{}^C > 50\%$). As in Dragotă (2016), the switch in power in AGM is determined exclusively by the changes in the voting preferences of Class C. Shareholders from Class C analyze the quality of decisions based on the results recorded by the company. As such, they do not evaluate the quality of the decision regarding the dividend payments made at the present moment (*t)* (see Section 3.1), but the quality of the decisions made in the past moments, as a proxy for the quality of the present decision (see also Table 2). The decision's quality is quantified comparing the recorded performance with the required one. We considered that the performance is proxied by the realized return of equity (ROE_t). Similarly, the required level of performance is quantified through a required rate of return ($ROE_t{}^*$). The evolution of ROE is described in Section 3.3. In Section 3.4 we discuss how they estimate their required rate of return.

At each moment *t* (the annual shareholders' meeting), Class C agents: (a) analyze if the realized return of equity ROE_t has an acceptable level (is higher or, at least, equal to the required rate of return, $ROE_t{}^*$), deciding if they support the power; and (b) if they support the power, they vote for the recommended dividend policy. Additionally, the AGM is the moment when the agents from Class C can change their voting preference: (i) if $ROE_t \geq ROE_t{}^*$, they are satisfied and keep their voting preference (they will continue to support the power); (ii) if $ROE_t < ROE_t{}^*$, they change their voting preferences, voting against the power. As a result, shareholders from Class A are imposing their viewpoint until: $x_t{}^B + x_t{}^C > 0.5$.

The changing preferences for Class C agents can be modelled through many different rules (Dragotă 2016). In this paper, we consider two cases. First, we assume that once an agent from Class D pass to Class C, his or her decision is irreversible (situation 1, S1). Secondly (situation 2, S2), we assume that:

$$if \begin{cases} ROE_t \geq ROE_t^*, & \text{then}: \ x_t^C \leq x_{t-1}^C \\ ROE_t < ROE_t^*, & \text{then}: \ x_t^C \geq x_{t-1}^C \end{cases}$$

We consider that $x_t{}^C$ is determined based on the rule defined in Dragotă (2016):

$$x_t{}^C = x_{t-1}{}^C + \alpha_t \cdot M_t \cdot x_{t-1}{}^D \tag{2}$$

In this relation, the percent of shareholders which vote against the power ($x_t{}^C$) increase from financial exercise to financial exercise if they are unsatisfied by the level of the rate of return; however, they can change their opinion if the results are satisfying them, becoming more trustful in management's decision.

As such:

$$\alpha_t = \begin{cases} 1, \text{ if } ROE_t < ROE_t^* \\ -1, \text{ if } ROE_t \geq ROE_t^* \end{cases}. \tag{3}$$

Additionally, by definition, $x_t{}^C$ should be at least equal cu 0: $x_t{}^C \geq 0$.

M_t is a random variable uniformly distributed on [0,1], which can be interpreted as a magnitude of the interest to change the power (Dragotă 2016). If $M_t = 0$, this can be interpreted as a total indifference to the level of return, but also as a conservative attitude (Hirshleifer 2001). If $M_t = 1$, the entire population of agents from class D will change their voting preference, joining the class C of agents,

immediately after the level of realized return is below the required rate of return. M_t is dependent of different factors that can have an impact on wealth and for this reason is not constant in time[7].

${x_t}^C$ can be written as:

$$ {x_t}^C = {x_{t-1}}^C + \alpha_t \cdot M_t \, (1 - x^A - x^B - {x_{t-1}}^C) = {x_{t-1}}^C \, (1 - \alpha_t \cdot M_t) + (1 - x^A - x^B)\alpha_t \cdot M_t \quad (4) $$

As an observation, shareholders from Class D can migrate to Class C even in the case in which the company records a low performance, even if the dividend policy was correct.

3.3. Evolution of Return on Equity

In our model, shareholders use the return on equity (ROE) recorded by the company in their analyses regarding the quality of the management's decision (decisions supported by Classes A and D of shareholders) (see Section 3.2). We consider that the company is 100% equity-financed, so assets = equity. Retained earnings are the sole source for financing the investment projects (Walter 1956). ROE, as a proxy for the company's level of performance, is determined by different factors, more or less anticipable. In an over-simplified model (but useful for our application), we can consider ROE as a cumulative effect of: (i) the normal (usual, unaffected by the decider's bad decision) ROE; (ii) the decrease in ROE determined by making the bad decision; and (iii) the impact of other factors, which are acting independently by the first two components. In other words, ROE is affected by bad decisions, but also by bad forecasts.

The initial level of ROE_0 can be considered as a benchmark. It is determined by the ratio between net earnings recorded in the year 0 (NE_0) and the level of equity in the previous year:

$$ ROE_0 = \frac{NE_0}{TE_{-1}} = \frac{NE_0}{TA_{-1}} \quad (5) $$

We consider the period [−t, 0] as being one characterized by making good decisions. As such, in this study, these historical levels of performance are important only for comparing the actual results with them. Moreover, we can assume that all the quantity of information is incorporated in this initial level of ROE, ROE_0. The level of total assets at the moment 0, TA_0 is considered as an initial stock of shareholders' wealth and is another input in the model.

However, ROE_0 is only a punctual benchmark. Some aleatory factors can influence even this normal ROE. Even if the company maintains constant its level of assets, most probably ROE_1 will be different than ROE_0. Even if it is considered that no bad decisions are made, it can be assumed that ROE_t is a random variable. Each year, NE_t is determined by the ROE_t (the return at which the capital is invested) and the stock of capital in the previous year, by the accounting identity:

$$ NE_t = \; ROE_t \cdot TA_{t-1} \quad (6) $$

The level of total assets on one moment t (TA_t) can be determined as a function by the level of the total assets in the previous year (TA_{t-1}), net earnings (NE_t) and dividend payments (DIV_t):

$$ TA_t = TA_{t-1} + NE_t - DIV_t \quad (7) $$

In another form:

$$ TA_t = TA_{t-1}(1 + ROE_t) - DIV_t \quad (8) $$

[7] Individuals prefer in many situations the status quo (the "anchoring" effect) (Samuelson and Zeckhauser 1988). As an effect, in this paper, we considered that Class C agents do no change their voting preference instantly. In a different context, Harari (2015, pp. 264–67) provides historical evidence regarding this "anchoring" effect and explains it by a necessity of human beings to make sense of their decisions. If they should accept the fact that their past decision was wrong, they should accept that their past "sacrifices" were unuseful.

As an effect, NE_t has t components: (1) a component resulted as the return of equity at which initial stock of assets is invested; (2) the result of the investments made in the first financial exercise ($t = 1$); and (3) the result of the investments made in the second financial exercise ($t = 2$), . . . , (t) the result of the investments made in the last financial exercise ($t = t - 1$). The components (2), (3), . . . (t) are a function of the internal rates of returns (IRR) corresponding to the invested capital in each financial exercise.

In our model, shareholders decide to invest in the company if the invested capital will determine an increase of their wealth higher than investing on the financial market in projects of similar risk (Walter 1956; Ross et al. 2010)[8]. In this study, we assume that the decisions at the AGM are made comparing the expected IRR, respectively, $E_{t-1}(IRR_t)$, with the expectations regarding the capital market return, $E_{t-1}(kM_t)$.

It can be noticed that $IRR_t \neq E_{t-1}(IRR_t)$. $IRR_t = E_{t-1}(IRR_t)$ only in the case of a perfect forecast. Since management is making a bad decision, IRR_t can be considered as a random variable, normally distributed, with a mean $[E_{t-1}(IRR_t) \cdot (1 - bd)]$ and a finite standard deviation[9,10].

As an observation, in this equation, $E_{t-1}(IRR_t)$ is the expectation made by the Class A agents, and it is not optimal (it can be assumed by Class B shareholders make a better prediction).

The bad decision is modelled through a coefficient, bd, which is applied to the estimated rate of internal return of the new projects. For instance, 0.1 means that the expected internal rate of return is over-valuated by 10% by the deciders.

Similarly, market return can be considered as a random variable, normal distributed, with a mean $[E_{t-1}(kM_t)]$ and a finite standard deviation[11].

Table 3 presents TA, NE, and ROE in some financial exercises and their rules of evolution[12]. It can be noted that the bad decisions have impact only if the net earnings are invested in the company. For a numerical simulation of the financial indicators, see Table 4.

3.4. Required Rates of Return

In our paper, we consider in the same model two of the investor's statuses. On the one hand, investors are making their analysis from a portfolio management's perspective, being interested about characteristics like return[13] and risk of their portfolio, making their judgments in estimating a required rate of return, etc. (Markowitz 1952). On the other hand, they are shareholders and they participate in AGM, being implied in making decisions at the corporate level, like adopting the dividend payout ratio.

In our model, two required rates of return appear as benchmarks, respectively, $E_{t-1}(kM_t)$ and ROE_t^*.

The first indicator is related to the expectations regarding the capital market. We assume that this indicator is estimated by the shareholders. In our study, we consider that, when proposing a dividend policy, the management compares the expected IRR with $E_{t-1}(kM_t)$ and decides to pay dividends only if $E_{t-1}(kM_t) > E_{t-1}(IRR_t)$.

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8 This statement is formalized in the corporate finance literature through classical selection criteria, like the net present value (NPV) > 0 and IRR > the required rate of return (Ross et al. 2010; Dragotă et al. 2013).

9 Theoretically, the realized IRR can take values in the $(-\infty, \infty)$ interval.

10 Some readers can have objections to this manner of formulation, considering that the expected rate of return is a function of the realized rate of return, and not vice versa. In our simple formulation, if we consider $E_{t-1}(IRR_t)$ as function of IRR_t, IRR_t should be generated randomly.

11 Similar to the formulation of IRRt, if we consider $E_{t-1}(kM_t)$ as function of kM_t, kM_t should be generated randomly.

12 Shareholders' wealth at moment t (W_t) is structured in two components: the initial capital invested in company and the capitalized dividends.

13 In the entire paper we consider the real rates of returns, even it is not specified expressly. In a more general context, we can assume that it is not important if we prefer real or nominal rates of returns as long as all the comparisons and considerations regarding these rates are consider the coherence between rates (e.g., compare real rates of returns with real rates of return, and nominal rates of returns with nominal rates of returns).

Table 3. Evolution of financial indicators.

Financial Exercise (Year)	Total Assets at the Beginning of the Period	Net Earnings	Return of Equity
0	TA_{-1}	NE_0	ROE_0
1	TA_0	$NE_1 = ROE_1 \cdot TA_0 = NE_0 \cdot ROE_0 \cdot (1 + \varepsilon_{ROE})$	$ROE_1 = ROE_0\ (1 + \varepsilon_{ROE})$
2	$TA_1 = TA_0 + NE_1 - DIV_1$	$NE_2 = NE_0(1 + \varepsilon_{ROE}) + (NE_1 - DIV_1)[E_1(IRR_2)(1 - bd)](1 + \varepsilon_{IRR2})$	$ROE_2 = \frac{NE_2}{TA_1}$
3	$TA_2 = TA_1 + NE_2 - DIV_2$	$NE_3 = NE_0(1 + \varepsilon_{ROE}) + (NE_1 - DIV_1)[E_1(IRR_2)(1 - bd)](1 + \varepsilon_{IRR2}) + (NE_2 - DIV_2)[E_2(IRR_3)(1 - bd)](1 + \varepsilon_{IRR3})$	…
…	…	…	…
$n - 1$	$TA_{n-2} = TA_{n-3} + NE_{n-2} - DIV_{n-2}$	…	…
n	$TA_{n-1} = TA_{n-2} + NE_{n-1} - DIV_{n-1}$	$NE_n = NE_0(1 + \varepsilon_{ROE}) + \sum_{t=1}^{n-1}(NE_t - DIV_t)[E_t(IRR_{t+1})(1 - bd)]\left(1 + \varepsilon_{IRR,t+1}\right)$	$ROE_n = \frac{NE_n}{TA_{n-1}}$

Table 4. Numerical simulation for the financial indicators (example).

Financial Exercise	TA_t	NE_t	ROE_t	$E_{t-1}(IRR_t)$	$E_{t-1}(kM_t)$	DIV_t	$x^A{}_t$	$x^B{}_t$	$x^C{}_t$	$x^D{}_t$	$APROE_t$	IRR_t	kM_t	*bd*	1 − τ	ROE_t*	Mt
	(m.u.)	(m.u.)	(%)	(%)	(%)	(m.u.)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
0	1000	25.00	2.50			25.00	1.00	1.00	0.00	98.00	2.50						
1	1000	38.50	3.85	2.64	2.90	38.50	1.00	1.00	0.00	98.00	2.77						
2	1000	56.00	5.60	9.32	0.65	0.00	1.00	1.00	0.00	98.00	3.17	2.38	2.90	10.00	90.00	2.86	20.00
3	1056	−13.90	−1.32	4.48	3.14	0.00	1.00	1.00	19.60	78.40	1.82	8.39	0.65	10.00	90.00	7.55	20.00
…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…

Regarding the second indicator, the required ROE (ROE_t^*), investors can consider different benchmarks (Dragotă et al. 2013). However, basically, all of these benchmarks can be reduced to two fundamental approaches. On the one hand, they expect a rate of return, related to the characteristic of the project (for instance, in CAPM they require a rate of return higher than risk-free rate and they claim also a risk premium—otherwise they will reject the project) (Ross et al. 2010). On the other hand, investors analyze the alternatives available on the capital market (if they do not invest in the proposed project, what alternatives are available?).

First (but not necessary in this order), they require an acceptable rate of return[14]. It can be considered that they consider as normal to record (at least) a level for return equal to a benchmark assumed to be normal (this can be considered as an "anchor"). It can be considered that the rate of equity return recorded in the past can be considered as a proxy for future performance. As such, in this study, we assumed, conventionally, that investors consider an average for the past five financial exercises as a first proxy for the required rate of return (noted APROE).

Secondly, shareholders require a rate of return related to IRR (a function of the risk of the investment project). Finally, they accept renouncing dividends in exchange for an acceptable estimated IRR for the projects adopted.

Thirdly, investors analyze the capital market conditions. They compare their return with the returns recorded by other investors, for other investment projects. In our model, we consider that they compare their performance with the capital market return (kM_t).

Finally, we can assume that all these benchmarks can be adjusted for some extraordinary events. Shareholders can have a relative tolerance before dismissing their management[15]. We introduce a coefficient of intolerance for the manager's performance—τ, with $\tau \in [0, 1]$. If this tolerance is maximal, that means that $\tau = 0$. In other words, shareholders do not require a rate of return (however, they require that their wealth to be maintained at the same level, so min (ROE_t^*) = 0). If shareholders decide to maintain the management in function only if the company records a level of ROE higher than ROE_t^*, we can state $\tau = 1$ (they are totally intolerant in the case of a lack of performance). This coefficient can be related to some socio-cultural factors (e.g., Schwartz 2006).

Thus:

$$ROE_t^* = \tau \cdot \max(APROE_t;\ E_{t-1}(IRR_t); kM_t) \quad (9)$$

3.5. Model Inputs

Table 5 presents the model inputs. Many discussions can be made regarding the level of the numerical values included in simulations. The purpose of this article is not to provide levels for these indicators based on empirical data or theoretical literature. The choice of these parameters should be adapted, case by case, function of the analyzed company. For some input variables we have preferred to use round values (e.g., TA_0).

[14] Most of the papers in finance stipulate that this required rate of return is related to the assumed risk.
[15] This variable can be also connected to the aversion to loss (Shefrin and Statman 1985; Odean 1998).

Table 5. Model inputs.

Input	Notation	Level	Numerical Simulation	Distribution of the Variable	Remarks
Initial stock of total assets (equal to total equity) (initial wealth in our program)	TA_0	Fixed	1000	Constant	This level is configurable in slider *"Initial-Total-Assets"*.
Initial return on equity	ROE_0	Fixed	2.5%	Constant	In the case of APROE calculations for the first periods (before the period of bad decisions), we have assumed also that ROE was equal to this level.
Expected market return	$E_{t-1}(kM_t)$	Random	Range between 0% and 5%	Normally distributed, with a mean of 2.5 and a standard deviation of 2.5.	At the beginning of each iteration, its value is changing.
Expected internal rate of return for the new projects	$E_{t-1}(IRR_t)$, ∀ t	Random	Range between 0% and 5%	Normally distributed with a mean of 2.5 and a standard deviation of 0.8	*eIRR* in NetLogo
The impact of making bad decision	bd	Fixed	0.1	Constant	It can take values between 0 (this means the forecast is optimal) and 1 (this means that the forecast is totally inadequate). It can be set from the interface and ranges between 0%–100%.
The tolerance for the manager's performance	τ	Fixed	50% (but it can be set from the interface and ranges between 0%–100%)	Constant	It can be considered also as a resilience for changing the power.
The magnitude of interest to change the power	M	Random	0.2	Random (multi-values, each agent has its own value of this variable)	Range between 0% and 100%

Other variables are intensely studied in different contexts. For instance, if the investors in our simulations should consider the past records of market return as proxies for expected market return, the variability of these expectations should be somehow exaggerated. For instance, the Standard and Poor Composite Index rose 85% (between 1927 and 1929) and 69% (between 1954 and 1957), but fell 56% (between 1973 and 1975) and 52% (between 1929 and 1933) (the standard deviation of the market return was 17%) (Shiller 1987). In our simulations, we have preferred a more prudent approach and we have considered $E_{t-1}(kM_t)$ to be normally distributed[16], with a mean of 2.5 and a standard deviation of 2.5. Of course, the program allows for considering a larger range.

3.6. Implementation in NetLogo

Four types of agents (see Section 3.2) have been created in NetLogo 6.0.4, belonging to either class A (in red), B (in green), C (in cyan), or D (in orange), as presented in Figure 3. Additionally, four monitors are available for each type of members, where one can easily observe how the number of the members in each category is changing in real-time. Additionally, we have offered the agents the possibility to return to group D, by setting the switch "Group-C-Can-Return-To-Group-D" to "on". The agents passing from group C to group D will be highlighted by coloring them in yellow, while their number, in real-time, will be counted in the "Group-D-Returned-Members" monitor. The NetLogo code is provided in Appendix A.

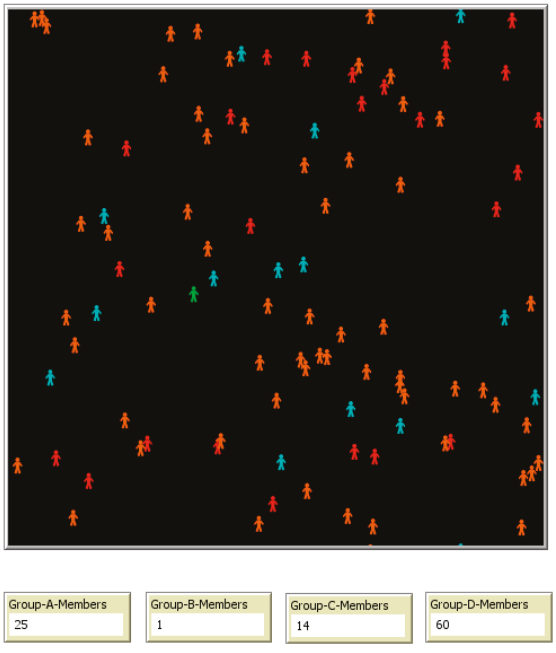

Figure 3. The types of agents created in NetLogo 6.0.4.

A series of variables have been considered in accordance with the model description presented above. The visual interface created in NetLogo 6.0.4. offers the possibility of setting some of these

[16] We have considered a normal distribution, and not a fat-tail one (e.g., McGroarty et al. 2019) for this variable due to the NetLogo limitations.

variables' values at the beginning of the simulation, while the presence of monitors and graphs depicts their evolution in real-time (see Figure 4).

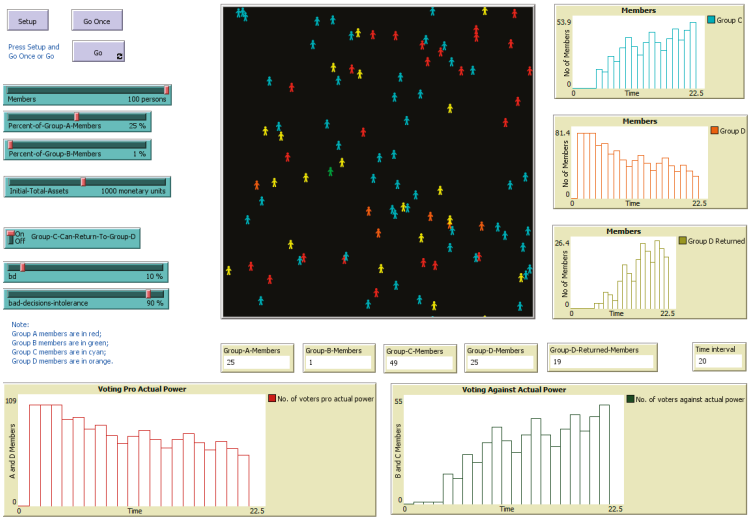

Figure 4. A snapshot of the NetLogo 6.0.4. model's interface at $t = 20$ ticks.

The simulation is stopping when the total number of members in groups A and D is smaller or equal than 50%. The "time interval" monitor depicts the number of ticks needed in order to change the power, where the tick is the time unit in NetLogo.

4. Numerical Results: Discussion

We have considered two main situations, described in Section 3.2, respectively: (i) Situation S1: group D members cannot return to their initial status (once they decide to enter in group C, they remain in this one); (ii) Situation S2: group D members can change their group (becoming member of group C if the performance of the company is changing in worse, but also re-becoming a member of D group if the performance of the company is changing in better). The first situation can be considered more optimistic (as it is easier to be followed), but the second one seems to be more connected to reality. For this reason, the DSMBD estimated in Situation S2 is the indicator which should be taken into account when a prudent approach is required.

For S1, different levels for "the tolerance for the manager's performance" (τ) and "the impact of making bad decisions" (bd) have been considered (see Tables 6 and 7). For each situation (S1-1 to S1-13) the model has been run 400 times and the average DSMBD in ticks has been extracted.

Table 6. Simulation's results for S1 when $bd = 0.1$.

S1		S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7
Parameters	The tolerance for the manager's performance (τ)	0	0.1	0.3	0.5	0.7	0.9	1
	The impact of making bad decision (bd)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average DSMBD (ticks)		12.29	12.54	14.73	19.17	24.28	31.43	43.52
DSMBD interval (min, max)		[10, 14]	[10, 16]	[11, 23]	[12, 27]	[15, 38]	[16, 39]	[24, 54]

Table 7. Simulation's results for S1 when $\tau = 0.5$.

S1		S1-8	S1-9	S1-10	S1-11	S1-12	S1-13
Parameters	The tolerance for the manager's performance (τ)	0.5	0.5	0.5	0.5	0.5	0.5
	The impact of making bad decision (*bd*)	0	0.3	0.5	0.7	0.9	1
Average DSMBD (ticks)		20.26	19.05	17.73	16.92	16.31	16.04
DSMBD interval (min, max)		[14, 27]	[12, 27]	[12, 26]	[12, 25]	[12, 24]	[12, 20]

For the (S1-1)–(S1-7) situations, we have kept the value of *bd* constant at the level of 0.1 and we have changed the tolerance for the manager's performance from 0 to 1. A level of $bd = 0.1$ can be interpreted as a systematic bad decision, but having a minor impact on financial performance. As a result, it has been observed that the average time (years) needed in order to stop the process of making bad decisions ranges between [12.29, 43.52], depending on the various values of the tolerance for the manager's decision variable (see Figure 5). Obviously, a systematic bad decision with minor impact can remain unobserved for a longer period.

Figure 5. Average DSMBD versus the tolerance for manager's performance, when $bd = 0.1$ and S1 is considered.

As observation, even in the case of $\tau = 0$, DSMBD can reach 10–14 years (iterations). Looking closer to the S1-1 situation in which we encounter zero tolerance for the manager's performance, an average DSMBD of 12.29 years results. Comparing this to the case in which 10% tolerance is considered, the average DSMBD of 12.54 years is recorded. Considering the individual values obtained from the simulations, it can be observed that the most frequent recorded value is 11 years (in 26% of the cases), the amount of time needed for making bad decisions being in [10, 16] (see Figure 6).

Additionally, from simulations, 32.75% of the cases in S1-2 have reached a DSMBD of 13 units, being also the most frequent value. On the other hand, no particular distribution can be determined for S1-3 average time, as there were a series of most frequent values encountered through simulations, such as: 13, 18, 22, and 26. This situation also occurs for all the other cases starting with S1-4 until S1-7.

Now, considering the two extreme cases: no tolerance (S1-1) and total tolerance for the manager's performance (S1-7), the average DSMBD difference is of 31.23 years, almost three and a half times more than in the no tolerance case. As expected, for the intermediate situations (S1-2 until S1-6), as the tolerance for manager's performance is increasing, while the impact of making bad decisions is not changing, the average DSMBD increases.

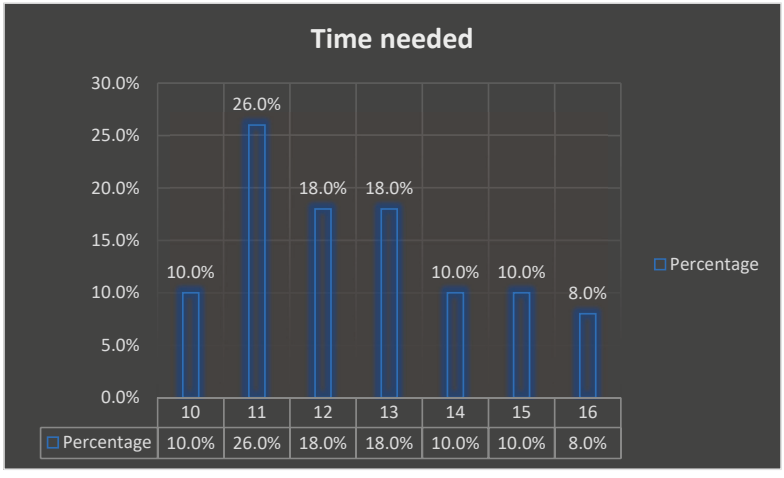

Figure 6. DSMBD—situation S1-1.

Considering the S1-4, S1-8 until S1-13 cases, it can be observed that when the deciders have over-confidence in the values of the expected IRR, DSMBD is longer, even though the time difference among the situations with the smallest and the largest average time amount is of only 4.22 time units (see Table 7). All the other average DSMBD values range smoothly among the values recorded for the extreme cases (see Figure 7).

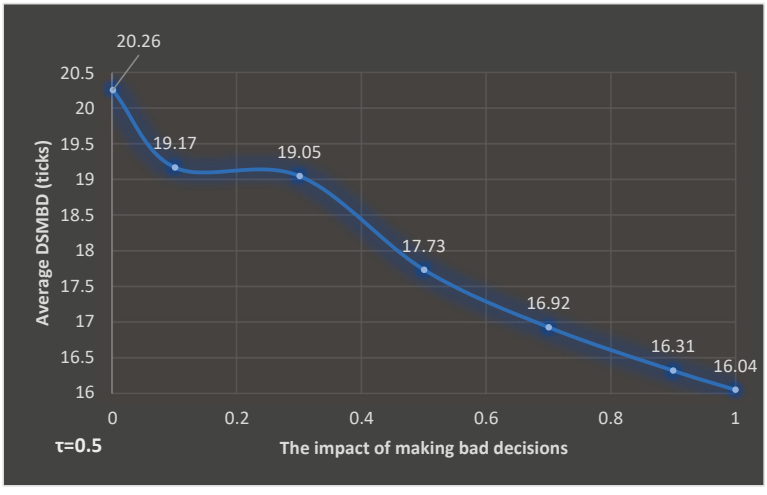

Figure 7. Average DSMBD versus the impact of making bad decisions, when $\tau = 0.5$ and S1 is considered.

Thus, among the two considered variables (the tolerance for the manager's performance and the impact of making bad decisions), the tolerance for manager's decisions has a greater impact, recording an average of 31.23 years (time units) when comparing the extreme cases with zero and total tolerance, while for the impact of making bad decisions considering the extreme cases, a time difference of only 4.22 years (time units) have been recorded. This result can suggest the important role of good monitoring processes, in accordance with Campbell et al. (2009).

We have made the same measurements for the S2 situation, in which the deciders can decide to return to group D. The results are summarized in Tables 8 and 9 below.

Table 8. Simulation's results for S2 when $bd = 0.1$.

S2		S2-1	S2-2	S2-3	S2-4	S2-5	S2-6	S2-7
Parameters	The tolerance for the manager's performance (τ)	0	0.1	0.3	0.5	0.7	0.9	1
	The impact of making bad decision (*bd*)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average DSMBD (ticks)		12.72	17.92	24.97	59.14	260.57	1203.71	4555.86
DSMBD interval (min, max)		[10, 15]	[10, 43]	[11, 85]	[12, 166]	[49, 741]	[263, 2252]	[933, 12489]

Table 9. Simulation's results for S2 when $\tau = 0.5$.

S2		S2-8	S2-9	S2-10	S2-11	S2-12	S2-13
Parameters	The tolerance for the manager's performance (τ)	0.5	0.5	0.5	0.5	0.5	0.5
	The impact of making bad decision (*bd*)	0	0.3	0.5	0.7	0.9	1
Average DSMBD (ticks)		65.62	54.23	50.71	50.32	49.18	48.13
DSMBD interval (min, max)		[20, 171]	[12, 164]	[12, 144]	[12, 141]	[12, 138]	[12, 116]

Obviously, the greater the tolerance for the manager's performance, the longer the average DSMBD is. However, it can be observed that, as the tolerance is higher, DSMBD can take extremely long periods of time until a normal situation is reached (see the S2-7 situation). This length (in years) substantially exceeds the normal life of companies which are in existence at this moment[17].

Figure 8 depicts the evolution of the average DSMBD when considering different values for the tolerance for manager's decision, ranging between zero tolerance (S2-1) and full tolerance (S2-7). It can easily be observed that a tolerance greater than 0.5 can have dramatic results on the DSMBD value.

In the extreme case of total tolerance (S2-7), the negative effects can perpetuate as much as possible, as people are continually changing their mind and switching groups, making DSMBD very long (supposing that the company can function in these conditions for such a long period).

Considering a low-tolerance situation (case S2-1), which can be plausible in some real-life situations, the average of such bad decisions' time is 17.92 years, which can be characterized as a double time for not creating major problems within the analyzed economic entity. Moreover, as the tolerance for manager's performance increases, DSMBD continues to increase, and it can be observed that, after a 0.5 tolerance, it is critically high, reaching, on average, more than 59.14 years (time units).

Comparing (S1-1)–(S1-7) with (S2-1)–(S2-7), it can be observed that for small values of tolerance for the manager's decisions (τ), DSMBD has comparable values. For example, the time difference between S1-1 and S2-1 is of only 0.43 (practically, 0) years (time units), while for 0.1 tolerance is 5.38 years (cases S1-2 and S2-2), and for 0.3 tolerance is of 10.24 years (cases S1-3 and S2-3). Starting with 0.5 tolerance, differences for DSMBD become notable: 39.97 years for $\tau = 0.5$, 236.29 for $\tau = 0.7$. Higher

[17] According to Wikipedia (https://en.wikipedia.org/wiki/List_of_oldest_companies, accessed on 23 July 2019), the oldest company still in function is Nishiyama Onsen Keiunkan (founded in 705 AD, so with an age less than 1400 years). Of course, such a long period of existence can be explained by making good decisions. From this perspective, it is implausible that, for a company to function for so many years, making systematically bad decisions, large levels of DSMBD can be interpreted as a failure before the change of the decider.

levels of tolerance make the difference extremely high: 1172.28 years (time units) for 0.9 tolerance and 4512.34 years for total tolerance ($\tau = 1$). Once more, the significant effect the degree of tolerance has on the average DSMBD can be underlined.

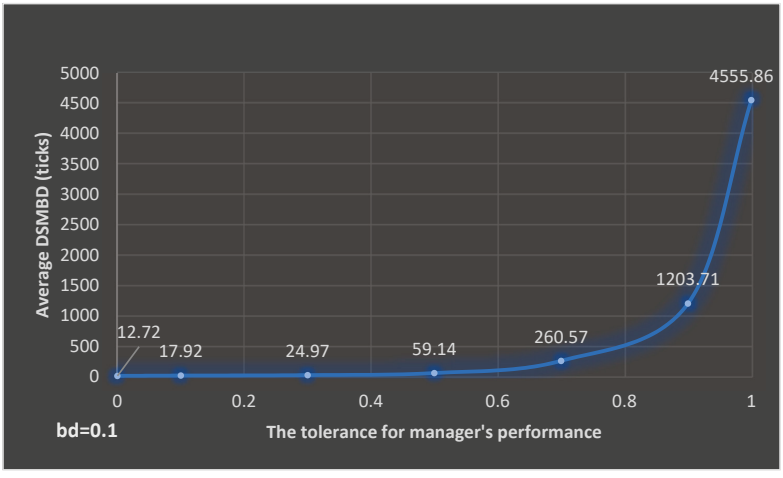

Figure 8. Average DSMBD versus the tolerance for manager's performance, when $bd = 0.1$ and S2 is considered.

As for the impact of making bad decisions, the data in Table 9, shows, as in the previous cases (S2-8 until S2-13), that *bd* has only a reduced influence over the overall average bad decisions time, making only a 17.49-time units (years) difference.

Figure 9 presents the evolution of DSMBD for various values of the impact of making bad decisions. It can be observed that the decrease of the average DSMBD values is smooth as it was also in Figure 7. The only difference is that in this case the values of DSMBD are higher than in the (S1-8)–(S1-13) situations and the difference among the extreme values is higher in this case.

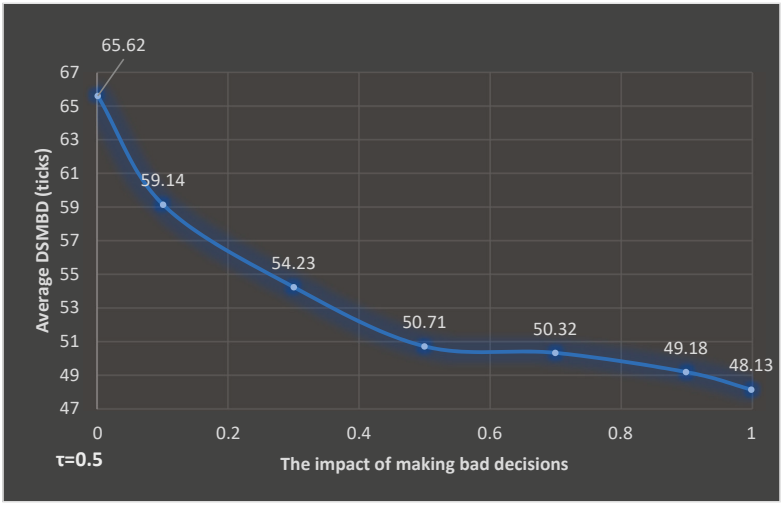

Figure 9. Average DSMBD versus the impact of making bad decisions, when $\tau = 0.5$ and S2 is considered.

Comparing the two situations (S1 and S2), it can be seen that in both of them, the deciders' tolerance to manager's bad decisions can make a difference, having a significant contribution to the overall average decision-making time.

Based on these simulations, we can conclude that the length of the DSMBD can be very long, probably exceeding the lifetime of the company. In some cases, the dominant group (class A in our model) can impose their viewpoint until the end of the company, while the group of rational shareholders (class B in our model) cannot impose theirs. Thus, in the absence of the improving the quality of making judgments and making better decisions, the existence of informed and rational investors is useless.

5. Conclusions

Bad decisions have an impact on the company's performance. However, their impact is not instant. For this reason, the process of making bad decisions can be very persistent, especially if no agreement about the best solution is existent. In this paper, we propose a model in which shareholders are not instantly aware about a bad decision made by the shareholders that dominate the annual general meeting of shareholders (AGM). This paper analyzes the case in which, for different reasons, the deciders systematically make bad decisions regarding dividend payout. We use this model for the estimation of the DSMBD in setting one dividend policy. We have started from Dragotă (2016), as a general case, and we have made some adjustments in order to adapt this model for the case of financial management, respectively, for dividend policy. We use NetLogo 6.0.4 for modelling, which offers a graphical interface, where the changes in the simulated environment can be observed in real-time.

This paper considers the case in which, in voting one dividend policy or another, individuals are following different objectives based on different values. Unfortunately, the democratic vote and the good intentions are not sufficient for guaranteeing the avoidance of systematically making bad decisions (Dragotă 2016). Since the deciders are convinced that their decisions are right, they have no reason to change them until the results of their actions significantly affect themselves. However, as long as their wealth is determined by other factors, too, they can hardly differentiate between the effect of their decisions and the impact of these other factors. As an effect, they can still be convinced that they are making good decisions. Moreover, even if the outputs are not acceptable, these results can be explained not as the effect of some bad decisions, but as the effect of some nonsystematic, external effects.

Our paper analyzes the conditions in which making bad decisions can become a systematic phenomenon and proposes a model presented both mathematically and numerically on a small example in order to increase its understanding and readability. Using the advantages provided by the agent-based modelling and NetLogo 6.0.4, a model is created and numerically simulated in order to make a proper estimation of DSMBD. In our model, we consider four classes of shareholders, each of them with a specific behavior. We propose an algorithm that can be used in modelling their interaction and for predicting this duration. Thus, the changes in voting structure can be followed in real-time. As far as we know, this approach has not been used in the financial literature concerning dividend policy.

Some cases have been considered, depending on whether hat the deciders can change their groups or not. Additionally, different values for the involved variables have been considered and simulated 400 times each. It has been observed that the deciders' tolerance to a manager's bad decisions can make a difference in terms of time.

We prove that, in some circumstances, DSMBD can be very long. Its length can reach a very large number of years, exceeding in some conditions a human lifetime and the maximal age of existing companies on Earth at this moment. Moreover, it can be possible for DSMBD to increase dramatically if the shareholders have a great level of trust in the management's decisions. Practically, in some conditions, the dominant group (controlling shareholders) can impose their viewpoint until the end of the company, while the group of rational shareholders cannot impose theirs. As a principal implication,

an increase of the quality of financial education for top-management and shareholders, and, from here, more performant instruments for controlling the power's decisions are required. After all, Campbell et al. (2009) warn that "Given the way the brain works, we can't rely on leaders to spot and safeguard against their own errors in judgment. [...] So rather than rely on the wisdom of experienced chairmen, the humility of CEOs, or the standard organizational checks and balances, we urge all involved in important decisions to explicitly consider whether red flags exist and, if they do, to lobby for appropriate safeguards."

Of course, simulations provide only an artificial environment and our study and their findings can be easily attacked from this perspective. New directions for study can be related to two proposed inputs—the coefficient of impact of bad decisions (*bd*) and the coefficient of intolerance for the manager's performance (τ). However, most of the parameters required in our model can be relatively easily imported in real-life, company level context.

Further, one interesting development of the study is to consider the agency problems which occur in dividend payment decision (Dragotă et al. 2009). In this case, multiple objective functions (Lovric et al. 2010), adaptable for different classes of shareholders, could be used. The manner in which the dividend payout is fixed can be a fruitful field of study, especially if the asymmetrical information, the power in negotiation, and the skills required for persuading other individuals to vote somehow are considered. In the same context, valuation the impact of combining financial and non-financial (e.g., ethical objectives) (Ballestero et al. 2012; Mallin 2016) can be another direction for study.

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Appendix A. The NetLogo Code

```
breed [ groupAmembers groupAmember ]
breed [ groupBmembers groupBmember ]
breed [ groupCmembers groupCmember ]
breed [ groupDmembers groupDmember ]
globals [
   Previous-DIV
   Previous-TA
   Previous-NE
   Previous-eIRR
   All-Previous-ROE
]
to setup
   clear-all
   reset-ticks
   set-default-shape turtles "person"
   setup-people
end
to setup-people
      create-groupAmembers Percent-of-Group-A-Members * Members/100 [
      setxy random-xcor random-ycor
      set color red
   ]
```

```
        create-groupBmembers Percent-of-Group-B-Members * Members/100 [
          setxy random-xcor random-ycor
          set color green
        ]
        create-groupCmembers 0 [
          setxy random-xcor random-ycor
          set color cyan
        ]
        create-groupDmembers Members - count groupAmembers - count groupBmembers - count
groupCmembers [
          setxy random-xcor random-ycor
          set color orange
    end
    to go
        if count groupAmembers + count groupDmembers <= 0.5 * Members [
          stop
        ]
        if ticks = 0 [
          go-0
        ]
       if ticks = 1 or ticks = 2 [
          go-12
        ]
        if ticks > 2 [
          go-3n
        ]
        tick
    end
    to go-0
        let TA Initial-Total-Assets
        let ROE 0.025
        let NE TA * ROE
        let DIV 0
        ifelse NE <= 0
        [
          set DIV 0
        ]
        [
          let eIRR (random-normal 2.5 0.8)/100
          let eKm (random-normal 2.5 2.5)/100
          ifelse eIRR >= eKm
          [
            set DIV 0
          ]
          [
          set DIV NE
          ]
        ]
        set Previous-DIV DIV
        set Previous-TA TA
```

```
    set Previous-NE NE
    set All-Previous-ROE (list ROE)
  end
  to go-12
    let TA Previous-TA + Previous-NE - Previous-DIV
    let ROE (random-normal 2.5 2.5)/100
    let NE TA * ROE
    let DIV 0
    let eIRR 0
    ifelse NE <= 0
    [
      set DIV 0
    ]
    [
      set eIRR (random-normal 2.5 0.8)/100
      let eKm (random-normal 2.5 2.5)/100
      ifelse eIRR >= eKm
      [
        set DIV 0
      ]
      [
      set DIV NE
      ]
    ]
    set Previous-DIV DIV
    set Previous-TA TA
    set Previous-NE NE
    set Previous-eIRR eIRR
    set All-Previous-ROE fput ROE All-Previous-ROE
  end
  to go-3n
    print word "#" ticks
    let TA Previous-TA + Previous-NE - Previous-DIV
    let ROE (random-normal 2.5 2.5)/100
    let IRR (1.1 - random-float 0.2) * Previous-eIRR * (1 - bd/100)
    let NE Previous-TA * ROE + Previous-NE * IRR;
    print word "NE:" NE
    let DIV 0
    let eIRR 0
    let eKm 0
    ifelse NE <= 0
    [
      set DIV 0
    ]
    [
      set eIRR (random-normal 2.5 0.8)/100
      set eKm (random-normal 2.5 2.5)/100
      print word "eIRR:" eIRR
      print word "eKm:" eKm
      ifelse eIRR >= eKm
```

```
        [
          set DIV 0
        ]
        [
        set DIV NE
        ]
      ]
      let CompanyROE NE/TA
      print word "CompanyROE:" precision CompanyROE 3
      let kM (1.1 - random-float 0.2) * eKm
      let aproe compute-aproe
      print word "aproe:" aproe
      let ROE* bad-decisions-intolerance/100 * max (list kM IRR aproe)
      print word "ROE*:" precision ROE* 3
      ifelse CompanyROE < ROE*
      [
        ask n-of (0.2 * count groupDmembers) groupDmembers
        [
          set breed groupCmembers
          set color cyan
        ]
      ]
      [
        print word "Scade C cu " (0.2 * count groupCmembers)
        ; scade numarul de agenti din grupul C
       if Group-C-Can-Return-To-Group-D
        [
          ask n-of (0.2 * count groupCmembers) groupCmembers
          [
            set breed groupDmembers
            set color yellow
          ]
        ]
      ]
      set Previous-DIV DIV
      set Previous-TA TA
      set Previous-NE NE
      set Previous-eIRR eIRR
      set All-Previous-ROE fput ROE All-Previous-ROE
    end
    to-report compute-aproe
      let i 0;
      let roe-sum 0
      while [i < 5]
      [
        ifelse i < length All-Previous-ROE
        [
          set roe-sum roe-sum + item i All-Previous-ROE
        ]
        [
```

```
        let index length All-Previous-ROE - 1
        set roe-sum roe-sum + item index All-Previous-ROE
      ]
      set i i + 1
    ]
    report roe-sum/5
  end
```

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Are Family Firms Financially Healthier Than Non-Family Firm?

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Abstract: This study examines the whether or not family firms are financially healthier than non-family in terms of capital structure and leverage. It therefore takes into consideration the existence of any significant differences between the leverage and risk choices of family and non-family firms. Using a panel data set of 888 firms and 7104 firm-year observations of unlisted small and medium size firms over the period 2007–2014, we present that family owned businesses have lower financial structure than those of non-family owned businesses. This indicates that most family firms use less debt financing than non-family firms, and as such maintain a lower level of debt. Secondly, family firms demonstrate lower risk as illustrated by the Altman Z-score. The Altman Z-score scale illustrates a contrary relationship of significance with respect to family firms and their counterparts in terms of the operation aspect of the business's risk factors. Family firms managed their business operations with lower risk and are generally healthier financially than their counterpart firms. Lastly, findings from the robust tests for the hypotheses using a sample of bankrupt firms in Iberian Balance sheet Analysis System (SABI) reveal that the proportion of failure of family firms as opposed to their counterpart firms is relatively low. Analyzing the bankruptcy files of firms from 2002 to 2014 shows a considerably low ratio of family firms at the 5% significant level. This affirms that the low risk illustrated in the Altman Z-score regression is consistent to the lower ratio of family firms that were declared bankrupted over the study period, which makes Spain an important case in this study.

Keywords: capital structure; family firms; leverage; non-family firms; risk

JEL Classification: G1; G32; G38

1. Introduction and Literature Review

Following the evidence cited by several researchers over the years (such as Shleifer and Vishny 1986; DeAngelo and DeAngelo 2000; Anderson and Reeb 2003), one principal characteristic to influence the management of firms is that of its risk profile. Even though very little empirical research has shown light on this topic, the small amount of existing empirical research suggests that the characteristics of family owned companies could be a possible reason for family business risk aversion and the choice of capital structure.

Anderson and Reeb (2003) argue that the agency problems that exist between management and stakeholders is reduced when the structure of a family firm is adopted by a company. They suggest however that the risk averse nature of the controlling families is disintegrated through monitoring.

DeAngelo and DeAngelo (2000) add that the risk nature of family firms achieved through engaging in lower risky activities that promote net present value by large and undiversified shareholders might impose costs to well-diversified shareholders with minority power. Following the illustration in (Miller et al. 2007; Villalonga and Amit 2006; Pison et al. 2014), 65%–80% of firms around the world are managed by one or more families, and generate approximately 70%–90% of the gross domestic product. Neubauer and Lank (2016) add that family owned businesses create approximately 70%–80% of jobs on a yearly basis. Meanwhile, evidence from the European Family Businesses (2012) present that over the globe, 85% of business startups are family orientated.

The fundament reason for the said study using Spain as the case is due to the peculiarities of the Spanish system being made up of approximately 90% family orientedbusinesses contributing to 60% of the country's GDP. In (Pérez and Lluch 2015; Pison et al. 2014; European Family Businesses 2012), family-oriented businesses generate over two-thirds of the total employment, and often these firms are thought to be small and medium size enterprises. Yet little attention has been provided to the financial health of the business in terms of capital structure and leverage.

A review of both management and finance empirical evidence regarding the risk profile of family businesses suggests the main hypothesis that family-oriented businesses have lower leverage and lower risk, which could actually benefit the company during times of economic downturn. Thus, from a financial standpoint, this paper presents indicators that are specific to family-orientedbusiness with long-time horizon, family orientation, and generational continuity as potential reasons for family business risk aversion and the choice of capital structure for medium and small oriented family companies in Spain.

In order to answer the hypothesis, we first examine the characteristics of family firms in term of the operation aspect of the business's risk factors and whether family firms managed their business operations with lower risk and are generally healthier financially than their counterpart firms. Next, we examine a series of bankruptcy filings in Spain from 2002 to 2014 and evaluate the proportion of family businesses in the sample.

Accordingly, March and Shapira (1987) consider decision investment as the deal between expected return and risk per the conventional theory. Masulis (1988, pp. 14−16) suggests that "managers in both family and non-family businesses will prefer having less leverage than shareholders in order to reduce the risk of their undiversified investment in the company". Consistent with this view, Grossman and Hart (1986) argue that increased leverage reduces the agency cost of type I associated with managerial discretion and managers' discretion over corporate decisions. In Bangladesh, Dey et al. (2018) present findings of financial risk disclosure indices in annual reports of 48 manufacturing companies over six-year period (2011–2015) using 30 disclosure identifiers. Their results show that there is a positive and significant relationship between the level of financial risk disclosure and firm size, financial performance, and auditor type.

A more recent study suggests "that risk is an unavoidable part of life, including business life and therefore, it exists in the content of uncertainty" (Garland 2003, p. 4). Furthermore, "it is no surprise that predicting the future is an uncertain task, involving, at best, probabilities, and inferences since the memory of the past is sometimes flawed and our knowledge of the present is incomplete" (Garland 2003, pp. 4–5). Hollenbeck et al. (1994) find that individuals treat risk as a dynamic factor, because the future carries its opportunities as well as it risks. They add that the "perspective of change in value rather than total value to evaluate a decision and to separate gains but not losses from initial outlay" is preferred by most risk analysis treating risk as a dynamic factor.

Furthermore, Bernstein and Bernstein (1996) add that the nature of risk has been sharp by the time horizon. May (1995) posits that the reason behind managers using only approximate time frames in their planning rather than the accurate time forecast is due to the personal risk when making decisions regarding firms risk. De Vries (1993) add that family businesses have a longer-term perspective than non-family businesses, (Oswald and Jahera 1991; Ntoung et al. 2016a), which may "improve decision-making resulting in higher earnings and dividends. After controlling for a variety of factors

that affect cross-sectional debt levels among all firms", Mishra and McConaughy (1999) conclude that family-controlled firms using less debt. This is indeed true because the use of less debt creates the founding family's aversion to the risk of loss of control.

2. Family Control and Firm Value

Family control businesses have been debated over century by prior research that it enhances family firm value. Some classical research argues that the ownership structures in widely held firms create opportunities for conflicts of interest between managers and shareholders. This can reduce the value of the firm since managers of such firms are more concerned about the maximization of private benefits at the expense of the owner of the firms (Agency Cost of Type I). Other school of thought claim that the most suitable instrument to correct the action of such sulphurous management behaviour is through concentrated ownership, (Ntoung et al. 2017, p. 127). For instance, in (Ntoung et al. 2016a) (Jensen and Meckling 1976; Sraer and Thesmar 2007) claim that separation between ownership and control can involveimportant costs and problems forshareholders. Their classical agency problem suggests that one way to resolve the conflict of interest between shareholders and managers is to increase the proportion of shares in the hands of the controlling shareholder.

"In light of the above, minority shareholders are victimised as ownership becomes more concentrated, while controlling shareholders tend to engage in undesirable behaviours. In a similar way, Schulze et al. (2001) examine the consequences of altruism concept and pay of incentives by controlling shareholder, and their influence in the level family firm's performance. They affirm that family firms with concentrated ownership are more exposed to agency danger. Chrisman et al. (2004) conclude that agency cost affects the performance of family business. Researches in Austria, Italy, and Spain show a positive and signification relationship between incentive and performance", (Ntoung et al. 2016b).

Furthermore, Asghar Butt et al. (2018) add that most family owners are less likely to use derivatives for hedging purposes as compared to non-family owners. Examining corporate derivatives and the ownership concentration of 101 Pakistani non-financial firms over the period 2012–2016, they concluded that non-family firm are more likely to use derivativemeasures to increase the value of their stocks.

Meanwhile, Yang et al. (2018) conclude by attesting that in order to perform risk management practices in a way that will guarantee competitive position in the market, the top management need to have enough financial skills. Finally, "their findings suggest that these characteristics of family firms do influence their performance. In Europe, Barontini and Caprio (2006) provide similar evidence to those of Villalonga and Amit. According to them, family firms with a founder or descendants as CEO or Chairman outperform other firms. However, family firms with a founder as CEO outperform family firms with descendants as CEO. Also, if no member of the family is involved in the management (passive), then the firms perform worse" (Ntoung et al. 2017, p. 125).

Hypotheses

With respect to the mixed empirical evidence from prior research, one can clearly argue that financial and capital structure choices by family businesses are motivated by the level of risk assumed. Anderson and Reeb (2003) argue that "the principal-agent cost and the asymmetric information between shareholders and managers" is reduced when a structure of family firm is adopted in a company. They suggest however that the risk averse nature of the controlling families is disintegrated through monitoring. DeAngelo and DeAngelo (2000) add that the risk aversion of family companies is achieved through avoiding high risk projects even when they have positive net present value as large and undiversified shareholders might impose costs to well-diversified shareholders with minority power. Thus, our first hypothesis:

Hypothesis 1 (H1). *Family firms have lower leverage than non-family peers.*

Hypothesis 2 (H2). *Family owned companies are less risky than non-family firms.*

These hypotheses suggest that family owned firms possess some characteristics, such as family legacy, generational succession, and longer-term horizons, which might potentially be responsible for the capital structure choice and make family business more risk averse and conservative.

3. The Hypothesis, Methods and Data

3.1. Empirical Model

This study examines if family firms are financially healthier than their counterpart firms. This led us to two specific factors that determine the financial health of the firm as shown in Sections 3.1.1 and 3.1.2 below.

3.1.1. Leverage

"We use a panel regression analysis to evaluate whether a family owned company has a different level of leverage to a similar non-family" (Ntoung et al. 2017) to examine the level of a firm's leverage (debt/EBITDA ratio and interest coverage ratio). One reason for excluding the usual ratio of debt/capital is because it is influenced not only by the choice of debt level the company makes, but also by the level of equity the company has. Also, the debt/capital ratio induced the market perception of the firm into the equation, thus it wouldn't provide aclean estimate of the leverage choices made by the firm.

We run five regression equations regarding our two dependent variables for leverage.

The regression equation is illustrated as follows:

$$\begin{aligned}\text{Leverage} = \alpha_1 \times (\text{Family dummy}) + \alpha_2 \times \text{Age} + \alpha_3 \times \text{Size measure} + \alpha_4 \times \text{Industry Dummy} \\ + \alpha_5 \times \text{Profitability measure} + \alpha_6 \times \text{Interactive Variables}\end{aligned} \quad (1)$$

where,

Leverage: Debt/EBITDA and Interest Coverage Ratio.
Family firm takes: dummy equals 1 when a firm is a family firm or zero otherwise
Profitability measure: refers to return of equity, return on assets, EBITDA margin, netincome margin
Size measure: refers to number of employees, total revenues, total assets
Age: calculate based on the company date of establishment.
Industry dummy: equaling 1 as dummy for each IAC classification code,
Year dummy: equals 1 for each year considered in the analysis.

Furthermore, to correct the presence of heteroskedasticity and serial correlation in the data, we employ the Huber–White sandwich estimator for variance (Ntoung et al. 2017).

3.1.2. Risk Exposure

"To critically analyze the risk profile of family businesses as opposed to their non-family peers, it is vital to examine beyond leverage, factors that reflect overall risk. We further evaluate these factors by employing the Altman Z-score, a predictive model developed to determine acompany's probability of filing for bankruptcy in the next subsequence of years and to measure the overall financial health of a company" (Ntoung et al. 2016b).

Altman Z-score: We consider the Altman Z-score as a dependent variable. "The choice of variable regarding a company risk's of survival was based on four balance sheet and income statement variables, namely profitability, leverage, solvency, liquidity, and activity. The result of the combination of ratios gives rise to a discriminantscore, otherwise called the Z-Score. The ratios are X^1 = working capital/total assets, X^2 = retained earnings/total assets, X^3 = earnings before interest and taxes/total assets, X^4 = market value of equity/book value of total debt, and X^5 = sales/total assets. In 1998, Altman redefined

his model by excluding X^5 (sales/total assets) to forecast the corporate risk of survival for manufacturing firms in Mexico. The weighted coefficients thus have different values" (Ntoung et al. 2017).

$$Z'' = 6.5X_1 + 3.2X_2 + 6.72X_3 + 1.0X_4 \quad (2)$$

Source: Altman et al. (1998, p. 3).

The analysis of family business risk characteristics using Altman Z-score provides information about risk exposure the company is willing to take on, hypothesizing that family firms would have a tendency to be more risk averse, if all things being equal.

We run five regression equations regarding our two dependent variables for leverage.

The regression equation is illustrated as follows:

$$\text{Altman Z-Score} = \alpha_1 \times (\text{Family dummy}) + \alpha_2 \times \text{Age} + \alpha_3 \times \text{Size measure} + \alpha_4 \times \text{Industry Dummy} + \alpha_5 \times \text{Profitability measure} + \alpha_6 \times \text{Interactive Variables} \quad (3)$$

where,

Altman Z-Score: $6.5X_1 + 3.2X_2 + 6.72X_3 + 1.0X_4$
Family firm takes: dummy equals 1 when a firm is a family firm or zero otherwise
Profitability measure: refers to return of equity, return on assets, EBITDA margin, netincome margin
Size measure: refers to number of employees, total revenues, total assets
Age: calculated based on the company date of establishment.
Industry dummy: equaling 1 as dummy for each IAC classification code,
Year dummy: equals 1 for each year considered in the analysis.

Furthermore, to correct the presence of heteroskedasticity and serial correlation in the data, we employ the Huber–White Sandwich estimator for variance (Ntoung et al. 2017).

3.2. Data

In this section we examine the hypothesis that family owned companies have lower leverage and lower risk than non-family peersof unlisted small and medium size sing data constructed based on the Iberian Balance sheet Analysis System (SABI) of the Bureau Van Dijk, containing detailed financial information on more than 2,000,000 Spanish businesses. Next, we employ the IAC2015 classification code excludingall financial and utilities firms using the industry classification. The reason for the exclusion of firms in these industries is due to the fact that firms are strongly regulated and influenced by the government. We also excluded all firms with incomplete accounting information. Our final sample consists of 888 firms and 7104 firm-year observations of unlisted small and medium size firms over the period 2007–2014. The study is based on Spain because Spain was one of the European countries that suffered greatly duringthe 2008 financial crisis. Many small and medium size businesses experienced bankruptcy and, as a result of this, it reveals an important case to study. We were interested to investigate whether the businesses failure was due to a high leverage or risk profile.

3.3. Variables Measurement

3.3.1. Dependent Variables

Leverage is measured using the debt/EBITDA and interest coverage ratio and Altman Z-score. This is consistent with (Shleifer and Vishny 1986; DeAngelo and DeAngelo 2000; Anderson and Reeb 2003).

3.3.2. Independent Variables—Ownership structure

The criteria used for the ownership structure of firms in Spain are based on the Iberian balance sheet analysis system (SABI). These criteria focus on the holding of a shareholder's ultimate voting

rights across these firms, which differ from the ultimate cash flow rights. In cases where information was available about the ownership structure of a company, we search this property directly on the company websites. Firms in Spain were classified through the aid of the BvD independence indicator available in SABI. The BvD independence indicator has five levels, namely "A", "B", "C", "D", and "U". According to SABI, independent indicator "A" denotes that a company is said to be independent if the shareholder must be independent by itself (i.e., no shareholder with more than 25% of ownership of ultimate voting rights), whereas independent indicator "B" is when no shareholders with more than 50% exist but one shareholder with voting rights between 25.1% to 50%. For a company to be classified with independent indicator "C", the company must have a recorded shareholder with a total or calculated ownership of 50.1% or higher, whereas a company is classified as "D" when a recorded shareholder demonstrates direct ownership of over 50% with branches and foreign companies (Ntoung et al. 2017).

Independent indicator "U" is applied when a company does not fall into the categories "A", "B", "C" or "D". Based on the above features and prior studies, a company with a shareholder having more than 25% is classified as family-run firm, while firms with no shareholder with more than 25% areclassified as widely held firms. This threshold of 25% allows shareholder to have significant influence on the firm. Therefore, firms categorized as "A" are widely held firms while firms in "B", "C", and "D" are family firms. Our next criteria for family is that, in a family firm, an individual or a family must be the largest shareholder and be categorized in "B", "C", and "D". The individual must be part of the founding family. If this is not the case, the controlling shareholder must have had the largest percentage of ultimate voting right over a long time period.For each firm, we identify founding family presence using information provided by SABI about corporate proxy statements on board structure and characteristics, ECO attributes, equity ownership structure, and founding-family attribute" (Ntoung et al. 2017). In case where there weremissing data, we directly search the company website for extra detail.

3.3.3. Other Independent Variables

Profitability measure refers to the return of equity, return on assets, EBITDA margin, and net income margin. Size measure refers to number of employees, total revenues, and total assets. Age is calculated based on the company's date of establishment. Table 1 provides a detailed definition of the variable used.

3.4. Descriptive Statistics

Table 2 shows a simple *t*-test analysis and itssignificance of the difference between family and non-family firms on each of the independent variables used in this study. With respect to the dependent variables, from our *t*-test presented in Table 2, both family and non-family firms exhibit the same risk profiles, even though family firms seem to be less risky than non-family firms. However, further examination is needed for the relationship between the variables in the form of regression estimates while controlling for other possible explanations for the outcome, as revealed in the *t*-test.

Also, the outcomes of the different *t*-tests indicate that most of the controlling variables are different for both family and non-family firms. With respect toprofitability measures, non-family firms appear to be more profitable than their peers. The proxy of age reveals that family firms have a longer time-horizon than non-family firms.

Lastly, across the different industrial sectors, the outcome from the *t*-test shows that, for construction, other services, and restaurant and lodging trades, family firms significantly dominate their non-family counterparts. However, for transport, communication, management and insurance activities, as well as energy, water, and metal transforming industries, non-family firms significantly dominate family firms (See Table 2).

Table 1. Definition of variable.

Dependent Variables	Debt/Earnings before interest, tax, depreciation and amortization (EBITDA), Interest Coverage Ratio and Altman Z-Score.
Independent Variables	
"A"	"Indicates a dummy equaling 1 if no shareholder with more than 25% of ownership of ultimate voting rights);"
"B"	"Indicates a dummy equaling 1 if no shareholder with more than 50% but exist one shareholder with voting rights between 25.1% and 50%."
"C"	"Indicates a dummy equaling 1 if a recorded shareholder with a total or a calculated ownership of 50.1% or higher"
"D"	"Indicates a dummy equaling 1 if a recorded shareholder with a direct ownership of over 50% with branches and foreign companies"
Family Firms	"B", "C" and "D"
Non-family firms	"A"
Family characteristics	"A family member is CEO, Chairman, CEO and Chairman, respectively in a family firm; the family only holds shares in the company without taking an active position; and the founder or a descendant is actively managing the company as Chairman or CEO."
Widely held corporation	"Denote a dummy variable 1 if the largest ultimate shareholder owns more than 25% of the shares in one of the categories."
Profitability measure	ROA, ROE, EBITDA margin, and Net income margin.
Size measure	Number of employees, total revenues, and total assets.
Firm age	"Defined the logarithm of the date of establishment"
Industry	"Defined according IAC classification code"

Table 2. Descriptive Statistics.

Descriptive Statistics	All Sample		Non-Family Firms		Family Firms		Difference in mean (Non-Family-Family Firms)	*t*-Test
	Mean	Std.	Mean	Std.	Mean	Std.		
Independent Variables								
Number of Employees	110.79	96.77	123.63	221.34	112.78	73.17	10.85	1.41
Total Assets	20,108.90	14,480.30	18,331.50	9231.54	26,191.18	27,523.31	−7859.66	−8.248 *
Total Revenue	20,206.30	13,224.60	19,062.50	9356.42	22,025.11	23,499.49	−2962.58	−3.514
Age	24.44	11.41	25.50	11.21	28.61	11.82	3.11	7.05 **
Return on Assets	2.84	8.05	2.57	6.45	2.60	7.60	−0.03	−0.10 **
Return on Equity	7.79	48.41	6.96	14.23	7.28	21.60	−0.32	−0.38 *
Net Income Margin	−19.22	1812.36	2.33	6.79	2.14	9.67	0.19	−0.50 *
Industry dummy								
Cattle raising	0.82	0.39	0.11	0.31	0.19	0.31	−0.08	−55.338 ***
Energy and water	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Extraction, transformation of non-energetic minerals	0.10	0.47	0.15	0.36	0.06	0.36	0.09	25.974 ***
Metal transforming industries	0.09	0.50	0.12	0.33	0.08	0.33	0.04	39.118 *
Other manufacturing industries	0.43	0.50	0.17	0.30	0.10	0.30	0.07	58.663 **
Construction	0.85	0.36	0.15	0.36	0.85	0.36	−0.70	−17.507 ***
Restaurant and lodging trade	0.00	0.06	0.17	0.38	0.83	0.38	−0.65	−38.056 ***
Transport and Communication	0.47	0.31	0.66	0.23	0.34	0.23	0.32	44.443 **
Management and insurance activities	0.35	0.42	0.54	0.69	0.39	0.31	0.13	14.924 **
Other services	0.86	0.34	0.14	0.34	0.86	0.34	−0.73	−18.331 **
Dependent Variables								
Z-Score	2.91	1.41	2.75	1.46	3.04	1.41	−0.30	−4.502 *
Debt/Capital	71.92	319.88	36.67	60.27	68.61	197.29	−31.95	−4.678 ***
EBIT/Interest Expense	5.78	1.33	4.17	1.32	9.05	51.21	−4.88	2.875 **
Debt/EBITDA	3.09	0.45	−1.45	184.97	3.11	210.59	−4.56	0.49 **

***, **, * significant at 1%, 5% and 10% levels.

4. Empirical Analysis

4.1. Leverage

Tables 3 and 4 summarize the panel regression outcomes for the leverage variable used in the study. We executed five regressions for each of the two dependent variables (debts/EBITDA and interest coverage ratio). This analysis helps us to prove whether a family firm has a different level of leverage than a similar non-family firm. For both analyses, we controlled for other possible proxy variables such as profitability measure (return of equity, return on assets, EBITDA margin, and net income margin), size measure (number of employees, total revenues, and logarithm of total assets), and age of firm based on the date of establishment

Table 3. Debt/EBITDA Regression.

	1	2	3	4	5
Intercept	−6.37 **	−1.82	5.74 **	−9.88 *	−8.65 *
	(−0.843)	(−0.04)	(0.015)	(−0.13)	(0.61)
Family Dummy	−6.78 ***	−2.89 **	−4.72 **	−3.34 **	−8.32 **
	(−0.366)	(−0.12)	(−0.23)	(−0.01)	(0.46)
Return on Assets	−1.53 *		−2.30 *	−5.74 **	−5.44
	(0.547)		(0.55)	(0.04)	(−0.11)
Return on Equity	−0.033 *	−4.63 *	−1.39 **	−0.01 *	−5.55 **
	(0.01)	(0.039)	(−0.10)	(0.00)	(0.07)
Total Revenue	−0.037 *	−0.04	−0.034		−0.00
	(−1.32)	(−1.40)	(−1.25)		(−0.09)
Age of Firm	0.64 *	0.03 *		−3.30 **	3.41
	(−0.24)	(0.01)		(0.06)	(0.05)
Number of Employees	1.66 ***	4.80		−3.11 **	−5.23 *
	(0.518)	(−0.50)		(−0.33)	(−0.55)
Size (log of Total Assets)	5.26 *	7.715 **	3.58 **	1.40	9.89 *
	(1.042)	(0.06)	(0.01)	(0.26)	(1.25)
EBITDA Margin	−0.55 *	−0.37 **	0.22 *	−1.38 **	−2.78 **
	(0.02)	(−0.02)	(0.14)	(−0.06)	(4.32)
Net Income Margin	−0.22 *		−5.14 **	−2.34 **	−6.36 *
	(−0.143)		(0.21)	(−0.59)	(0.137)
Return on Assets*Family					−2.74 **
					(−2.17)
Return on Equity*Family		−1.68 **	−5.72 **	0.02 *	−7.74 **
		(−0.03)	(0.10)	(−0.12)	(−0.07)
Total Revenue*Family				−5.35 *	
				(−1.18)	
Age of Firm*Family		2.16 **		−7.86	−4.80 **
		(−0.12)		(0.92)	(−0.11)
Number of Employees*Family		5.04		3.00	5.35
		(0.72)		(0.44)	(0.76)
Size (log of Total Assets)*Family		5.28 **		−1.23 *	−0.35 **
		(0.12)		(2.19)	(−0.22)
EBITDA Margin*Family			−0.26	−0.85 **	
			(0.17)	(−0.77)	
Net Income Margin*Family			−0.02	−0.02	
			(−0.02)	(−2.19)	
Adjusted R^2	23.2 ***	23.2 ***	21.5 ***	28.7 ***	29.4 ***
Industry Dummy included	Yes	Yes	No	No	No

"The variables for the analyzed sample of 888 firms and 7104 firm-year observations of unlisted small and medium size firms over the period 2007 to 2014, includes leverage is measured using the Debt/EBITDA and Interest Coverage Ratio. Profitability measure refers to return of equity, return on assets, EBITDA margin, and net income margin. Size measure refers to number of employees, total revenues, and total assets. Age calculate based on the company date of establishment. Also, family firm denotes a dummy taking the value 1 if the firm has a family or individual with 25% or more voting rights, and zero otherwise (SABI of the Bureau Van Dijk).***, **, * illustrate the significance at the 1%, 5%, and 10% level respectively". Source: Authors elaboration.

Table 4. Interest Coverage Ratio Regression.

	1	2	3	4	5
Intercept	−7.27 **	5.88	−6.44 **	−15.35 **	−19.62
	(−4.44)	(0.90)	(1.94)	(2.69)	(0.39)
Family Dummy	−1.72 **	−30.23	−0.52	−4.50 ***	−3.04 **
	(−1.98)	(−0.93)	(−0.32)	(−3.70)	(−2.44)
Return on Assets	−1.95 ***		−1.98 ***		1.20
	(30.34)		(30.28)		(0.18)
Return on Equity	−0.016	−0.77 ***	−0.69 ***	−0.74 ***	−0.64 *
	(−1.48)	(3.75)	(−3.54)	(3.61)	(−1.75)
Total Revenue	−0.00		−0.00 ***	−0.00	−0.00
	(1.48)		(−0.00)	(−0.06)	(−0.50)
Age of Firm	−9.64	11.59 **		−11.79 *	−10.88
	(−0.24)	(−5.73)		(−1.77)	(−1.73)
Number of Employees	−2.64 *	−0.00		0.01 **	−0.01 **
	(−2.89)	(−0.18)		(0.52)	(−0.33)
Size (log of Total Assets)	−3.125	1.78 **	0.64 **	2.79 **	2.53 *
	(2.72)	(−0.29)	(0.32)	(2.21)	(2.09)
EBITDA Margin	−0.01		−1.69	−0.063	−1.16
	(−0.28)		(−1.20)	(−1.34)	(−0.00)
Net Income Margin	−2.35 *		−0.00	−7.20 ***	−5.27 ***
	(1.65)		(−0.34)	(−4.66)	(−1.18)
Return on Assets*Family					−0.05 **
					(0.91)
Return on Equity*Family		−1.68 **		−0.33 **	−0.31 **
		(−0.03)		(−3.22)	(−1.71)
Total Revenue*Family				−4.45 ***	
				(−4.46)	
Age of Firm*Family		5.23		5.46 **	−4.96 **
		(1.49)		(1.57)	(1.51)
Number of Employees*Family		0.00		−0.11	0.00
		(0.16)		(−0.89)	(0.35)
Size (log of Total Assets)*Family		1.88 **			−2.53 **
		(0.58)			(2.09)
EBITDA Margin*Family				−2.98	
				(−2.18)	
Net Income Margin*Family				−7.46	
				(−4.85)	
Adjusted R^2	23.3 ***	23.2 ***	24.5 ***	27.4 ***	31.3 ***
Industry Dummy included	Yes	Yes	Yes	No	No

"The variables for the analyzed sample of 888 firms and 7104 firm-year observations of unlisted small and medium size firms over the period 2007 to 2014, includes leverage is measured using the Debt/EBITDA and Interest Coverage Ratio. Profitability measure refers to return of equity, return on assets, EBITDA margin, and net income margin. Size measure refers to number of employees, total revenues, and total assets. Age calculated based on the company's date of establishment. Also, family firm denotes a dummy taking the value 1 if the firm has a family or individual with 25% or more voting rights and zero otherwise (SABI of the Bureau Van Dijk). ***, **, * illustrate the significance at the 1%, 5%, and 10% level respectively". Source: Authors elaboration.

With respect to debts/EBITDA as a dependent variable for leverage, our results from Table 3 show negative significance at the debt level for the first regression. This indicates that most family firms use less debt financing than non-family firms, and as such maintain a lower level of debt.Regarding the profitability measure, the result from regression 1 illustrates a negative and statistically significant relationship between level of debt and profitability at the 5% level. These results suggest that most families tend to increase their reserves during the profitable circle of their firms and later reinvest this surplus profit when there is a need for expansion. They employ equity finance rather than debt finance for investment.

Further, to examine the cross-influence of family business age and size on debt, we execute regression 2 with interactive terms of two controlling variables and the family dummy. Specifically, the cross-influence of family business age and size on debt is positive and statistically significantly at the 5% level. The average age of most family examined in this study is 28, indicating that most of the firms are first generation. This result suggests that most family firms in their earlier developmentdepend on equity finance;however, as years go by, they more fully depend on debt finance for their activities. This is consistent with a positive and statistically significant correlation with the interactive term of

family and size. Early in their development, most family firms depend on equity finance, but as they grow bigger, huge debt finance is needed to finance their activities.

In addition, regressions 3, 4, and 5 exclude some of the controlling variables and include some combination of interaction variables between size and family, profitability and family, and age and family, and are negative and statistically significant at the 5% level. These regressions using different combinations of variables indicate positive coefficients for the family dummy on debt. The results of these regressions illustrate that family firms actually have lower levels of debt than non-family firms. This result is consistent with several prior research papers which have examined the characteristics of family-controlled business. One possible reason for this could be that family ownership and control is responsible for most family businesses adopting a more risk averse structure and the tendency to avoid high risk activities. These results support the hypothesis that family owned companies have lower leverage than non-family firms (See Table 3).

With respect to the interest coverage ratio as a dependent variable for leverage, our results from Table 4 show a similar result in Table 3, with negative significance at the debt level for the first regression. This indicates that most family firms use less of debt financing than non-family firms, as such maintain a lower level of debt. Regarding the profitability measure, the result from regression 1 illustrates a negative and statistically significant relationship between the level of debt and profitability at the 5% level. These results suggest that most family firms tend to increase their reserves during the profitable cycle of their firms and later reinvest this profit when there is a need for expansion. They employ equity finance rather than debt finance for investment.

Further, to examine the cross-influence of family business age and size on debt, we execute regression 2 with interactive terms of two controlling variables and the family dummy. Specifically, the cross-influence of family business age and size on debt is positive and statistically significantly at the 5% level. The average age of most family firms examined in this study is 28, indicating that most of the firms are first generation. This result suggests that most family firms in their earlier developmentdepend on equity finance, however, as years go by, they come to fully depend on debt finance for their activities. This is consistent with a positive and statistically significant correlation for the interactive terms of family and size. During their earlier development, most family firms depend on equity finance, but as they grow bigger, huge debt finance is needed to finance their activities.

In addition, regressions 3, 4, and 5 exclude some of the controlling variables and include some combination of interaction variables between size and family, profitability and family, and age and family, and are negative and statistically significant at the 5% level. These regressions, using different combinations of variables, indicate positive coefficients for the family dummy in the case of debt. The results of these regressions illustrate that family firms actually have lower levels of debt than non-family firms. This result is consistent with several prior research papers that examined the characteristics of family-controlled businesses. One possible reason for this could be that family ownership and control is responsible for most family business adopting a more risks adverse structure and the tendency to avoid high risk activities. These results support the hypothesis that family owned companies have lower leverage than non-family firms (see Table 4).

4.2. Risk Exposure

In this section of our study, we prove the risk exposure of family businesses by applying the Altman Z-score, a predictive model developed to evaluate the possibility of a firm going bankrupt in the subsequent years and to measure the overall financial health of companies (Altman et al. 2013; Altman and Hotchkiss 2006). We run five regressions for the leverage analysis in Tables 3 and 4.

Table 5 shows the positive significance of family orientated businesses as independent variables of the Z-score at the 5% level. These results suggest that a family-oriented business is actually healthier than its counterpart.

Table 5. Altman Z-Score Regression.

	1	2	3	4	5
Intercept	−0.16	1.13	−1.92 **	1.52 ***	1.28 ***
	(−0.48)	(3.36)	(2.82)	(9.80)	(8.21)
Family Dummy	0.13 **	0.06	0.31	3.16 ***	0.58 **
	(2.89)	(0.74)	(0.88)	(11.05)	(3.15)
Return on Assets	0.07 ***		0.25 ***		0.00 **
	(38.28)		(2.81)		(0.00)
Return on Equity	0.00 **	0.01 ***	0.01 ***	0.02 ***	0.05 *
	(2.41)	(14.15)	(13.90)	(3.69)	(4.62)
Total Revenue	0.00 ***		0.04 ***	0.00	0.00 ***
	(11.59)		(0.52)	(0.28)	(13.38)
Age of Firm	9.64	0.07		0.09 **	0.07 **
	(0.24)	(0.34)		(2.69)	(2.16)
Number of Employees	1.34 *	0.00 **		0.00 ***	0.00 **
	(4.21)	(3.56)		(0.52)	(6.15)
Size (log of Total Assets)	0.23 **	0.36 ***	0.18 **	6.30 ***	0.37 ***
	(6.5)	(10.88)	(0.56)	(2.21)	(4.19)
EBITDA Margin	0.00		0.00 **	36.11 ***	0.00 ***
	(2.05)		(2.30)	(−3.54)	(2.13)
Net Income Margin	16.62 ***		0.00 *	17.27 ***	3.21 ***
	(12.59)		(0.00)	(13.06)	(5.38)
Return on Assets*Family					0.04 **
					(3.37)
Return on Equity*Family		0.00		0.33 **	0.03 ***
		(0.21)		(3.22)	(4.56)
Total Revenue*Family				4.45 ***	
				(4.46)	
Age of Firm*Family		0.32 ***		0.09 **	0.07 **
		(1.68)		(2.11)	(2.39)
Number of Employees*Family		0.00 **		0.00	0.00 **
		(0.00)		(−7.01)	(6.97)
Size (log of Total Assets)*Family		0.00 **			0.11 **
		(0.00)			(5.92)
EBITDA Margin*Family				−37.70	
				(−3.73)	
Net Income Margin*Family				−23.34 ***	
				(−17.37)	
Adjusted R^2	23.6 ***	23.2 ***	23.8 ***	30.1	31.3
Industry Dummy included	Yes	Yes	Yes	No	No

"The variables for the analyzed sample of 888 firms and 7104 firm-year observations of unlisted small and medium size firms over the period 2007–2014 includes risk exposure and is measured using the Altman Z-score. Profitability measure refers to the return of equity, return on assets, EBITDA margin, and net income margin. Size measure refers to number of employees, total revenues, and total assets. Age is calculated based on the company's date of establishment. Also, family firm denotes a dummy taking the value 1 if the firm has a family or individual with 25% or more voting rights and zero otherwise (SABI of the Bureau Van Dijk). ***, **, * illustrate significance at the 1%, 5%, and 10% level respectively". Source: Authors elaboration.

We further examine the cross-influence of family business age and size on risk exposure. Specifically, the cross-influence of family business age and size on risk exposure is positive and statistically significantly at the 5% level. The positive sign shows the relationship between age and size to risk exposure. Following the Altman Z-Score, "to check the bankruptcy situation of these firms, Altman and Hotchkiss (2006) and Ntoung et al. (2016b) matched a correspondencebetween the Standard and Poor's rating and the score, which makes the model reliable and consistent" (Ntoung et al. 2017). Therefore, the higher the Z-Score, the lowerthe possibility ofa firm being categorized in the distress zone, and this suggests that, at any size and age, family firms are less risky than their counterpart firms.

In addition, regressions 3, 4 and 5 "exclude some of the controlling variables and include some combination of interaction variables between size and family, profitability and family, and age and family" and are positive and statistically significant at the 5% level. This result confirms the results obtained in the first and second regressions.These regressions using different combinations of variables indicate positive coefficients for the family dummy on debt. The results of these regressions illustrate that family firms are actually less risky than their counterpart firms. This result is consistent with several prior research papers which examined the characteristics of family-controlled businesses.

One possible reason for this could be that family ownership and control is the responsible for most family businesses adopting a more risk averse structure and the tendency to avoid high risk activities. These results support the hypothesis 2 that family owned companies are less risky than non-family firms (see Table 5).

4.3. Robustness Test

"The endogeneity of ownership structures of firmsbe theyfamily or non-family, post an important concern regarding the validity of the result obtained. Several authors fail to consider ownership as endogenous, and have reported a positive, negative, insignificant, nonlinear reverse relationship between ownership and firm performance. No study so far has provided evidence for the risk profile of Spanish family firms. Meanwhile, other authors have tested ownership as endogenous to obtain theconclusion of there being no significant relationship using either a panel-fixed effect or instrumental variables" (Ntoung et al. 2016a).

In this study, we argue that family ownership and control can be motivated by the lower leverage and risk aversion of family businesses as opposed to the school of thought that says thatfamily ownership and control is responsible for most family businesses adopting a more risk averse structure and the tendency to avoid high risk activities. This is indeed true because the use of less debt and lower risk strategies makes the founding family's aversion to the risk of loss of control. Also, imagine that high leverage and high risk are associated with family ownership, this will either result to bankruptcy or disintegration of the family ownership and control. As usual, every business is characterized byboth ups and downs. To see if high leverage and high risk is the sole cause of family firms changing to non-family firms or to be categorised as bankrupt, or the reason why family businesses in Spain don't attain the second and third generation, we sampled a series of bankruptcy filings of small and medium size firms in SABI from 2002 to 2014, evaluating the ratio of family to non-family companies in the sample. We selected a longer horizon time because these years represent the financial crisis of 2008–2014, as well as 2005 to 2007, and stable (2002–2004) markets in the Spanish economy. These different cycles in the economy will have a huge effect on family firm's bankruptcies, due to the high inherent risk. The sample includes 534 companies that have been declared bankrupt in SABI. We collect information over the period 2002–2014. Big and listed firms were eliminated from the list. Only small and medium size firms are considered, giving us a total 526 small and medium firms that filed for bankruptcy from 2002 to 2014. We collected data on bankruptcy date, industry, year founded, number of employees, debt level at bankruptcy, a list of large shareholders at bankruptcy, as well as information about ownership and control. The ownership and control information helped us to categorize which firm is a family firm or non-family firm.

In Ntoung et al. 2017, "according to SABI, the shareholder ultimate voting rights across these firms differs from the ultimate cash flow rights. In cases where information was available about the ownership structure of a company, we search this property directly on the company websites. Family firms in Spain were classified through the aid of the BvD independence indicator available in SABI." "The BvD independence indicator has five levels, namely "A", "B", "C", "D", and "U". According to SABI, independent indicator "A", denotes that a company independent if the shareholder must be independent by itself (i.e., no shareholder with more than 25% of ownership of ultimate voting rights), whereas independent indicator "B" is when no shareholder with more than 50% but one shareholder with voting rights between 25.1% to 50% exist. For a company to be classified with independent indicator "C", the company must have a recorded shareholder with a total or a calculated ownership of 50.1% or higher, whereas a company is classified with "D" when a recorded shareholder has direct ownership of over 50% with branches and foreign companies".

"Independent indicator "U" is applied when a company does not fall into the categories "A", "B", "C" or "D". Based on the above features and prior studies, a company with a shareholder having more than 25% is classified as a family firm while firms with no shareholder with more than 25% areclassified as widely held firms. This threshold of 25% allows shareholders to have a significant

influence on the firm. Therefore, firms categorized with "A" are widely held firms while firms in "B", "C", "D" are family firms. Our next criterion for a family firm is that an individual or a family must be the largest shareholder, and be categorized in "B", "C", and "D". The individual must be part of the founding family. If this is not the case, the controlling shareholder must have had the largest percentage of ultimate voting rights over a long time period. After building a database by classifying which firm is family or non-family firm, Figure 1 shows the filingsforbankruptcy over 2002 to 2014".

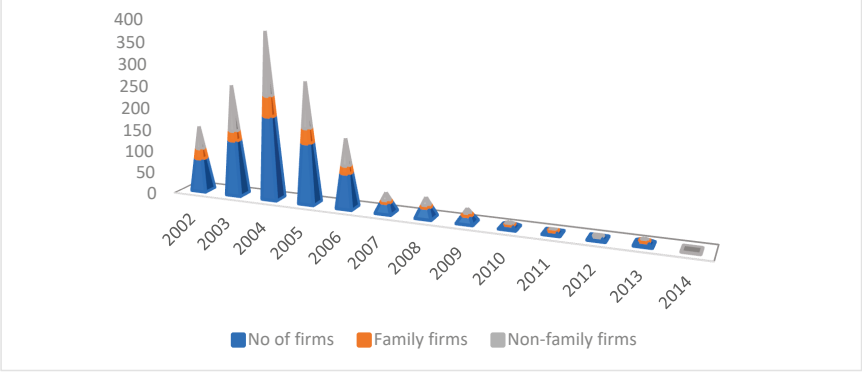

Figure 1. Number of Bankrupt firms over the period 2002–2014. Source: Authors' elaboration.

Analysing Figure 1 shows that family firms are less likely to file for bankruptcy in the years of difficult financial pressure and economic downturn, as opposed to the years of growth or stagnation. This is because family firms are characterised with lower debt and are less risky. The proportion of firms that filed for bankruptcy during the financial crisis 2008 to 2013 is relatively lower than those that filed in for bankruptcy during 2003–2004 for family firms. Also, the proportion of family firms that filed for bankruptcy isrelatively lower than their counterpart firms. Thus, high leverage and high risk cannot be the sole cause of family firms changing to non-family, or to be categorised as bankrupt, or the reason why family businesses in Spain don't attain the second orthird generation.Therefore, the hypothesis that family firms have lower debt and manage their operations in a less risky manner is true.

We also back up the analysis in Figure 1 by running a *t*-test. The *t*-test evaluates whether there are significant differences between family and non-family firms with respectto four variables, namely the number of employees, age of firms, debt level, andratio of amortization over cash flow.The number of employees is a proxy for company size, while age distinguishes between younger and older firms, as well as being a proxy of generational succession.The ratio of amortization and cash flow is a proxy for the risk ofbankruptcy, while debt levels show the level of debt at bankruptcy.

Table 6 shows that the ratios of family/non-family firms in the sample in each year are 0.00 for 2012, 0.29 for 2008, 0.32 for 2004, and 0.44 for 2002, and statistically significant at the 5% level.This initial observation rejects the hypothesis that high debt and high risk cause family firms to file for bankruptcy, or causes family ownership to dissolve. Family firms have lower debt and are less risky thantheir counterpart firms. The ratio of family firms filing for bankruptcy is higher for 2004 (32.2%) and 2002 (44.2%) and lower for 2014 (0.0%), 2012 (0.0%), and 2008 (29.4%). This shows that family ownership involvement, in the management or ownership ofa significant holding, in the firms reveals a unique characteristic of the firms and thus maintains a lower percentage of bankruptcy cases. Comparing thisproportion of bankruptcy cases, we conclude that family firmshave lower debts and are less risky than non-family firms.

Table 6. Bankrupt Firms over the period 2014–2002.

		Family Ownership			
Year	**Number of Firms**	**Family Firms %**	**Family Insiders %**	**Family Blockholders %**	**Both Insiders & Blockholders %**
2014	0	0%	0%	0%	0%
2013	6	50%	50%	50%	0%
2012	4	0%	0%	0%	0%
2011	4	33.3%	100%	0%	0%
2010	6	20%	0%	100%	0%
2009	15	50%	80%	20%	0%
2008	22	29.4%	60%	40%	0%
2007	22	29.4%	60%	40%	0%
2006	78	27.9%	65%	35%	0%
2005	137	31.7%	67%	33%	0%
2004	189	32.2%	76%	24%	0%
2003	126	21.2%	91%	9%	0%
2002	75	44.2%	65%	35%	0%

According to the difference between family and non-family with regards to number of employees, the age of firm, debt at bankruptcy, and the ratio of amortization/cash flows, our findings are significant at 5% and 10% levels. However, when evaluating the age of the firms that file for bankruptcy, it is apparent that family firms are younger on average. A potential explanation for this significant difference is that many of the firms categorized as family firms following the definition are start-ups or in their early stage in their life cycle. Such young firms are at greater risk to fail as compared to more established firms as in Table 7.

Table 7. Bankrupt Firms over the period 2014 to 2002.

Year	**Mean Age All Bankrupt Firms**	**Mean Age (Non-Family Firms)**	**Mean Age (Family) Firms**	**Difference (Non-Family-Family Firms)**	***t*-Test**	***p*-Value**
2014	13.441	16.267	0.000	16.267	67.673	0.000 ***
2013	23.280	26.850	12.330	14.530	1.360	0.268
2012	44.000	22.500	0.00	−7.250	−0.298	0.816
2011	16.500	26.700	23.900	2.800	0.000	0.000 ***
2010	19.843	26.900	8.467	18.433	1.307	0.321
2009	19.096	23.900	2.600	21.230	3.597	0.023 **
2008	17.755	7.380	14.240	−6.860	−2.568	0.062 *
2007	19.382	0.000	17.540	−17.540	−4.236	0.013 **
2006	14.691	0.000	18.760	−18.760	−3.028	0.039 **
2005	14.738	0.000	13.429	−13.429	−7.551	0.000 ***
2004	12.192	18.013	12.392	5.621	1.989	0.054 *
2003	10.274	14.246	4.015	10.229	7.902	0.000 ***
2002	9.046	12.059	2.152	9.908	10.118	0.000 ***

Note: ***, **, *, significance levels1%, 5%, and 10% of the difference of family and non-family bankrupted firms. Number of employees refers to the latest number of employees available at bankruptcy date.

Younger firms tend to have founders present due to their phase in the cycle and therefore are categorized as family companies in this sample. However, these firms do not necessarily share the characteristics associated with family firms, such as long-term time horizon, succession planning considerations, and risk aversion. To eliminate this bias, we re-runa *t*-test for firms that filed for bankruptcy with the age of 10 years and above. Table 8 shows a duplicated version of Table 7, but only includes firms with an age above 10 years before declaring bankruptcy. As expected, the sample of family firms decreases in each of the years except for 2004. Specifically, in the year of financial crisis (2008–2013), the ratio of family firms filing for bankruptcy waslower than in the years of economic prosperity (2004–2007). This confirmed the fact that family businesses filing for bankruptcy is not due

to the high debt and riskiness of the business. Using this sample, we can validate our hypothesis that family firms have lower leverage and are less risky than their counterpart firms.

Table 8. Firms older than 10 years.

	Family Ownership				
Year	**Number of Firms %**	**Family Firms %**	**Family Insiders %**	**Family Blockholders %**	**Both Insiders & Blockholders %**
2014	0		0	0	0
2013	4	17%	17%	0%	0
2012	0	0%	0%	0%	0
2011	4	25%	25%	0%	0
2010	3	0%	0%	0%	0
2009	7	0%	0%	0%	0
2008	13	18%	14%	5%	0
2007	13	18%	14%	5%	0
2006	16	21%	19%	1%	0
2005	18	24%	18%	7%	0
2004	21	22%	16%	6%	0
2003	0	0%	0%	0%	0
2002	0	0%	0%	0%	0

5. Conclusions

Numerous scholars have debated the uniqueness of the characteristics of family firms in terms of performance as opposed to their counterpart firms. The perception that families possess a more conservative attitude towards the management of the business makes family firms less risky. The risk profile of family business has been argued to be one of the characteristics significantly impacting the management of family business. In the light of the above, this paper has as its main objective to predict if family firms have lower leverage and manage their operations in a less risky manner as compared to their counterpart firms. The analysis conducted in this study yields some interesting results regarding the risk profile of the family firm.

Firstly, family firms have a lower financial structure than non-family firms. This indicates that most family firms use less debt financing than non-family firms, and as such maintain a lower level of debt. Regarding the profitability measure, this result suggests that most families tend to increase their reserves during the profitable cycle of their firms and later reinvest this reserved profit during economic downturn, rather than using debt finance. In other words, they employ their equity finance rather than debt finance for investment.

Secondly, family firms demonstrate lower risk as illustrated by the Altman Z-score. The Altman Z-score captures the financial risk inherent in a firm by examining four financial ratios (such as working capital/total assets, retained earnings/total assets, EBITDA/total assets, and market value of equity/book value of total debt). The significant difference between family firms and non-family firms on the Altman Z-score scale indicates that the lower inherent risk of family firms arises from the operation aspect of the business. Family firms managed their business operation with lower risk and are generally healthier financially than their counterpart firms. This explains the uniqueness of the capital structure of family businesses.

Lastly, the robust tests for the hypotheses using a sample of bankrupt firms in SABI reveal that the proportion of failure of family firms as opposed to theircounterpart firms is relatively low. Analyzing the bankruptcy files of firms from 2002 to 2014 shows a considerably low ratio of family firms at the 5% significance level. This affirms that the low risk illustrated in the Altman Z-score regression is consistent withthe lower ratio of family firms that were declared bankrupt over the study period. Lastly, the average debt at bankruptcy was lower and statistically significant for family firms as opposed to

non-family firms. Therefore, the findings herein confirm the hypothesis that family firms have a lower capital structure and maintain more financially healthy operations than non-family firms.

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Optimal Contracting of Pension Incentive: Evidence of Currency Risk Management in Multinational Companies

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Abstract: Using a large sample of multinational companies (MNCs), this paper intends to explore whether executives' pension incentives will function as a mechanism of optimal contracting in motivating firm risk management. We find that granting more pension to executives is significantly related to the higher likelihood and intensity of currency hedging strategies in MNCs. This suggests that pension incentive should promote executives to more actively manage firms' risk. Such a positive relationship is robust to endogeneity and is more prominent in firms with strong shareholder power. We further explore the contribution of currency hedging induced by pension incentives to shareholder value. Supporting the hypothesis of optimal contracting, our results indicate that pension incentives play an important role in reconciling managerial risk preference and shareholder value creation.

Keywords: pension incentive; currency hedging; multinational companies; firm value

1. Introduction

How to financially motivate executives has attracted a great deal of attention in literature. This is not surprising, as self-interested managers—along with their substantial influence on firm policies—are found to extract private benefits at the expense of shareholders, and therefore a well-designed compensation contract is critically important for shareholders who seek to maximize their value. However, the dominant theme of existing literature in executive compensation only focuses on traditional components, such as a base salary, bonus, and equity compensation (stocks or options), but overlooks another important piece, pension benefits, which mainly include retirement plans and deferred compensation. As emphasized by Jensen and Meckling (1976), the ingredients of an ideal compensation package for managers should include both equity-based and liability-based instruments. The binding claim in liability-like benefits is expected to influence managerial risk-preference, mitigate the agency cost, and hence affect possible value reallocation among stakeholders.

Compared to the widespread practice of pension plans or retirement benefits, studies regarding to the role of such liability-based compensation are generally scant. Edmans and Liu (2011) and Sundaram and Yermack (2007) are the earlier studies that explore liability-based instruments in compensation from theoretical and empirical perspectives. Particularly, Edmans and Liu (2011) propose that pension compensation outperforms cash compensation and helps solve the agency conflicts between shareholders and debtholders. Sundaram and Yermack (2007) document that liability-based compensation accounts for an important portion of executives' total wealth, motivating them to invest conservatively and therefore reducing default risk. Recent studies suggest that executives'

pension benefits are associated with lower CDS spreads (Wei and Yermack 2011), lower R&D investment and financial leverage (Cassell et al. 2012), lower cost of private loan financing and fewer restrictive covenants (Anantharaman et al. 2014), cash holding (Liu et al. 2014), and managerial risk-taking (Anantharaman and Lee 2014).

The research on incentive design is important not only because it, per se, targets a fundamental business contract, but also yields instructive and practical insights into how an agent's risk attitude is financially effected and how the stakeholders are exposed to the related consequence. As noted above, there is a paucity of research on the nature of pension incentive and its impacts on the risk management of firms. For example, Anantharaman et al. (2014) found that firms with more pension incentive are charged with lower cost of debt financing and fewer restricting covenants. Cassell et al. (2012) and Liu et al. (2014) observe that the use of pension incentive is associated with lower R&D investment and more cash holding. However, none of them provide an explicit link between pension incentive and corporate risk management, particularly with the interplay of shareholder governance. By utilizing the data of currency hedging strategy used by the MNCs, this paper aims to investigate a direct impact of pension incentive on the managerial decisions. Additionally, the unique and hand-collected hedging data across the industries offer us a chance to have an unambiguous view of active risk management.

Corporate risk management, particularly hedging strategy, has become a critical dimension of financial policy and also attracted a lot of research interest. The study based on the Wharton survey of derivative usage shows that a growing number of CEOs view financial derivatives as indispensable tools in managing firms' risk (Géczy et al. 2007). The academic research also documents that hedging increases firm value by overcoming the market imperfections, such as deadweight costs related with bankruptcy risk, aggressive tax region, the underinvestment problem, and high cost of capital (Smith and Stulz 1985; Froot et al. 1993; Rogers 2002; Campello et al. 2011). More importantly, the literature suggests that executives' compensation incentives are an important determinant of corporate hedging. The traditional view of financial incentives focusing on equity compensation predicts that granting stocks or stock options will motivate managers to overcome risk aversion. In contrast, Sundaram and Yermack (2007) argue that executives' pension benefits would generate different incentives. The nature of unsecured and unfunded pension liabilities may expose managers to firm risk due to a lack of diversification and may result in a devastating loss of personal wealth in the case of firm bankruptcy. Since hedging reduces a firm's cash flow volatility and consequently lowers the likelihood of bankruptcy, it is plausible that CEOs who hold a larger amount of wealth in pension will be more actively involved in managing firm risk through hedging.

This study focuses on currency risk management by using foreign exchange derivatives, because Géczy et al. (1997) investigated the use of derivatives for a sample of Fortune 500 non-financial firms and found that currency derivatives are used most frequently by corporations. Foreign currency exposure is also considered as a major source of risk by the US firms (Bodnar et al. 1998; Krapl and White 2016). It is arguable that a firm may have little need to use foreign currency hedging if it has no relevant foreign currency risk. Therefore, in the spirit of the literature (Graham and Rogers 2002; Campello et al. 2011), we identify the multinational firms with ex ante exposure to foreign currency risk in this study. However, we also followed Doukas and Pantzalis (2003), to consider the case that a firm might be subject to foreign currency risk due to the competitive environment. To do so, we included keywords related to foreign currency and foreign exchange market risk in our textual searching program to read if firms explicitly state their foreign currency exposures in 10-K filings.

In this paper, we first examine the relationship between pension incentive and hedging propensity. Based on the sample retrieved from the COMPUSTA Segment database and matched with EXECUCOMP executive pension database, our investigation covers 1625 US firms from 2006 through 2015. Hedging data are collected from 10-K filings compiled in the SEC EDGAR database. We find that a higher level of pension incentive is associated with a higher probability of adopting currency hedging strategy. A one-standard-deviation increase in the pension benefits in dollar amount leads to an increase of 2.2% in hedging probability. Meanwhile, a one-standard-deviation increase in the

pension proportion in CEO total compensation increases hedging probability by 6.5%. In addition, by using the notional amount of hedging position, we find that a higher level of pension incentive also brings about a larger position of hedging. For one percent increase in CEO pension relative leverage, the hedging position rises by 40 basis points of total assets (0.4%), an equivalence of USD 35.95 million investment in foreign currency derivatives.

As with most studies in business research, the endogenously determined incentive might be a potential concern in our research. However, the significant and positive relation between hedging activity and pension incentive remains consistent when we perform robustness checks, instrumental variables (IV) model to control for endogeneity. The results from the robust models suggest that endogeneity cannot explain away the positive impact of pension incentive on hedging activity, and the inference from the baseline models is unaffected when correcting for endogeneity.

Given a positive relation between pension incentive and hedging activity, a natural question to further explore is whether this relation is contingent on governance mechanism. To answer this question, we propose the optimal contracting hypothesis. Our analysis suggests a more prominent influence of pension incentive on hedging for the firms with strong shareholder power than those with weak shareholder power. Furthermore, we employ the model of Faulkender and Wang (2006) to quantify the impact of hedging on firm value, augmented with pension incentive and governance mechanisms. The empirical evidence shows that one dollar of investment in existing hedging position generates USD 0.374 to shareholders and one dollar increase in hedging position creates an additional value of USD 0.204. More importantly, we find that the marginal impact of pension incentive on the value of hedging is higher for the firms with strong shareholder power, which supports the optimal contracting hypothesis.

In the extant research, the influence of pension incentive on active risk management (e.g., hedging) has not been given enough attention. Belkhir and Boubaker (2013) and Krapl and White (2016) are the two of few studies that have explored this area. Belkhir and Boubaker (2013) examined pension paid to CEOs in the US bank holding companies and find that higher CEO pension holdings relate to higher use of derivatives to hedge against banks' interest rate risk. They explain that pension compensation binds the banks' default risk with the executives' interest and curbs their excessive risk-taking activities. Krapl and White (2016) document a negative relation between foreign exchange exposure and pension-based compensation paid to executives including CEOs, CFOs, and other top managers. These results imply that pension compensation encourages executives to reduce cash flow volatility and hence lowers firms' exposure to foreign exchange risk.

Our findings are consistent with Belkhir and Boubaker (2013) and Krapl and White (2016), but this study differs from them. First, we build a large sample of companies that span across a wide array of industries, rather than only financial institutions. This large sample recognizes the possible heterogeneity and produces more applicable conclusions. Moreover, as suggested by Krapl and White (2016) foreign exchange exposure is a major source of risk to most of the US firms. Our focus on currency risk management reflects such an urgent demand in the age of globalization. In addition, our hedging data allow a direct look at the financial derivatives used in risk management. This study supplements the literature with the supportive evidence and further casts new light on the long-debated contracting theory of executive compensation.

In this paper, we fill the void in the literature by empirically examining the impact of pension incentive on firm risk management and how such influence is contingent on governance environment. Our study contributes to the literature in the following ways. First, we document a significantly positive impact of pension incentive on foreign currency hedging implemented by the multinational firms. Second, this paper complements the literature of compensation design by providing new evidence to support the optimal contracting hypothesis. Our analysis suggests that pension, the liability-based instrument adopted in the environment of strong shareholder power has a more pronounced impact on executives' hedging decisions. In addition, this study also enriches the existing hedging literature. After controlling for other well-documented determinants, we find pension incentive plays a remarkable

role, which is different from the equity-like compensation, in determining managerial risk attitude gauged through the hedging strategy. Finally, this research relates to the literature of risk management and we add the new insight to understand the active currency hedging strategy used by the multinational companies in creating shareholder value.

The remainder of this paper is structured as follows: Section 2 will review the literature and develop the testable hypotheses. Section 3 describes the sample, the variable constructions, and the summary statistics are also provided. Section 4 discusses the model specification and reports our main empirical results. In Section 5, we present an extended analysis on the value of hedging, interacted with pension incentive and governance. Section 6 concludes the paper.

2. Relevant Literature and Testable Hypotheses

2.1. Equity-Based Incentive and Managerial Risk Preference

There is a large and growing literature on executive compensation and its influence on managerial incentives, corporate financing, investment, and firm value (Peng and Roell 2014; Gormley et al. 2013; Bereskin and Cicero 2013; Liu and Mauer 2011; Billett et al. 2010; Coles et al. 2006; Carpenter 2000). Practically, an executive compensation package consists of the short-term and long-term components. The former mainly includes salary and bonus, whereas the latter refers to restricted stock grants, grants of stock options, long-term incentive payouts, and other compensation. Although the annual salary can be partially decided by the past performance, and the bonus component is based on various metrics of accounting information (i.e., return on assets, return on equity, sales growth or other according measures relative to the industry or competitors), these two components are not the primary solutions for the shareholders, intuitively, to maximize the their value since neither of them are directly linked to stock returns, which is presumably concerned most by shareholders. As Jensen and Murphy (1990) point out, the present value of current and future increases in salary and bonus represents a small fraction of total financial incentives. Meanwhile, under the framework of principal-agent theory, incentive contract is designed to reduce the agency conflicts between risk-neutral shareholders and risk-averse managers. For this reason, compensation packages containing long-term incentives, particularly equity-based instruments, attract more interests and explorations.

Unlike well-diversified shareholders, managers cannot diversify their human capital. As a result, they tend to forgo positive NPV but highly risky projects when their benefits from an increase in firm value are lower than their costs associated with greater firm risk. Equity-like compensation is viewed as a mechanism to reduce this underinvestment problem through aligning the interests of managers and shareholders (Jensen and Meckling 1976). Smith and Stulz (1985) and Guay (1999) also suggest that equity compensation motivates managers to overcome risk aversion and hence induce optimal risk-taking behaviors. In particular, Smith and Stulz (1985) show that the risk-related incentive problem can be controlled by rewarding managers with stock options or common stocks to structure their wealth as a convex function of firm value, therefore leading to risk-seeking managers.

2.2. Liability-Based Incentive

Although there has been a rigorous examination of executives' equity compensation in the literature, the exploration of liability-based compensation remains relatively limited after Jensen and Meckling (1976) first formulated a concept of debt-like compensation. Until recently, Bebchuk and Fried (2004) state that pension and other retirement benefits are considerably large in relation to executives' actual compensation. Sundaram and Yermack (2007) implement one of the first empirical research on debt-like compensations of large U.S. companies' CEOs. They find that when a CEO's incentive leverage (a ratio of liability-based compensation relative to equity-based compensation) exceeds the firm's leverage ratio, CEOs tend to manage firms more conservatively, such as investing on less risky projects, lowering the use of debt capital or choosing long-maturity debt, and trimming dividends payout. An event study by Wei and Yermack (2011) indicates that a wealth

transfer from stockholders to debtholders is associated with the announcements of granting pension and deferred compensation to CEOs. Additional examinations of the impact of CEO pension on firm policies include White (2012), Anantharaman et al. (2014), and Cassell et al. (2012). In particular Cassell et al. (2012) find a negative relationship between pension compensation and the volatility of equity returns, financial leverage or R&D expenditures, but a positive relation between debt compensation and firm diversification or asset liquidity. Anantharaman et al. (2014) find that CEOs' pension incentive is associated with a lower cost of debt financing and fewer restrictive covenants. Moreover, White (2012) examines how pension incentive affects the dividend policy. Overall, studies suggest that pension incentives have a significant influence on discouraging risk taking behavior.

2.3. Hypothesis Development

As suggested by Sundaram and Yermack (2007), the nature of unsecured and unfunded pension liabilities held by CEOs makes them in line with outside creditors. In other words, CEOs with greater pension benefits are expected to display lower levels of risk-seeking behavior since they are exposed to similar default risk. From risk management literature a well-known benefit of hedging is that hedging smooths firm performance, resulting in lower volatility of net income and cash flows (Smith and Stulz 1985). The probability of bankruptcy or financial distress is considerably higher when a firm's earnings or cash flows are more volatile. As hedging smooths cash flows or/and net incomes, bankruptcy risk will be reduced. Smith and Stulz (1985) suggest that hedging reduces a firm's cash flow volatility and consequently lowers the likelihood of bankruptcy. As a result, we conjecture that firms granting the higher level of pension incentive to CEOs are more likely to engage in hedging activities. Our first hypothesis is formulated as:

Hypothesis 1 (H1). *Pension incentive has a positive impact on corporate hedging activity.*

Given that our first hypothesis reveals an important relationship between pension incentive and hedging behavior, there is another question that remains unclear, namely the interplay of pension incentive and governance on this relation. To disentangle the relation between corporate hedging and CEO pension incentive in the different context of governance, we propose our second hypothesis: Pension incentive is a part of the optimal contract that is designed to mitigate agency costs of debt (e.g., risk-shifting) and agency costs of equity (effort-shirking). Under this logic, we would expect CEOs with a larger amount of debt-like compensation relative to equity compensation (i.e., a higher CEO pension relative leverage) to be more active hedgers of the "priced" risk. Since corporate hedging is an outcome of an optimal compensation contract for CEOs, we anticipate that the predicted positive relation between hedging and executives' pension incentive should be observed in firms with strong corporate governance. Thus, our second hypothesis can be offered as:

Hypothesis 2 (H2). *The positive relation between pension incentive and the hedging activity should be more pronounced for the firms with strong governance than those with poor governance.*

To summarize, both hypotheses predict a positive relation between pension incentive and hedging. The theory of optimal contracting further suggests that a positive relation should be more significant for firms with strong corporate governance than for firms with weak governance. In contrast, however, an opposite view would predict that the positive relation between hedging and pension incentive should only hold for poorly governed firms where managers face fewer consequences from pursuing corporate policies that are mainly motivated for self-interests. In the empirical tests below, we first examine how pension incentive influences hedging, and further condition the relation on corporate governance to verify the h of optimal contracting.

3. Sample Selection and Variable Construction

3.1. Sample Selection

The information of executive pension is collected from the Standard and Poors' EXEUCOMP database. In 2006, the SEC issued a new rule on the proxy disclosure of executive compensation, requiring a detailed disclosure of pension and deferred compensation that are granted as a part of executive compensation. Accordingly, EXEUCOMP extends the coverage on this disclosure, which allows us to obtain top managers' pension compensation from 2006 and afterwards. Therefore, our initial sample includes all US firms whose CEOs are listed in EXEUCOMP from 2006 through 2015. Financial firms (with a SIC code of 6000 through 6999) and utility firms (with a SIC code of 4900 through 4999) are excluded as these firms are heavily regulated. We also eliminate observations with missing or negative total assets or negative common equity. Such criteria generate the initial sample of 1936 firms with 16,936 firm-years.

Following the literature (Doukas and Pantzalis 2003; Graham and Rogers 2002; Campello et al. 2011), we identify the multinational firms with ex ante exposure to currency risk if they report foreign assets, foreign sales, or foreign income in the COMPUSTAT Geographic Segment databases, or they disclose positive amounts of foreign currency adjustment, exchange rate effect, foreign income taxes, or deferred foreign taxes in the annual COMPUSTAT database. We identify an MNC sample of 49,557 firm-year observation associated with 8642 firms that have foreign operation activities from 2006 to 2015.[1] Given the fact of the different coverage between COMPUSTAT and EXECUCOMP (EXECUCOMP mainly covers the large-cap firms), after merging two databases we obtain the final sample of 11,718 firm-year observations associated with 1625 firms that have foreign operation activities from 2006 to 2015.

We retrieved the information of firm hedging activities through conducing a textual search in 10-K filings compiled in the Securities and Exchange Commission (SEC) EDGAR database. Specifically, we performed the search based on a set of keywords including: *currency derivative, currency swaps, currency forwards, currency futures, currency options, currency contract, currency forward contract, exchange forward, exchange future, exchange swap, exchange option, exchange contract, or forward exchange contract*. For each keyword found, we review the context in which the keyword appears in the report to confirm the use of derivatives for hedging. We match the 10-K filing information with the financial data from COMPUSTAT by the identifier of Central Index Key (CIK).

3.2. Measure of Active Management of Currency Risk

Based on the above sample, we examine the firms' foreign currency risk management by examining their hedging strategy against the currency risk. To retrieve hedging data, we perform a keyword search for financial derivatives uses in 10-K filings compiled in the SEC EDGAR database. In this study, we focus on foreign currency derivatives. The foreign currency derivatives are most commonly used for hedging strategy by non-financial U.S. firms. Géczy et al. (1997) investigate the use of derivatives for a sample of Fortune 500 non-financial firms in 1993 and find that currency derivatives are used most frequently by corporation (52.1%). For each type of derivative, we use a set of relevant key words as specified above for the corresponding currency derivative instruments. When a keyword is found, we review the context in which the keyword appears in the report to confirm the use of derivatives for hedging and to collect hedging information. We use two proxies from literature to describe corporate

[1] We also follow Doukas and Pantzalis (2003) to consider the case that a firm might be subject to foreign currency risk due to the competitive environment. To do so, we include the keywords related to foreign currency risk and market risk in our textual searching program to read if firms explicitly state their foreign currency exposures in 10-K filings. We also perform the additional check by identifying MNCs by setting the ratios of foreign assets, foreign sales or foreign income greater than 10%. This classification is based on the requirements of the Statement of Financial Accounting Standard No. 14 (Financial Accounting Standards Board 1976), which defines a firm as a multinational company if it reports foreign assets and foreign sales ratios of 10% or more. Both ways show the qualitatively consistent results.

hedging activities. Following Nance et al. (1993), Géczy et al. (1997), and Chen and King (2014) we first use a dummy variable of hedging to represent if a firm implements hedging in a given year. The hedging dummy variable takes the value of one if a firm holds a hedging position using any types of foreign currency derivatives at the end of the fiscal year or has transactions involving one or more foreign currency derivatives for the purpose of hedging during that year, and zero otherwise. In addition, we use the notional amount of foreign currency derivatives in a given year to quantitatively capture the intensity of hedging activity.

3.3. Measures of Pension Incentive

As one of the main variables of interest for our study, we follow the literature to construct the measures of executive pension incentive. Sundaram and Yermack (2007) point out that retirement compensation and deferred compensation are two primary benefits generating CEO pension incentives. In the Execucomp database, the value of retirement compensation is defined to be the aggregate present (actuarial) value of the executive's accumulated benefits under the firm's pension plans, and deferred compensation is computed as the aggregate balance under the non-tax-qualified deferred compensation plan. Pension incentive motivates the executives to stand with the creditors to claim residual value during firm liquidations. Deferred compensation refers to the part of compensation which is deferred under the voluntary act of the executives to pay at pre-specified dates in the future. Such two types of compensation arrangements may work as the liability-like security to align CEO incentives with creditors and to induce less risky firm policies. Consequently, we expect a positive relation between hedging activity and executive pension incentive.

Although the equity-based components of CEO compensation have been documented in extant literature to cause risk-taking behavior, liability-based compensation is expected to lead to managerial risk aversion. Particularly, Jensen and Meckling (1976) conjecture that a compensation package with equal-weighted equity and debt instruments is superior to 100% equity compensation. In contrast, Edmans and Liu (2011) suggest granting executives equally weighted liability and equity compensation is typically inefficient. With the component of pension, the executives' wealth is aligned with both the incidence of bankruptcy and firm liquidation value, which makes them less incentive to transfer wealth from debtholders to stockholders and attenuates the stockholder-bondholder conflicts. However, on the other hand, executives paid with excessive pension compensation might engage in unnecessarily conservative policies and reallocate wealth from stockholders to debtholders. As a result, to quantitatively capture the incentive of liability-based compensation relative to equity-based compensation and also to consider the external influence of firm capital structure exposed on the executives, we form the two main proxies to gauge the relative magnitude of pension incentive. The first is relative pension leverage, which is defined as CEO pension leverage divided by firm leverage. We also adopt a dummy variable, which takes the value of one if the relative pension leverage is greater than one and zero otherwise, as a way to capture the possible non-linear relation between dominant liability-based incentives and managerial risk attitude. These measures are also suggested by Edmans and Liu (2011) and Wei and Yermack (2011). We speculate that firms with a higher relative pension leverage have a higher likelihood of hedging and a larger notional amount of hedging derivatives.

3.4. Control Variables

The motivations of corporate hedging have been well examined in the literature; thus, we follow the previous studies to incorporate those important drivers of hedging as control variables. Below we briefly discuss the motivation of including those control variables. We first control for CEO equity-based compensation, which is based on stocks and options granted to the executives: One is the change in stock price, which affects the value of stock holding and value of options, and the other is the volatility of stock return, which mainly affects the value of options. Guay (1999) highlights the difference between these two measures, with the former notated by delta and the latter by vega. More incentives from

delta expose more firm risk to managers and cause them risk averse, while compensation with vega incentive helps offset the problem of underinvestment due to the risk aversion that arises from delta incentive. In addition, Rogers (2002) argues that it has more explicitly economic sense to measure the CEO risk-taking incentive per dollar of value-increasing incentives, namely, the ratio of vega to delta (vega/delta). We expect a negative relation between the ratio of vega/delta and hedging since a stronger risk-taking incentive from compensation makes executive more aggressive and are consequently less likely to hedge.

Smith and Stulz (1985) suggest that hedging reduces the volatility of corporate performance, resulting in a lower bankruptcy risk. The probability of bankruptcy or financial distress is considerably higher when a firm's leverage is higher, or when interest coverage or percentage of tangible assets is lower. Therefore, there is a negative relation between interest coverage or tangible assets and hedging, and a positive relation between leverage and hedging. Froot et al. (1993) theorize that hedging can curtail the underinvestment problem (Myers 1977) when a firm faces potential growth opportunities but suffers a high cost of external financing. Following Gay and Nam (1998), we use the correlation between cash flow and firm investment to gauge the underinvestment problem and expect a positive relation between this measure and hedging, indicating that firms with a severe underinvestment problem tend to hedge. In the case of a progressive (convex) tax schedule, marginal tax rate increases with taxable income. Hedging reduces the expected tax liability by smoothing taxable income. Therefore, a positive relation between tax benefit and hedging is predicted. We adopt two measures of tax benefit: a dummy variable indicating positive tax credit and a continuous variable of tax convexity, which measures the expected tax savings from a 5% reduction in the volatility of taxable income (Graham and Smith 1999). Cash holdings are regarded as a natural mechanism to alleviate the negative impact of uncertainty. In addition, convertible bonds can be also used to reduce the agency cost of debt. As both are potential alternatives of hedging, we include them and expect a negative relation between these substitutes and hedging.

3.5. Descriptive Statistics

Our final sample contains 1625 firms and 11,718 firm-year observations. Table 1 provides the summary statistics of hedging behavior, pension incentive, equity incentive and control variables for this final sample. We find that in general hedging appears in 52% of the firm-years and the notional amount of hedging position is on average USD 19.51 million, an equivalent of about 8.2% of total assets for the full sample of firm-year observations, and rises to USD 260.7 million. These results are consistent with the literature. For example, Campello et al. (2011) report that 50% of their sample firms use foreign currency derivative to hedge and the positions of derivatives account for about 7.5% of firm assets, respectively. As to the pension incentive variables, on average, CEOs are paid with USD 2.63 million of pension benefits. Such liability-based compensation constitutes 36% of CEOs' total compensation or 54% of equity-based compensation.

The variable of CEO pension relative leverage has a mean (median) value of 4.72 (0.30) in our final sample. Less than half (39%) of the firm-year observations have this variable greater than one. For equity incentive, the mean values of Delta incentive and Vega incentive are 0.14 and 0.01, respectively. We also note that the ratio of Vega/Delta has an average value of 0.24, suggesting that risk-taking incentive tied to stock volatility represents about a quarter of the value-increasing incentives driven by stock price. Our sample firms on average have a moderate leverage ratio of 0.18 and a healthy interest coverage ratio of 24.61. On average market-to-book ratio is 1.66 and the tangible assets ratio is 76%. The correlation between cash flow and firm investments has a mean (median) value of 0.41 (0.48). In addition, the sample firms hold 18% assets in cash and 3% assets in convertible bond contracts. We also find that 56% sample firm-year observations have a positive tax credit and the average tax convexity is USD 2.13 million, both suggesting that the tax benefits associated with smoothing incomes are considerably attractive. Finally, about 71% of the board members are from out of the firms to serve as independent directors and 33% firm stakes are held by the institutional blockholders.

Table 1. Summary statistics.

	N	Mean	Median	SD	P25	P75
Pension Incentive						
CEO Pension (USD M)	11,718	2.63	0.00	7.59	0.00	0.80
CEO Pension/Total Compensation	11,718	0.36	0.00	0.84	0.00	0.17
CEO Pension/Equity Compensation	11,221	0.54	0.03	1.36	0.00	0.46
CEO Pension Relative Leverage	9488	7.72	0.30	31.69	0.00	2.76
Dummy (CEO Pension Relative Leverage >1)	9488	0.39	0.00	0.49	0.00	1.00
Hedging Variables						
Currency Hedging Propensity (Dummy)	11,718	0.52	1.00	0.52	0.00	1.00
Currency Hedging Intensity (Notional Amount, USD M)	11,718	19.51	0.00	187.98	0.00	0.00
Currency Hedging Intensity (USD M, For Hedgers)	6128	260.70	71.31	639.91	21.55	197.73
CEO-Equity Incentive						
Delta Incentive	11,718	0.14	0.06	0.23	0.03	0.18
Vega Incentive	11,718	0.01	0.01	0.02	0.00	0.02
Vega Incentive/Delta Incentive	11,718	0.24	0.11	0.31	0.01	0.37
Firm-related Characteristics						
Total Assets (USD M)	11,718	8987.72	1739.99	33078.54	612.05	5512.01
Leverage	11,718	0.18	0.15	0.14	0.06	0.27
Market-to-book Ratio	11,718	1.66	1.38	0.75	1.11	1.94
Interest Coverage	11,718	24.61	8.43	42.74	3.84	20.51
Tangible Assets Ratio	11,718	0.76	0.80	0.21	0.54	0.96
Corr(Cash Flow, Investment)	11,718	0.41	0.48	0.42	0.15	0.76
Cash Holding	11,718	0.18	0.10	0.21	0.03	0.24
Convertible Bonds Ratio	11,718	0.03	0.00	0.06	0.00	0.00
Positive Tax Credit (Dummy)	11,718	0.56	1.00	0.50	0.00	1.00
Tax Convexity (MUSD)	11,718	2.13	1.72	1.67	0.70	3.40
Board Independence	11,718	0.71	0.80	0.14	0.43	0.93
Institutional Blockholder Ownership	11,718	0.33	0.30	0.08	0.15	0.57

This table shows summary statistics of pension incentive variables, hedging variables, equity incentive variables, and firm-related variables for the sample of 11,718 firm-year observations from 2006 through 2015 with winsorization at the 1th and 99th percentiles. All variable definitions are reported in Appendix A.

Moreover, we present the Pearson correlation matrix of hedging activity and incentive variables in Table 2, which indicates a positive relation between hedging activity and CEO pension incentives. For example, *CEO Pension Relative Leverage* is significantly positive correlated with both of hedging measures, including hedging propensity (0.36) and hedging intensity (0.35). These relations suggest that greater pension incentives may lead to more hedging activities. In addition, Delta incentive and Vega incentive—these two equity-based incentives—are found to have a different correlation with hedging activity. Note that Delta incentive has an insignificant correlation with hedging, while Vega incentive has a significantly negative correlation with hedging, which is consistent with the literature of equity compensation that granting equity, particularly stock options to managers should, ceteris paribus, generate incentives to take more risks, or consequently hedge less.

Table 2. Correlations matrix between hedging and pension incentive.

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Foreign Currency Hedging Propensity [1]	1									
Foreign Currency Hedging Intensity [2]	0.60 *	1								
CEO Pension (USD M) [3]	0.32 *	0.26 *	1							
CEO Pension/Total Compensation [4]	0.31 *	0.26 *	0.34 *	1						
CEO Pension/Equity Compensation [5]	0.37 *	0.31 *	0.84 *	0.75 *	1					
Ln (CEO Pension Relative Leverage) [6]	0.36 *	0.35 *	0.64 *	0.65 *	0.80 *	1				
Dummy (Pension Relative Leverage > 1) [7]	0.36 *	0.35 *	0.67 *	0.66 *	0.82 *	0.88 *	1			
Delta Incentive [8]	0.04	0.03	0.20 *	0.19 *	0.26 *	0.16 *	0.18 *	1		
Vega Incentive [9]	−0.07 *	−0.07 *	−0.11	−0.05 *	−0.10 *	−0.05	−0.06 *	−0.06 *	1	
Vega Incentive/Delta Incentive [10]	−0.07 *	−0.05 *	−0.20 *	−0.11 *	−0.22 *	−0.09 *	−0.10 *	−0.33 *	−0.54 *	1

This table presents the Pearson correlation coefficients between hedging variables and CEO pension incentive for the final sample from 2006 through 2015. * denotes statistical significance under 5% level. All variable definitions are reported in Appendix A.

4. Model Specification and Empirical Results

4.1. Baseline Model

The primary purpose of this research is to investigate the influence of executive pension incentive on firms' active management of risk. Utilizing the final sample of multinational firms that are exposed to foreign currency risk, we first implement the baseline model regressions of hedging activity on a series of regressors, which contain the measures of pension incentives as the main independent variables, equity incentive variables, the proxies for other hedging drivers discussed in Section 3.4, and control for heterogeneity across industries and time. The baseline model is specified as follows:

$$\begin{aligned} Hedge_{i,t} = \; & \alpha + \beta * PensionIncentive_{i,t-1} + \gamma_1 EquityIncentive_{i,t-1} + \gamma_2 Leverage_{i,t-1} + \gamma_3 InterestCov_{i,t-1} \\ & + \gamma_4 Tangible_{i,t-1} + \gamma_5 Market/book_{i,t-1} + \gamma_6 Corr(CF, Investment)_{i,t-1} + \gamma_7 TaxDummy_{i,t-1} \\ & + \gamma_8 TaxCovexity_{i,t-1} + \gamma_9 CashHolding_{i,t-1} + \gamma_{10} CovertibleBond_{i,t-1} + \gamma_{11} Ln(TotalAssets)_{i,t-1} \\ & + \sum_{k=1}^{47} Industry_k + \sum_{t=1}^{10} Year_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where hedging, the dependent variable, is measured by the dummy variable of hedging or the continuous variable of hedging intensity. The measures of pension incentives include the logarithm of CEO pension benefits in dollar amount, the ratio of CEO pension benefits to CEO total compensation, the ratio of CEO pension benefits to CEO equity compensation. Additionally, following the literature, the continuous variable of CEO pension relative leverage and the dummy variable of CEO pension relative leverage greater than one are constructed.[2] As to CEO equity-based compensation, the incentives of stock and option compensation are gauged by Delta incentive, Vega incentive, and a ratio of Vega incentive to Delta incentive.

To analyze the impact of pension incentives on the hedging adoption, we first perform a Probit model analysis by regressing the dummy variable of hedging on the explanatory variables specified in Equation (1). The results are reported in Panel A of Table 3. To facilitate the interpretation of regression results, we report the incremental effects on the probability of implementing hedging strategy for a one standard deviation change in continuous explanatory variables. However, the incremental effects for the logarithmic variables (i.e., the logarithm of CEO pension relative leverage) or the incremental effects for the dichotomous variables (i.e., the dummy variable of CEO pension relative leverage greater than 1 or the dummy variable of positive tax credit) follow the traditional pattern.[3] Z-values based on robust standard errors are reported in parentheses to test whether the coefficients are equal to zero. Consistent with the theoretical predictions provided on the sign column, we first observe strong evidence across models that CEO pension incentives have a significantly positive influence on the decision of currency hedging. From Model 1 through Model 3, we look at the effect of pension incentives by directly examining the dollar amount of CEO pension incentive, the proportion of pension benefits to total compensation, and the proportion of pension benefits to equity-based compensation. The coefficients of pension incentive in these models all show significant and positive relations with corporate hedging decision. For example, a one-standard-deviation increase in the overall pension benefits in dollar amount leads to an increase of 2.2% in hedging probability. Similarly, a one-standard-deviation increase in pension proportion in CEO total compensation (equity

[2] We also test the alternative measures, such as the CEO pension relative leverage and the squared CEO pension relative leverage, and we find general consistent results. However, considering the potential skewness in the variable of CEO pension relative leverage, we adopt the logarithm form of CEO pension relative leverage or use the conversion to a dummy indicator of CEO pension relative leverage.

[3] Specifically, for each of continuous explanatory variables we multiply the coefficients of the regressions by the standard deviations of each independent variable, while for the logarithmic variables and the dichotomous variables we directly report the coefficient of estimation.

compensation) increases the hedging probability by 6.5% (4.8%). More importantly, the effect of CEO pension incentives on hedging probability is economically meaningful. In Model 4 the continuous measure of CEO pension relative leverage has a positive and significant coefficient (0.006), suggesting that a percentage increase in CEO pension relative leverage leads to about 1.6% increase in the likelihood of hedging. In Model 5, we find when the CEO pension relative leverage is greater than one, that is, when CEO's wealth "leverage" is greater than firm's capital "leverage", the probability of corporate hedging is higher by 20.9%.

Table 3. Baseline Models of Impact of Pension Incentive on Hedging.

Panel A: Probit Model of Hedging Propensity						
	Sign	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
CEO Pension (USD M))	+	0.022 **				
		(2.545)				
CEO Pension/Total Compensation	+		0.065 ***			
			(2.628)			
CEO Pension/Equity Compensation	+			0.048 ***		
				(3.064)		
Ln (CEO Pension Relative Leverage)	+				0.016 **	
					(2.313)	
Dummy (CEO Pension Relative Leverage >1)	+					0.209 ***
						(3.352)
Delta Incentive	+	1.241	0.477	0.865	0.834	0.731
		(0.891)	(0.341)	(0.620)	(0.596)	(0.523)
Vega Incentive	−	−0.273 **	−0.195	−0.376 ***	−0.216 *	−0.228 *
		(−2.259)	(−1.602)	(−3.133)	(−1.762)	(−1.862)
Leverage	+	1.066 ***	0.949 ***	0.908 ***	1.359 ***	1.336 ***
		(4.947)	(4.417)	(4.242)	(6.180)	(6.092)
Interest Coverage	−	−0.002 ***	−0.002 ***	−0.002 ***	−0.002 ***	−0.002 ***
		(−3.455)	(−3.283)	(−3.567)	(−4.149)	(−3.756)
Tangible Assets Ratio	−	−0.362 ***	−0.388 ***	−0.310 **	−0.353 **	−0.367 ***
		(−2.630)	(−2.808)	(−2.260)	(−2.567)	(−2.666)
Market to Book	+	0.029	0.035	0.037	0.011	0.013
		(0.757)	(0.922)	(0.986)	(0.297)	(0.353)
Corr (CF, Investment)	−	−0.134 **	−0.132 **	−0.127 **	−0.133 **	−0.130 **
		(−2.413)	(−2.379)	(−2.308)	(−2.394)	(−2.350)
Positive Tax Credit (Dummy)	+	0.130 ***	0.137 ***	0.139 ***	0.129 ***	0.128 ***
		(3.150)	(3.307)	(3.382)	(3.123)	(3.091)
Tax Convexity	+	−0.033 **	−0.028 **	−0.030 **	−0.029 **	−0.030 **
		(−2.447)	(−2.114)	(−2.232)	(−2.177)	(−2.213)
Cash Holding	−	−0.456 ***	−0.442 ***	−0.509 ***	−0.463 ***	−0.424 ***
		(−3.292)	(−3.205)	(−3.713)	(−3.346)	(−3.062)
Convertibles Bonds	−	−1.790 ***	−1.504 ***	−1.502 ***	−1.516 ***	−1.520 ***
		(−4.433)	(−3.728)	(−3.739)	(−3.767)	(−3.775)
Log (Total Assets)	+	0.348 ***	0.334 ***	0.358 ***	0.346 ***	0.345 ***
		(20.278)	(19.159)	(20.733)	(20.102)	(19.973)
Intercept		−2.508 ***	−2.506 ***	−2.676 ***	−2.632 ***	−2.635 ***
		(−7.130)	(−7.072)	(−7.570)	(−7.484)	(−7.450)
Industry and Year Fixed Effect		Yes	Yes	Yes	Yes	Yes
Number of Observations		11,718	11,718	11,221	9488	9488
Pseudo R^2		0.369	0.369	0.371	0.393	0.391
Panel B: Tobit Model of Hedging Intensity						
	Sign	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
CEO Pension (USD M)	+	0.009 **				
		(2.238)				
CEO Pension/Total Compensation	+		0.035 *			
			(1.695)			
CEO Pension/Equity Compensation	+			0.027 **		
				(2.501)		
Ln (CEO Pension Relative Leverage)	+				0.004 *	
					(1.690)	
Dummy (CEO Pension Relative Leverage >1)	+					0.018 ***
						(2.919)

Table 3. *Cont.*

Panel B: Tobit Model of Hedging Intensity						
	Sign	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
Delta Incentive	+	0.109	0.089	0.109	0.096	0.093
		(1.412)	(1.139)	(1.393)	(1.234)	(1.203)
Vega Incentive	−	−0.011	−0.010	−0.018 **	−0.009	−0.010
		(−1.500)	(−1.364)	(−2.350)	(−1.213)	(−1.255)
Leverage	+	0.097 ***	0.090 ***	0.090 ***	0.110 ***	0.110 ***
		(7.520)	(7.033)	(7.001)	(8.328)	(8.300)
Interest Coverage	−	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***
		(−5.631)	(−5.521)	(−5.721)	(−6.133)	(−5.858)
Tangible Assets Ratio	−	−0.024 ***	−0.024 ***	−0.022 ***	−0.024 ***	−0.024 ***
		(−2.990)	(−3.037)	(−2.749)	(−2.939)	(−2.983)
Market to Book	+	0.014 ***	0.014 ***	0.014 ***	0.013 ***	0.013 ***
		(6.314)	(6.498)	(6.643)	(5.911)	(6.088)
Corr (CF, Investment)	−	−0.005	−0.004	−0.004	−0.004	−0.004
		(−1.417)	(−1.352)	(−1.345)	(−1.366)	(−1.332)
Positive Tax Credit (Dummy)	+	0.003	0.004	0.004 *	0.004	0.004
		(1.403)	(1.643)	(1.771)	(1.507)	(1.482)
Tax Convexity	+	−0.001 *	−0.001	−0.001	−0.001	−0.001
		(−1.678)	(−1.462)	(−1.606)	(−1.431)	(−1.424)
Cash Holding	−	−0.058 ***	−0.059 ***	−0.062 ***	−0.059 ***	−0.058 ***
		(−6.852)	(−6.908)	(−7.252)	(−6.974)	(−6.790)
Convertibles Bonds	−	−0.141 ***	−0.130 ***	−0.130 ***	−0.128 ***	−0.129 ***
		(−5.589)	(−5.126)	(−5.118)	(−5.068)	(−5.062)
Log (Total Assets)	+	0.016 ***	0.016 ***	0.017 ***	0.016 ***	0.016 ***
		(17.086)	(16.344)	(17.511)	(16.817)	(16.638)
Intercept		−0.192 ***	−0.195 ***	−0.201 ***	−0.197 ***	−0.198 ***
		(−10.040)	(−10.342)	(−10.758)	(−10.446)	(−10.735)
/sigma		0.070 ***	0.070 ***	0.070 ***	0.070 ***	0.070 ***
		(79.666)	(79.860)	(80.000)	(79.687)	(79.861)
Industry and Year Fixed Effect		Yes	Yes	Yes	Yes	Yes
Number of Observations		6128	6128	5869	4962	4962
Pseudo R^2		0.105	0.099	0.117	0.104	0.104

This table shows the results of baseline model regressions of hedging activity for the sample of 3492 firm-years from 2006 through 2010. Panel A reports the effects on the probability of hedging from Probit model for a one standard deviation change in continuous explanatory variables (or for a change from zero to one in dummy explanatory variable). In Panel B we apply Tobit model to regress the total notional amount of hedging positions scaled by book value of total assets on the set of explanatory variables. We control for industry effects by using the Fama-French 48-industry classification and control for time effects by using year dummies. The robust standard errors are used to calculate Z-Statistics (Probit model) or T-Statistics (Tobit model) that are reported in parentheses below estimates. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

For firm-related variables, the results are generally consistent with the literature. Leverage has the positive impact on hedging, and both interest coverage and tangible assets are negatively related with hedging. We also find a significantly negative association between hedging and the correlation of cash flow and investments, suggesting that firms with a lower degree of matching between cash flows and investment needs tend to hedge more. Furthermore, we find evidence to support the potential tax benefits of hedging. For example, the dummy variable of positive tax credit has positive and significant effect on hedging. Lastly, we find that cash holding and convertible bonds are both negatively associated with hedging, indicating that they may serve as possible substitutes for hedging.

Liability-based incentive urges executives' inclination to take risk-reduced investment, i.e., more likely to hedge and increase the magnitude of hedging activity. To detect how pension incentive affects the intensity of hedging, we turn to an investigation by applying the continuous measure of hedging activity. Specifically, we replace hedging dummy variable in Equation (1) with the notional amount of hedging positions scaled by the book value of total assets. We keep the same set of explanatory variables. Given the nature of non-negative notional amount of hedging position, we adopt Tobit regressions for our baseline models. The results are shown in Panel B of Table 3. Across the models, we find a significantly positive relation between the notional amount of hedging and all measures of pension incentives. The positive relations between pension incentive and hedging notional amount to total assets ratio are detected from Models 1 through 4. For example, we observe from Model 1 that

firms increase about USD 81 million (=0.009 *USD 8987 million) when pension compensation increases one-standard-derivation or equivalently USD 7.59 million. In addition, the coefficient (0.004) in Model 4 shows that for a one percent increase in CEO pension relative leverage, the hedging position rises by 40 basis points of total assets (0.4%), and in other words, firms on average increase their hedging positions by USD 35.95 million (=0.04%*USD 8987 million). Finally, this significant and positive relation also holds in Models 5, when CEOs' wealth leverage is greater than firms' leverage, the ratio of hedging position to total assets is higher by 1.8%. Considering that the average hedging notional amount to total assets ratio is 2.9% (=USD 260.70/USD 8987), the change of the CEO pension relative leverage from less than or equal to one to greater than one boosts the hedging intensity by more than 60% (1.8%/2.9% = 62%). Overall, the results of baseline models provide supportive evidence to our first hypothesis.

4.2. Alternative Models to Control for Equity-Based Incentives

While the focus of this research is not about equity-based incentive, it may be arguable that equity-based incentive is designed differently for the sample firms that are more/less likely to do currency risk management. From our baseline models, we find that Vega incentive is negatively associated with hedging decision, but an insignificant impact of Delta incentive on hedging decision is also observed. Although the results of equity incentives seem mixed from the theoretical predictions, these discordant results are also reported in the literature. For instance, Guay (1999) illustrates that shareholders should consider the slope and convexity of the relation between executives' compensation and firm performance, where slope (Delta) refers to the sensitivity of executives' compensation to stock price and convexity (Vega) refers to the sensitivity of executives' compensation to stock return volatility. As a result, granting equity compensation to executives should, ceteris paribus, generate incentives to take more risks, or equivalently hedge less. Knopf et al. (2002) provide the evidence to support the positive association between hedging and the sensitivity of a manager's equity wealth to stock price and the negative association between hedging and the sensitivity of a manager's equity wealth to stock return volatility. Rajgopal and Shevlin (2002) report a significantly negative relation between risk-taking incentives (Vega) and commodity hedging for a sample of gas and oil firms.

But in a similar setting, Rogers (2002) only find weak evidence of Delta and Vega incentives which affect the hedging decision. Accordingly, Rogers (2002) proposes economic interpretation of the ratio of Vega to delta should be more intuitive because it measures the CEO risk-taking incentive per dollar of value-increasing incentives from option and stock holdings that delta and Vega measure managerial motivation from "value-creating" and "risk-taking" incentives, respectively. On the other hand, Lewellen (2006) demonstrates that the "moneyness" of stock options has different impacts on managerial risk attitude. In particular, those in-the-money options discourage risk-taking. Meanwhile, as emphasized by Carpenter (2000) equity compensation does not necessarily result in more risk-taking behavior because it makes executives' wealth more vulnerable to stock price fluctuation. Hirshleifer and Suh (1992) also discuss the side effect of equity compensation, which encourages executives to work hard but also affects their attitude toward project risks, ending up with less risk-taking. Gerakos (2010) provides some evidence that executives granted with more pension benefits are paid less on other dimensions of compensation.

To ensure that the results of the baseline model are not vulnerable to the potential inconsistent impact of equity-based incentive, we perform the alternative models to recognize the evidence from Carpenter (2000). The results of the alternative models are shown in Table 4 and report the regressions by adopting the ratio of Vega incentive to Delta incentive. As expected, we find the significant and negative coefficients of this variable across the models. For example, the ratio of Vega incentive to Delta incentive are negatively associated with both hedging propensity in Model 3 of Panel A (−0.226) and hedging intensity in Model 3 of Panel B (−0.028). With this new control variable in Table 4, the coefficients of pension incentive measures keep positive. Notably, the effect of pension incentive on hedging propensity and on hedging intensity are also statistically significant, consistent with the

finding in Table 3. To this end, the alternative models help confirm that hedging activity is plausibly affected by the executive pension incentive.

Table 4. Alternative Models of Impact of Pension Incentive on Hedging.

Panel A: Probit Model of Hedging Propensity						
	Sign	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
CEO Pension (USD M)	+	0.024 **				
		(2.533)				
CEO Pension/Total Compensation (%)	+		0.066 **			
			(2.612)			
CEO Pension/Equity Compensation (%)	+			0.047 ***		
				(3.012)		
Ln (CEO Pension Relative Leverage)	+				0.017 **	
					(2.256)	
Dummy (CEO Pension Relative Leverage >1)	+					0.204 ***
						(3.218)
Vega Incentive/Delta Incentive	−	−0.154 **	−0.135 **	−0.226 ***	−0.156 **	−0.157 **
		(−2.256)	(−1.975)	(−2.809)	(−2.278)	(−2.291)
Firm-related Characteristics		Yes	Yes	Yes	Yes	Yes
Industry and Year Fixed Effect		Yes	Yes	Yes	Yes	Yes
Number of Observations		11,718	11,718	11,221	9488	9488
Pseudo R^2		0.368	0.368	0.370	0.392	0.391
Panel B: Tobit Model of Hedging Intensity						
	Sign	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
CEO Pension (USD M)	+	0.009 **				
		(2.401)				
CEO Pension/Total Compensation (%)	+		0.038 *			
			(1.732)			
CEO Pension/Equity Compensation (%)	+			0.030 **		
				(2.503)		
Ln (CEO Pension Relative Leverage)	+				0.005 *	
					(1.740)	
Dummy (CEO Pension Relative Leverage >1)	+					0.019 ***
						(3.172)
Vega Incentive/Delta Incentive	−	−0.021	−0.020	−0.028 **	−0.026 **	−0.030 **
		(−1.496)	(−1.618)	(−2.222)	(−2.061)	(−2.395)
Firm-related Characteristics		Yes	Yes	Yes	Yes	Yes
Industry and Year Fixed Effect		Yes	Yes	Yes	Yes	Yes
Number of Observations		6128	6128	5869	4962	4962
Pseudo R^2		0.099	0.102	0.105	0.099	0.117

This table shows the results of the alternative models of pension incentive on hedging activity by recognizing a different measure of equity incentives (the ratio of Vega incentive relative to Delta incentive). Panel A reports the effects on the probability of hedging from Probit model for a one standard deviation change in continuous explanatory variables (or for a change from zero to one in dummy explanatory variable). In Panel B we apply Tobit model to regress the total notional amount of hedging positions scaled by book value of total assets on the set of explanatory variables. We control for industry effects by using the Fama-French 48-industry classification and control for time effects by using year dummies. The robust standard errors are used to calculate Z-Statistics (Probit model) or T-Statistics (Tobit model) that are reported in parentheses below estimates. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

4.3. Robustness Checks for Endogeneity

In this section, we tend to identify the causal drive of the pension incentive to the hedging activity. As in most research in business, endogeneity may cause a concern in this study. While, by and large, the relation between pension incentive and hedging is well supported by theoretical work, it is relatively challenging to capture the causal effect because compensation contracts and hedging practices can be determined by unobservable firm-related and other factors.

We employ the approach of instrumental variables (IV) regression, where two instruments (firm age and CEO age) are used for each of the pension incentive measures in regressions.[4] In particular, treated as endogenous variable, pension incentive is regressed on a set of all other explanatory variables plus firm age and CEO age as instruments in the first stage. Predicted values of pension incentive are computed from the first-stage regression and used in the second-stage regression as specified in Equation (1).

We report the results in Table 5. In Model 5 of Panel A, as the dependent variable (hedging dummy) and the endogenous independent variable (the dummy variable of CEO pension relative leverage greater than one) are both dichotomous variables, we apply the Bivariate Probit model. Specifically, we simultaneously estimate a system in which the first and second stage regressions are both Probit models (Greene 2004). For other models of the hedging dummy regressions, we apply the IV-Probit model in which the first stage is an OLS (Ordinary Least Squares) model and the second stage is a Probit model. For the models in Panel B where the dependent variable is hedging notional amount scaled by the firm size (a continuous nonnegative variable), we apply IV-Tobit model as a regular IV regressions with truncated continuous dependent variable, namely, the first stage is an OLS model and the second stage is a Tobit model. Panel B of Table 5 reports the second stage results of IV regressions on hedging dummy and hedging notional amount, respectively. Consistent with our conjecture, the positive relation between hedging and pension incentive remain robust after controlling for potential endogeneity. Meanwhile, we find that the impact of equity-based incentives also shows evidence consistent with theoretical predications. For example, in Model 5 of Panel A (the hedging dummy regression), the coefficient of Vega incentive relative to Delta incentive is negative and significant the 5% level. In the regressions of hedging notional amount, the coefficient of this variable is found negative and significant at the 1% level in Models 5 of Panel B.

Table 5. Instrumental variables regressions.

Panel A: Instrumental Variable Regression of Debt Incentives on Hedging Propensity						
	Sign	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
CEO Pension (USD M)	+	1.410 ***				
		(3.463)				
CEO Pension/Total Compensation (%)	+		2.386 ***			
			(3.951)			
CEO Pension/Equity Compensation (%)	+			3.015 ***		
				(3.984)		
Ln (CEO Pension Relative Leverage)	+				0.251 ***	
					(3.224)	
Dummy (CEO Pension Relative Leverage >1)	+					0.959 ***
						(3.542)
Vega Incentive/Delta Incentive	−	−1.028 **	−0.201	−0.083 **	−0.225	−0.142 **
		(−2.233)	(−0.954)	(−2.086)	(−0.895)	(−2.067)
Leverage	+	1.843 ***	0.940 ***	0.828 ***	2.093 ***	1.939 ***
		(4.911)	(4.296)	(3.768)	(4.884)	(5.366)
Interest Coverage	−	−0.001	−0.001 **	−0.002 ***	−0.002 ***	−0.002 ***
		(−0.728)	(−2.422)	(−2.921)	(−4.239)	(−3.374)
Tangible Assets Ratio	−	−0.833 ***	−0.521 ***	−0.388 ***	−0.478 ***	−0.484 ***
		(−3.553)	(−3.431)	(−2.727)	(−3.110)	(−3.215)
Market to Book	+	−0.039	0.028	0.038	−0.031	−0.017
		(−0.750)	(0.715)	(0.999)	(−0.701)	(−0.415)
Corr (CF, Investment)	−	−0.130 *	−0.127 **	−0.110 *	−0.129 **	−0.125 **
		(−1.875)	(−2.255)	(−1.954)	(−2.272)	(−2.215)
Positive Tax Credit (Dummy)	+	0.071	0.139 ***	0.164 ***	0.123 ***	0.120 ***
		(1.282)	(3.308)	(3.830)	(2.906)	(2.857)

[4] We recheck the results by trying the lagged variable approach, with which the endogenous variable of pension incentive is lagged to help in mitigating the potential bias of endogeneity. We observe the positive relation between hedging activity and pension incentive unchanged.

Table 5. *Cont.*

Panel A: Instrumental Variable Regression of Debt Incentives on Hedging Propensity						
	Sign	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
Tax Convexity	+	−0.013	−0.017	−0.016	−0.017	−0.019
		(−0.740)	(−1.206)	(−1.098)	(−1.132)	(−1.344)
Cash Holding	−	0.155	−0.306 **	−0.420 ***	−0.307 *	−0.247
		(0.579)	(−2.010)	(−2.943)	(−1.903)	(−1.512)
Convertibles Bonds	−	−2.086 ***	−1.162 ***	−0.938 **	−1.209 ***	−1.241 ***
		(−4.007)	(−2.662)	(−2.070)	(−2.757)	(−2.888)
Log (Total Assets)	+	0.152 **	0.270 ***	0.304 ***	0.288 ***	0.292 ***
		(2.209)	(8.314)	(12.000)	(8.540)	(9.623)
Intercept		−0.948	−2.173 ***	−2.534 ***	−2.391 ***	−2.454 ***
		(−1.380)	(−5.587)	(−6.949)	(−6.296)	(−6.620)
p-value of Smith-Blundell Test of Exogeneity		0.114	0.189	0.237	0.012	0.236
p-value of Amemiya-Lee-Newey Over-identification Test		0.523	0.512	0.469	0.305	0.363
Industry and Year Controls		Yes	Yes	Yes	Yes	Yes
Number of Observations		11,718	11,718	11,221	9488	9488
Panel B: Instrumental Variable Regression of Debt Incentives on Hedging Intensity						
	Sign	**[6]**	**[7]**	**[8]**	**[9]**	**[10]**
CEO Pension (USD M)	+	0.025 **				
		(2.545)				
CEO Pension/Total Compensation (%)	+		0.052 ***			
			(2.826)			
CEO Pension/Equity Compensation (%)	+			0.048 **		
				(2.231)		
Ln (CEO Pension Relative Leverage)	+				0.005 **	
					(2.158)	
Dummy (CEO Pension Relative Leverage >1)	+					0.021 **
						(2.449)
Vega Incentive/Delta Incentive	−	−0.002 *	−0.005	−0.003 **	−0.003 *	−0.004 ***
		(−1.681)	(−0.713)	(−1.963)	(−1.924)	(−2.772)
Leverage	+	0.070 ***	0.053 ***	0.052 ***	0.078 ***	0.076 ***
		(7.093)	(7.571)	(7.349)	(5.833)	(6.673)
Interest Coverage	−	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***	−0.000 ***
		(−4.693)	(−5.891)	(−6.457)	(−7.211)	(−6.646)
Tangible Assets Ratio	−	−0.028 ***	−0.024 ***	−0.020 ***	−0.022 ***	−0.022 ***
		(−4.563)	(−4.888)	(−4.502)	(−4.579)	(−4.675)
Market to Book	+	0.006 ***	0.008 ***	0.008 ***	0.006 ***	0.007 ***
		(4.413)	(5.983)	(6.306)	(4.389)	(4.981)
Corr (CF, Investment)	−	−0.002	−0.002	−0.002	−0.002	−0.002
		(−1.198)	(−1.190)	(−1.085)	(−1.224)	(−1.171)
Positive Tax Credit (Dummy)	+	0.001	0.002	0.003 *	0.002	0.002
		(0.475)	(1.576)	(1.926)	(1.296)	(1.254)
Tax Convexity	+	−0.001 **	−0.001 **	−0.001 ***	−0.001 **	−0.001 ***
		(−2.377)	(−2.528)	(−2.784)	(−2.493)	(−2.633)
Cash Holding	−	−0.019 ***	−0.027 ***	−0.030 ***	−0.027 ***	−0.026 ***
		(−2.617)	(−5.005)	(−5.926)	(−4.931)	(−4.610)
Convertibles Bonds	−	−0.092 ***	−0.072 ***	−0.072 ***	−0.074 ***	−0.074 ***
		(−6.063)	(−4.868)	(−4.725)	(−4.968)	(−5.082)
Log (Total Assets)	+	0.006 ***	0.007 ***	0.008 ***	0.008 ***	0.008 ***
		(3.266)	(7.220)	(11.051)	(7.407)	(8.252)
Intercept		−0.072 ***	−0.092 ***	−0.101 ***	−0.096 ***	−0.098 ***
		(−3.970)	(−7.216)	(−8.481)	(−7.750)	(−8.093)
p-value of Smith-Blundell Test of Exogeneity		0.243	0.365	0.328	0.068	0.202
p-value of Amemiya-Lee-Newey Over-identification test		0.322	0.317	0.125	0.242	0.387
Industry and Year Controls		Yes	Yes	Yes	Yes	Yes
Number of Observations		6128	6128	5869	4962	4962

This table reports the results of the robustness checks based instrumental variables (IV) models. The dependent variables are hedging dummy in Panel A and are hedging intensity (the ratio of total notional amount of hedging positions scaled by the book value of total assets) in Panel B. The two-stage regressions with a Probit model in the second stage are applied on Panel A and the two-stage regressions with a Tobit model in the second stage are applied on Panel B, respectively. We control for industry effects by using the Fama-French 48-industry classification and control for time effects by using year dummies. The robust standard errors are used in all models in Panel A to calculate Z-Statistics or T-Statistics that are reported in parentheses below estimates. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Roberts and Whited (2013) suggest that the IV regression model is only as good as the choice of instrumental variables. We select the instruments by considering both its relevance with pension incentives and irrelevance with hedging. More specifically, the relevance rule requires a non-zero correlation between an instrument and the endogenous variable of pension incentive, and the irrelevance rule indicates that the selected instrument must not be correlated with the unobserved determinants of hedging. Existing literature on pension benefits suggests that CEO age and firm age are closely related to the granting of retirement plans (Liu et al. 2014; Cassell et al. 2012; Sundaram and Yermack 2007). The firm age is used as one of instrumental variables due to the business life-cycle reason. Firms usually do not offer pension or other fringe benefit plans when they start in business, and gradually adopt them afterwards. Brown and Medoff (2003) document that the firms that have been in business longer are more likely to implement pension plans. With the consideration of little conclusive theory in classical economics for the connection between hedging activity and biological age, CEO age is used as another variable in the set of instruments. However, we are aware of some evidence in the recent literature that reports the impact of executives' age on corporate polices. For example, Serfling (2014) suggests that younger CEOs generally have a more aggressive leadership style. Jenter and Lewellen (2015) and Yim (2013) show that younger CEOs are more likely to engage in risky acquisitions. Croci et al. (2017) find a high likelihood of being a hedger from senior CEOs. When biological age connects to executives' psychological or physiological situation, the CEOs' age may not be able to introduce exogenous variations to capture the causal impact of pension incentive on firms' hedging policy.[5]

But to be more prudent, we use the econometric methods to test the verification of IV model and instruments. We employ the Smith-Blundell test of exogeneity to test the null hypothesis that there is no serious endogeneity in the model, and the Amemiya-Lee-Newey over-identification test to test the null hypothesis that there is no over-identification problem. Across the models, we find that the null hypothesis of Smith-Blundell test of exogeneity cannot be rejected in all Models except Model 4 for the hedging propensity and hedging intensity, indicating that a problem of endogeneity is not extensively present. Meanwhile, from models 1 through 4 for both the hedging propensity and hedging intensity regressions, the p-value in the Amemiya–Lee–Newey over-identification test is much greater than 10%, indicating that the instruments are chosen appropriately and there is no over-identification problem in our models. To summarize, the robustness checks confirm that the positive impact of pension incentive on hedging activities detected in baseline models is unlikely to be driven by the endogeneity issue.

4.4. The Role of Pension Incentive in Different Governance Environment

From the above empirical analyses a significant and positive relation between hedging and pension incentive has been documented in baseline and robustness models, but another important question, which relates to a considerable debate regarding the nature of incentive design as aforementioned, is how this positive relation varies in the different situations of corporate governance. As a component of compensation contract, pension incentive itself is closely associated with governance mechanism. Lee and Tang (2011) document that CEO pension benefits are associated with corporate governance. They find that entrenched managers, proxied by a small board, CEO duality, and protection from anti-takeover provisions, are more likely to obtain higher compensation of pension benefits. Halford and Qiu (2012) test whether firms that are likely to face more severe agency problems of debt

[5] With this caveat in mind, we seek the alternative instruments by trying the federal and state personal tax rates (Anantharaman et al. 2014; Kim and Lu 2011), as one can reasonably assume that those highest-paid CEOs would have different preference towards the compensation packages when they are subject to the different personal income tax brackets. In addition, we also utilize a regulatory reform, Pension Protection Act in 2006, which attempts to strengthen the pension system, protects retirement accounts and makes pension benefits more attractive. As the legislation provides greater incentives to firms and employees in investing in pension plans, this exogenous change of law should have no implicit impacts on the hedging decision. Although the tests by using the above alternative sets of instruments show the qualitatively consistent results, we acknowledge that the potential issue of endogeneity cannot be entirely resolved given the lack of perfect instruments, and therefore the causality results based on the IV models should be interpreted with caution.

provide more debt incentives. Inconsistent with the agency theory's prediction they find evidence that firms with lower default risk use more pension plans, and little evidence to support the hypothesis that pension incentive is used to alleviate the agency costs of debt.

In Section 2, our second hypothesis (H2) predicts the different relations between corporate hedging and CEO liability-based compensation which are conditional upon the strength of corporate governance. Recall that our first hypothesis proposes a positive relation between hedging and pension incentive. However, the optimal contracting hypothesis predicts that the positive relation should be more significant for firms with strong corporate governance than for firms with weak governance. Thus, in this section we test how the influence of pension incentive on hedging is contingent on the mechanism of corporate governance. In Table 6, we present the regressions of three baseline models but in the subsamples categorized by the median value of board independence.

Following the same steps, we report the incremental effect on the probability of hedging for a one-standard-deviation change in the continuous explanatory variables (or for a change from zero to one for the dummy explanatory variables). Furthermore, we apply the Chow test to examine the difference in coefficients between the two subsamples. Panel A reports the results for the hedging propensity regressions. In particular, the influence of pension incentive on hedging is more pronounced for the firms in the above-median group than in the below-median group (0.069 vs. 0.04 in Model 1 and Model 2). In other words, the effect of pension incentives on hedging is more prominent for firms with strong shareholder power. The differences are also economically significant based on the predicted probabilities. Specifically, Model 5 and Model 3 show that when CEOs' wealth leverage is greater than firms' leverage, it will cause a 44% (=0.287/0.650) rise in predicated probability of hedging for the firms in the above-median group of independent board directors, but only a 16% (=0.124/0.783) rise for the firms in the below-median group of independent board directors. Panel B of Table 6 reports the results based on the notional value of hedging, further confirming the finding.

Similarly, we conduct the subsample comparison by splitting firms into groups with the median value of blockholder ownership and report the results in Table 7. In Models 1 and 2 of Panel A, we find that a one-standard-deviation increase in pension incentive in firms with higher blockholder ownership will increase 7.3% of hedging probability, more than double the increase (2.8%) in the subsample with lower blockholder ownership. A similar difference with statistical significance is also found in Panel B of Table 7. For example, the coefficient of the dummy variable of CEO pension relative leverage greater than 1 is substantially larger in the subsample with low blockholder ownership than that in the subsample with high blockholder ownership (0.028 vs. 0.016 in Model 5 and Model 6) with significance at the 5% level. As a result, the above evidence lends strong support for the optimal contracting hypothesis (our second hypothesis). The pension incentive is governed to expose more influence on executives' decisions, and this risk-reducing function is induced more when firms have strong governance, but does not fully perform in the case of weak governance.

Table 6. The influence of pension incentive on hedging by board independence.

Panel A: The Influence of Pensive Incentive on Hedging Propensity by Board Independence										
	Sign	**(> Median)**	**(< Median)**	**Diff**	**(> Median)**	**(< Median)**	**Diff**	**(> Median)**	**(< Median)**	**Diff**
		[1]	**[2]**	**Chow test**	**[3]**	**[4]**	**Chow test**	**[5]**	**[6]**	**Chow test**
CEO Pension/Equity Compensation (%)	+	0.069 ***	0.040	0.029 ***						
		(5.249)	(1.048)	(2.907)						
Ln (CEO Pension Relative Leverage)	+				0.018 **	0.008 *	0.009 *			
					(2.440)	(1.893)	(1.736)			
Dummy (CEO Pension Relative Leverage >1)	+							0.287 ***	0.124	0.163 **
								(3.700)	(1.303)	(2.302)
Firm-related Characteristics		Yes	Yes		Yes	Yes		Yes	Yes	
Industry and Year Controls		Yes	Yes		Yes	Yes		Yes	Yes	
Number of Observations		5455	5455		2216	2217		2216	2217	
Pseudo R^2		0.435	0.422		0.472	0.465		0.433	0.439	
Panel B: The Influence of Pensive Incentive on Hedging Intensity by Board Independence										
	Sign	**(> Median)**	**(< Median)**	**Diff**	**(> Median)**	**(< Median)**	**Diff**	**(> Median)**	**(< Median)**	**Diff**
		[1]	**[2]**	**Chow test**	**[3]**	**[4]**	**Chow test**	**[5]**	**[6]**	**Chow test**
CEO Pension/Equity Compensation (%)	+	0.039 ***	0.019	0.020 ***						
		(3.187)	(0.716)	(3.661)						
Ln (CEO Pension Relative Leverage)	+				0.005 ***	0.003	0.002 ***			
					(3.875)	(1.218)	(2.586)			
Dummy (CEO Pension Relative Leverage >1)	+							0.020 ***	0.015 *	0.005 ***
								(5.644)	(1.918)	(3.266)
Firm-related Characteristics		Yes	Yes		Yes	Yes		Yes	Yes	
Industry and Year Controls		Yes	Yes		Yes	Yes		Yes	Yes	
Number of Observations		2867	2867		2413	2414		2413	2414	
Pseudo R^2		0.186	0.181		0.135	0.133		0.138	0.138	

This table reports the regressions for the subsamples categorized by board independence. The Probit Model is applied in Panel A where the dependent variable is hedging dummy, and Tobit models are used in Panel B where the dependent variable is the ratio of total notional amount of hedging positions scaled by the book value of total assets. We control for industry effects by using the Fama-French 48-industry and control for time effects by using year dummies. The robust standard errors are to calculate Z-Statistics or T-Statistics reported in parentheses below estimates. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 7. The influence of pension incentive on hedging by blockholder ownership.

Panel A: The Influence of Pensive Incentive on Hedging Propensity by Blockholder Ownership.										
	Sign	**(> Median)**	**(< Median)**	**Diff**	**(> Median)**	**(< Median)**	**Diff**	**(> Median)**	**(< Median)**	**Diff**
		[1]	**[2]**	**Chow test**	**[3]**	**[4]**	**Chow test**	**[5]**	**[6]**	**Chow test**
CEO Pension/Equity Compensation (%)	+	0.073 ***	0.028	0.045 ***						
		(4.875)	(1.568)	(2.788)						
Ln (CEO Pension Relative Leverage)	+				0.020 **	0.014 *	0.006			
					(2.495)	(1.949)	(1.614)			
Dummy (CEO Pension Relative Leverage >1)	+							0.251 ***	0.132	0.119 *
								(2.202)	(1.072)	(1.893)
Firm-related Characteristics		Yes	Yes		Yes	Yes		Yes	Yes	
Industry and Year Controls		Yes	Yes		Yes	Yes		Yes	Yes	
Number of Observations		5455	5455		2216	2217		2216	2217	
Pseudo R^2		0.431	0.430		0.464	0.468		0.419	0.418	
Panel B: The Influence of Pensive Incentive on Hedging Intensity by Blockholder Ownership										
	Sign	**(> Median)**	**(< Median)**	**Diff**	**(> Median)**	**(< Median)**	**Diff**	**(> Median)**	**(< Median)**	**Diff**
		[1]	**[2]**	**Chow test**	**[3]**	**[4]**	**Chow test**	**[5]**	**[6]**	**Chow test**
CEO Pension/Equity Compensation (%)	+	0.043 ***	0.021	0.021 **						
		(2.667)	(0.762)	(2.348)						
Ln (CEO Pension Relative Leverage)	+				0.007 ***	0.002 *	0.004 **			
					(2.605)	(1.690)	(2.351)			
Dummy (CEO Pension Relative Leverage >1)	+							0.028 ***	0.016 *	0.012 **
								(2.143)	(1.729)	(2.003)
Firm-related Characteristics		Yes	Yes		Yes	Yes		Yes	Yes	
Industry and Year Controls		Yes	Yes		Yes	Yes		Yes	Yes	
Number of Observations		2867	2867		2414	2413		2414	2413	
Pseudo R^2		0.187	0.181		0.134	0.134		0.138	0.137	

This table reports the regressions for the subsamples categorized by blockholder ownership. The Probit Model is applied in Panel A where the dependent variable is hedging dummy, and Tobit models are used in Panel B where the dependent variable is the ratio of total notional amount of hedging positions scaled by the book value of total assets. We control for industry effects by using the Fama-French 48-industry and control for time effects by using year dummies. The robust standard errors are to calculate Z-Statistics or T-Statistics reported in parentheses below estimates. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

5. The Influence of Pension Incentive on Value of Corporate Hedging

Tan and Young (2016) show that executives motivated by the long-term incentive pay, such as retirement plans may engage in behaviors unfavorable to shareholders. To provide a novel insight into the role of pension incentive in terms of value creation, we adopt Faulkender and Wang's (2006) methodology to assess the marginal value of hedging as a function of CEO pension incentives. We first treat hedging motivated by pension incentive as a beneficial driver to shareholders. Therefore, in addition to the firm characteristics specified in Faulkender and Wang (2006), we include the change of hedging activity in the regression model to quantify the value of hedging:

$$\begin{aligned} r_{i,t} - R^{B}_{i,t} = \quad & \gamma_0 + \beta * \Delta Hedge_{i,t} + \gamma_1 L_{i,t} + \gamma_2 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_3 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_4 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_5 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \gamma_6 \frac{\Delta I_{i,t}}{M_{i,t-1}} \\ & + \gamma_7 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \gamma_8 \frac{NF_{i,t}}{M_{i,t-1}} + \sum_{t=1}^{10} Year_t + \varepsilon_{i,t} \end{aligned} \tag{2}$$

where the dependent variable $r_{i,t}$ is the annual excess equity return calculated from a firm i's stock return over year $t-1$ to year t, net of $R^{B}_{r,t}$, the return of Fama and French (1993) size and book-to-market matched portfolio from year $t-1$ to year t. $\Delta X_{i,t}$ is the notation for the one-year change of variable X for firm i over year $t-1$ to year t, i.e., $X_t - X_{t-1}$; $\Delta Hedge_{,t}$ represents the hedging propensity (*HP*) or change of hedging intensity (*HI*). $M_{i,t}$ is market value of equity at time t; $C_{i,t}$ is cash plus marketable securities; $E_{i,t}$ is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits; $NA_{i,t}$ is total assets minus cash holdings; $RD_{i,t}$ is research and development expense (which is set to zero if missing); $I_{i,t}$ is interest expense; $D_{i,t}$ is common dividends; $NF_{i,t}$ is total equity issuances minus repurchases plus debt issuances minus debt redemption; $L_{i,t}$ is the ratio of long-term debt plus debt in current liabilities divided by the market value of assets at time t. The regression results of Equation (2) are reported in Table 8. We use three measures of pension incentive to separate the sample.

Table 8. The impact of pension incentives on the value of hedging.

Panel A: The Value of Hedging Propensity by Pension Incentive							
	Full Sample	**CEO Pension/Equity Compensation (%)**		**CEO Pension Relative Leverage**		**CEO Pension Relative Leverage**	
		(High Group)	**(Low Group)**	**(High Group)**	**(Low Group)**	**>1**	**<1**
		[1]	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
$HP_{i,t}$	1.015 *	1.039 **	1.007	1.022 *	1.018	1.025 **	1.017
	1.682	(1.973)	(0.390)	(1.724)	(1.018)	(2.367)	(0.953)
$L_{i,t}$	−0.796 ***	−0.661 ***	−0.765 ***	−0.841 ***	−0.607 ***	−0.726 ***	−0.746 ***
	(−10.227)	(−7.162)	(−10.165)	(−10.503)	(−7.618)	(−8.798)	(−9.344)
$\Delta C_{i,t}/M_{i,t-1}$	0.949 ***	1.052 ***	0.847 ***	0.974 ***	0.900 ***	1.026 ***	0.850 ***
	(6.106)	(7.064)	(6.827)	(7.270)	(6.725)	(7.523)	(6.470)
$\Delta E_{i,t}/M_{i,t-1}$	0.865 ***	0.904 ***	0.935 ***	0.904 ***	0.961 ***	0.802 ***	1.106 ***
	(9.872)	(8.540)	(11.097)	(10.382)	(9.746)	(9.098)	(11.430)
$\Delta NA_{i,t}/M_{i,t-1}$	−0.001	0.007	−0.081 *	−0.076	−0.018	−0.026	−0.110 **
	(−0.023)	(0.105)	(−1.758)	(−1.566)	(−0.329)	(−0.526)	(−2.029)
$\Delta RD_{i,t}/M_{i,t-1}$	0.301	3.247	−2.040	3.161	−2.744	2.641	−1.847
	(0.184)	(1.416)	(−1.102)	(1.502)	(−1.385)	(1.219)	(−0.952)
$\Delta I_{i,t}/M_{i,t-1}$	−0.019	−1.087	−0.920	1.937	−3.842 ***	−1.291	−0.849
	(−0.994)	(−0.612)	(−0.755)	(1.436)	(−2.666)	(−0.926)	(−0.606)
$\Delta D_{i,t}/M_{i,t-1}$	3.053 *	2.649	4.122	−0.013	9.081 *	−0.058	7.085
	(1.787)	(0.611)	(0.877)	(−0.003)	(1.811)	(−0.014)	(1.402)
$NF_{i,t}/M_{i,t-1}$	0.135 ***	0.098 ***	0.129 ***	0.137 ***	0.092 ***	0.094 ***	0.137 ***
	(4.719)	(3.678)	(6.575)	(6.319)	(4.150)	(4.270)	(6.257)
Intercept	0.169 **	0.316 **	0.224	0.046	0.037	0.336 *	0.149
	(2.373)	(2.072)	(0.783)	(0.245)	(0.129)	(1.765)	(0.523)
Year Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N of Obs.	11,718	5610	5611	4744	4744	3710	5778
Adjusted R^2	0.153	0.200	0.264	0.270	0.211	0.233	0.250

Table 8. *Cont.*

Panel B: The Value of Hedging Intensity by Pension Incentive							
		CEO Pension/Equity Compensation (%)		CEO Pension Relative Leverage		CEO Pension Relative Leverage	
	Full Sample	(High Group)	(Low Group)	(High Group)	(Low Group)	>1	<1
		[1]	[2]	[3]	[4]	[5]	[6]
$HI_{i,t-1}/M_{i,t-1}$	0.312	0.374 *	0.291 *	0.286 *	0.370	0.326 *	0.289 *
	1.518	(1.921)	(1.789)	(1.852)	(0.932)	(1.936)	(1.831)
$\Delta HI_{i,t}/M_{i,t-1}$	−0.033	0.694	−0.169	−0.234	0.730	−0.092	0.065
	(−1.343)	(0.924)	(−0.216)	(−0.337)	(0.841)	(−0.137)	(0.072)
$(HI_{i,t-1}/M_{i,t-1})$*$(\Delta Hi_{i,t}/M_{i,t-1})$	0.114 *	0.204 **	0.059 *	0.143 **	−0.013	0.141 ***	0.129
	(1.873)	(2.328)	(1.934)	(2.413)	(−0.079)	(2.890)	(0.750)
$L_{i,t}$	−0.811 ***	−0.764 ***	−0.850 ***	−0.939 ***	−0.684 ***	−0.834 ***	−0.800 ***
	(−9.091)	(−8.200)	(−11.313)	(−11.503)	(−8.602)	(−9.984)	(−9.983)
$\Delta C_{i,t}/M_{i,t-1}$	1.126 ***	1.045 ***	0.822 ***	0.962 ***	0.889 ***	1.018 ***	0.836 ***
	(7.253)	(7.087)	(6.676)	(7.248)	(6.698)	(7.558)	(6.393)
$\Delta E_{i,t}/M_{i,t-1}$	0.937 ***	0.877 ***	0.899 ***	0.861 ***	0.942 ***	0.770 ***	1.071 ***
	(8.303)	(8.368)	(10.697)	(9.906)	(9.647)	(8.827)	(11.058)
$\Delta NA_{i,t}/M_{i,t-1}$	−0.043	0.024	−0.067	−0.048	−0.017	0.008	−0.108 **
	(−1.174)	(0.392)	(−1.473)	(−0.984)	(−0.307)	(0.172)	(−2.013)
$\Delta RD_{i,t}/M_{i,t-1}$	1.602	3.403	−1.694	2.871	−1.966	2.781	−1.371
	(1.518)	(1.501)	(−0.923)	(1.377)	(−1.000)	(1.301)	(−0.710)
$\Delta I_{i,t}/M_{i,t-1}$	−0.658	−0.395	−0.511	2.607 *	−3.293 **	−0.954	−0.275
	(−0.593)	(−0.224)	(−0.422)	(1.942)	(−2.301)	(−0.692)	(−0.196)
$\Delta D_{i,t}/M_{i,t-1}$	0.165 **	4.493	6.099	2.232	9.893 **	1.866	8.906 *
	(2.059)	(1.051)	(1.305)	(0.547)	(1.996)	(0.465)	(1.770)
$NF_{i,t}/M_{i,t-1}$	2.353 **	0.069 **	0.111 ***	0.114 ***	0.076 ***	0.073 ***	0.118 ***
	(2.324)	(2.557)	(5.599)	(5.194)	(3.425)	(3.297)	(5.282)
Intercept	0.278	0.388 **	0.183	0.188	0.062	0.218	0.172
	(0.497)	(2.571)	(0.645)	(0.989)	(0.219)	(1.151)	(0.610)
Year Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N of Obs.	6128	2935	2934	2481	2481	1940	3022
Adjusted R^2	0.175	0.201	0.255	0.260	0.210	0.234	0.237

This table presents the OLS regressions of excess stock returns on CEO pension incentive and the changes in firm characteristics, including the explanatory variables from Faulkender and Wang (2006) specification augmented with the measures of pension incentive, hedging variables, and governance variable. Panel A examines the propensity of hedging (*HP*) and Panel B examines the intensity of hedging (*HI*). In all panels the dependent variable is the annual excess equity return calculated from a firm *i*'s stock return over year $t-1$ to year t, $r_{i,t}$, net of $R^B_{r,t}$, the return of Fama and French (1993) size and book-to-market matched portfolio from year $t-1$ to year t. $\Delta X_{i,t}$ is the notation for the one-year change of variable X for firm i over year $t-1$ to year t, i.e., $X_t - X_{t-1}$; $HI_{i,t}$ is hedging principal (dollar amount of total notional value of derivatives) at time t, and $\Delta HI_{i,t} = HI_{i,t} - HI_{i,t-1}$; $M_{i,t}$ is market value of equity at time t; $C_{i,t}$ is cash plus marketable securities; $E_{i,t}$ is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits; $NA_{i,t}$ is total assets minus cash holdings; $RD_{i,t}$ is research and development expense; $I_{i,t}$ is interest expense; $D_{i,t}$ is common dividends; $NF_{i,t}$ is total equity issuances minus repurchases plus debt issuances minus debt redemption; $L_{i,t}$ is the ratio of long-term debt plus debt in current liabilities divided by the market value of assets at time t. The robust standard errors are to calculate T-Statistics reported in parentheses below estimates. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Across the groups, we observe that the coefficients on the variables used in Faulkender and Wang (2006) are generally consistent with the literature. For example, cash and earnings are positively related to excess shareholder return, while leverage is negatively related to excess equity return. Considering that the dependent variable is excess equity return, the coefficient of explanatory variables measures the additional value accrued to the equity holder for one unit change of the explanatory variables. The coefficients of hedging propensity ($HP_{i,t}$) and hedging intensity ($HI_{i,t}$) mean the additional value flowing to shareholder per one dollar investment in hedging position. Particularly, Panel A shows the incremental value contributed by hedging adoption to the shareholders. We find the value creation of hedging is more significant when pension incentive is higher. This indicates that pension incentive functions an effective mechanism in motivating executives to implement active risk management to create firm value. In Panel B, the existing hedging position ($NI_{i,t-1}/M_{i,t-1}$), incremental hedging amount ($\Delta NI_{i,t}/M_{i,t-1}$), and the interaction term of them

are included. We find that the interaction term has a significant and positive impact on firm value. For example, the result in Model 1 shows that one dollar investment in existing hedging position brings USD 0.374 to shareholders and one dollar increase in hedging position creates an additional value of USD 0.204. In contrast, when pension incentive is in the lower level (Model 2), the additional value created by the hedging investment is only USD 0.059 per dollar of investment. This distinct difference suggests that the pension incentive promotes a firm's hedging strategy and also strengthens the value creation of hedging for shareholders.

Given the above finding as to how hedging creates value for shareholders, we advance further to consider the interplay of pension incentives and governance mechanisms. In particular, we augment the model specified in Equation (2) by adding measures of pension incentive and governance. For pension incentives, we construct a dummy variable, *PI*, for each of the pension incentive measures. Specifically, *PI* takes the value of one when *CEO Pension/Equity* is greater than the median value of this variable, and takes the value of one when *CEO Pension Relative Leverage is* above the median value or greater than one, respectively. In addition, we construct the indictors of strong governance, a dummy variable that takes the value of one when *Board Independence* is greater than the median value, and zero otherwise.[6] The regression model to examine the value of hedging with the consideration of pension incentive and governance is specified below in Equation (3):

$$\begin{aligned} r_{i,t} - R^{B}_{i,t} = \; & \beta_1 * Hedge_{i,t} + \beta_2 * PI_{i,t} + \beta_3 * Gov_{>p50,i,t} * PI_{i,t} * Hedge_{i,t} + \beta_4 * Gov_{<p50,i,t} * PI_{i,t} * Hedge_{i,t} \\ & + \gamma_1 L_{i,t} + \gamma_2 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_3 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_4 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_5 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \gamma_6 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \gamma_7 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \gamma_8 \frac{NF_{i,t}}{M_{i,t-1}} \\ & + \sum_{t=1}^{10} Year_t + \varepsilon_{i,t} \end{aligned} \tag{3}$$

The optimal contracting hypothesis suggests the more pronounced effect of pension incentive on the equity value of hedging to well-governed firms. Intuitively, since pension incentive is intended to dampen CEO incentives to pursue active risk management that largely benefits equity holders, the optimal contracting hypothesis predicts that pension benefit has a positive influence on the marginal relation between equity value and hedging in firms with stronger shareholder power. We report the result of above specification in Table 9. Remarkably, among the coefficients on the triple interaction terms for each of three pension incentive measures, we find that those that interacted with the above-median governance dummies are statistically significant, but those that interacted with the below-median governance dummies are not significant. For example (in Panel A), a significant coefficient of the triple interaction term (0.068) is found in the column of *CEO Pension/Equity Compensation* for the firms with governance measure above the median. From the column using the dummy variable of (CEO pension relative leverage greater than one) we also observe that the triple interaction term with the governance (>Median) has a significant coefficient of 0.068. These results indicate that the marginal impact of pension incentive on value of hedging is higher for the firms with good governance structure or strong shareholder power. This finding is consistent with the optimal contracting hypothesis that the contract of liability-based incentive is an outcome of optimal governance structure, and the additional hedging amount promoted by such effective incentive creates more value for shareholders.

[6] We also examine the results by using institutional blockholder ownership and observe the consistent results. These results are not reported for brevity.

Table 9. The Value Creation of Pension Incentive through Hedging Interacted with Governance.

Panel A: Value of Hedging Adoption Interacted with Governance						
	CEO Pension/Equity Compensation (%)		**CEO Pension Relative Leverage**		**Dummy (CEO Pension Relative Leverage >1)**	
	Coef	***T-stat***	***Coef***	***T-stat***	***Coef***	***T-stat***
$HP_{i,t}$	1.301 **	(1.993)	1.306 **	(1.989)	1.322 **	(1.991)
$PI_{i,t}$ (=1 if CEO Pension/Equity >Median)	0.023	(1.220)				
$PI_{i,t}$ (=1 if CEO Pension Relative Leverage > Median)			0.022	(1.242)		
$PI_{i,t}$ (=1 if CEO Pension Relative Leverage >1)					0.049	(1.085)
Governance (>Median)*$PI_{i,t}$*$HP_{i,t}$	0.068 ***	(3.607)				
Governance (<Median)*$PI_{i,t}$*$HP_{i,t}$	0.010	(0.096)				
Governance (>Median)*$PI_{i,t}$*$HP_{i,t}$			0.060 *	(1.921)		
Governance (<Median)*$PI_{i,t}$*$HP_{i,t}$			0.053	(0.634)		
Governance (>Median)*$PI_{i,t}$*$HP_{i,t}$					0.074 **	(2.304)
Governance (<Median)*$PI_{i,t}$*$HP_{i,t}$					0.051	(0.361)
$L_{i,t}$	−0.638 ***	(−11.789)	−0.632 ***	(−10.543)	−0.644 ***	(−10.779)
$\Delta C_{i,t}/M_{i,t-1}$	0.881 ***	(8.459)	0.863 ***	(7.512)	0.859 ***	(7.506)
$\Delta E_{i,t}/M_{i,t-1}$	0.799 ***	(10.243)	0.769 ***	(9.013)	0.766 ***	(8.968)
$\Delta NA_{i,t}/M_{i,t-1}$	−0.044	(−1.030)	−0.039	(−0.825)	−0.039	(−0.838)
$\Delta RD_{i,t}/M_{i,t-1}$	−0.019	(−0.012)	−0.336	(−0.194)	−0.309	(−0.178)
$\Delta I_{i,t}/M_{i,t-1}$	−1.039	(−0.876)	−1.795	(−1.372)	−1.774	(−1.359)
$\Delta D_{i,t}/M_{i,t-1}$	5.351 *	(1.752)	5.331	(1.566)	5.423	(1.592)
$NF_{i,t}/M_{i,t-1}$	0.110 ***	(6.244)	0.116 ***	(6.008)	0.116 ***	(5.968)
Year Controls	Yes		Yes		Yes	
N of Obs.	11,221		9488		9488	
Adjusted R^2	0.184		0.182		0.188	
Panel B: Regression of Pension Incentives on the Value of Hedging Intensity with Governance						
	CEO Pension/Equity Compensation (%)		**CEO Pension Relative Leverage**		**Dummy (CEO Pension Relative Leverage >1)**	
	Coef	***T-stat***	***Coef***	***T-stat***	***Coef***	***T-stat***
$HI_{i,t-1}/M_{i,t-1}$	0.276 *	(1.908)	0.283 *	(1.855)	0.224	(1.483)
$\Delta HI_{i,t}/M_{i,t-1}$	0.037	(0.506)	0.025	(0.205)	0.059	(0.788)
$PI_{i,t}$ (=1 if CEO Pension/Equity > Median)	−0.018	(−0.278)				
$PI_{i,t}$ (=1 if CEO Pension Relative Leverage > Median)			0.024	(0.519)		
$PI_{i,t}$ (=1 if CEO Pension Relative Leverage >1)					0.055	(1.508)
Governance (>Median)*$PI_{i,t}$*($\Delta HI_{i,t}/M_{i,t-1}$)	0.009 ***	(2.594)				
Governance (<Median)*$PI_{i,t}$*($\Delta HI_{i,t}/M_{i,t-1}$)	0.010	(0.096)				
Governance (>Median)*$PI_{i,t}$*($\Delta HI_{i,t}/M_{i,t-1}$)			1.213 **	(2.436)		
Governance (<Median)*$PI_{i,t}$*($\Delta HI_{i,t}/M_{i,t-1}$)			0.853	(0.634)		
Governance (>Median)*$PI_{i,t}$*($\Delta HI_{i,t}/M_{i,t-1}$)					1.297 ***	(2.578)
Governance (<Median)*$PI_{i,t}$*($\Delta HI_{i,t}/M_{i,t-1}$)					1.051	(0.361)
$L_{i,t}$	−0.467 ***	(−11.463)	−0.486 ***	(−11.746)	−0.492 ***	(−12.114)
$\Delta C_{i,t}/M_{i,t-1}$	0.656 ***	(8.468)	0.668 ***	(8.460)	0.656 ***	(8.364)
$\Delta E_{i,t}/M_{i,t-1}$	0.594 ***	(10.241)	0.608 ***	(10.263)	0.606 ***	(10.309)
$\Delta NA_{i,t}/M_{i,t-1}$	−0.033	(−1.034)	−0.034	(−1.058)	−0.036	(−1.120)
$\Delta RD_{i,t}/M_{i,t-1}$	−0.002	(−0.002)	−0.026	(−0.022)	−0.021	(−0.018)
$\Delta I_{i,t}/M_{i,t-1}$	−0.767	(−0.876)	−0.782	(−0.874)	−0.676	(−0.763)
$\Delta D_{i,t}/M_{i,t-1}$	3.801 *	(1.667)	3.962 *	(1.703)	3.252	(1.409)
$NF_{i,t}/M_{i,t-1}$	0.081 ***	(6.165)	0.082 ***	(6.080)	0.083 ***	(6.262)
Year Controls	Yes		Yes		Yes	
N of Obs.	5869		4962		4962	
Adjusted R^2	0.155		0.146		0.142	

This table presents the OLS regressions of excess stock returns on CEO pension incentive and the changes in firm characteristics, including the explanatory variables from Faulkender and Wang (2006) specification augmented with the measures of pension incentive, hedging variables, and governance variable. Panel A examines the propensity of hedging (*HP*) and Panel B examines the intensity of hedging (*HI*). In all panels the dependent variable is the annual excess equity return calculated from a firm *i*'s stock return over year $t-1$ to year t, $r_{i,t}$, net of $R^B_{r,t}$, the return of Fama and French (1993) size and book-to-market matched portfolio from year $t-1$ to year t. $\Delta X_{i,t}$ is the notation for the one-year change of variable X for firm i over year $t-1$ to year t, i.e., $X_t - X_{t-1}$; $HI_{i,t}$ is hedging principal (dollar amount of total notional value of derivatives) at time t, and $\Delta HI_{i,t} = HI_{i,t} - HI_{i,t-1}$; $M_{i,t}$ is market value of equity at time t; $C_{i,t}$ is cash plus marketable securities; $E_{i,t}$ is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits; $NA_{i,t}$ is total assets minus cash holdings; $RD_{i,t}$ is research and development expense; $I_{i,t}$ is interest expense; $D_{i,t}$ is common dividends; $NF_{i,t}$ is total equity issuances minus repurchases plus debt issuances minus debt redemption; $L_{i,t}$ is the ratio of long-term debt plus debt in current liabilities divided by the market value of assets at time t; *PI* denotes one of three dummy proxies of pension incentive in each regression, namely, *PI* takes the value of one when *CEO Pension/Equity* is greater than the median value of this variable, and takes the value of one when *CEO Pension Relative Leverage* is above the median value or greater than one, respectively. *Governance* is a dummy variable that takes the value of one when *Board Independence* is greater than the median value, and zero otherwise. T-Statistics in the column next to the estimates are computed using robust standard errors. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Apparently, the tests based on hedging intensity in Panel B also report the consistent results of significantly strengthening influence of pension incentive on the value of hedging. For instance, when we use the dummy measure of CEO pension relative leverage, pension incentive significantly increases the value of hedging by USD 1.297 for the firms with strong governance but no significant value creation is found for the peers with weak governance. This result justifies our optimal contract hypothesis and, also, confirms our findings in Tables 6 and 7. With more influence of pension incentive, the marginal value creation of hedging attributed to such liability-based incentives is higher for firms with strong shareholder power.

6. Conclusions

In this paper, we empirically examine the influence of CEO pension incentive on corporate risk management activity by employing a sample of multinational firms over the period of 2006 to 2015 and across a wide array of industries. The results show a significantly positive impact of pension incentive on hedging activity. More liability-based incentives encourage managers to adopt hedging or/and increase hedging position. We also verify that such a positive relationship cannot be attributed to the endogenous issue of compensation design.

Furthermore, we find that the influence of pension incentive on hedging is more pronounced for the firms with good governance than those with poor governance. The results help untangle the role of compensation in the mechanism of governance by providing the evidence to support the optimal contracting hypothesis. Lastly, we further investigate the value of extra investment in hedging position by following Faulkender and Wang's (2006) methodology, especially in the context of pension incentive and corporate governance. We detect that a higher level of pension incentive is associated with the higher value of hedging, particularly for the firms with strong shareholder power. This result echoes the theory of optimal contracting.

Taken together, this research contributes to the extant literature on the role of pension incentive by providing new evidence about its economic influence on corporate risk management. Although the existing literature reports mixed results pertaining to equity-based incentives, the findings documented in this research clearly show that liability-based compensation creates a valuable incentive and has a material impact on firms' active risk management. Our results warrant further attention to the design of pension incentive and its interplay with corporate governance.

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Appendix A

Table A1. Detailed definition of primary variables used in this study.

Variable Names	Variable Definitions
Pension Incentive	
CEO Pension (USD M)	The sum of the aggregate actuarial present value of the CEO's accumulated benefits of pension and the aggregate balance in non-tax-qualified deferred compensation plans at the end of the fiscal year.
CEO Pension/Total Compensation (%)	The value of CEO pension divided by CEO total compensation. Total CEO compensation includes CEO pension, equity compensation, salary, bonus, long-term Incentive payouts, and all other total.
CEO Pension/Equity Compensation (%)	Value of CEO pension divided by CEO equity compensation. Equity compensation is the sum of the value of the CEO's common stock holdings plus the value of options based on Black-Scholes, all measured at the fiscal year end.

Table A1. *Cont.*

Variable Names	Variable Definitions
CEO Pension Relative Leverage	= (CEO pension/ CEO equity Compensation)/(firm debt/firm equity). CEO pension and equity compensation are defined as above. Firm debt is sum of long term debt plus debt in current Liabilities. Firm equity is common shares outstanding*stock price at the end of fiscal year.
Dummy (CEO Pension Relative Leverage >1)	A dummy variable which takes value of one if CEO-firm D/E ratio is greater than one. Otherwise zero.
Hedging Variables	
Currency Hedging Propensity	The dummy variable that takes a value of one when a firm holds or trades foreign currency derivatives for hedging in a given year, and zero otherwise.
Currency Hedging Intensity	Total notional value of foreign currency derivatives for hedging in scaled by the book value of total assets.
CEO-Equity Incentive	
Delta Incentive	=[∂ (option value)/ ∂ (stock price)]*(price/100) = exp(−d*T)*N(Z)*(price/100). Particularly, it's defined as the change in option portfolio value for a 1% change in the stock price.
Vega Incentive	=[∂ (option value)/∂ (stock volatility)]*0.01 = exp(−d*T) N′(Z)*S*T*(1/2)*(0.01). Particularly, it's defined as the change in option portfolio value for a 0.01 change in the annualized standard deviation of stock return.
Vega Incentive/Delta Incentive	Rogers (2002) proposes that delta and Vega measure managerial motivation from "value-creating" and "risk-taking" incentives, respectively. However, economic interpretation of the ratio of Vega to delta should be more intuitive because it measures the CEO risk-taking incentive per dollar of value-increasing incentives from option and stock holdings. Rogers (2002) demonstrates this ratio has more explanatory power than either Delta or Vega.
Firm-related Characteristics	
Log (Total Assets)	The logarithm of firm total assets adjusted with 2015 CPI.
Leverage	= (long term debt + debt in current liability)/market value of total assets, where market value of assets is the sum of total debt and market value of equity.
Market-to-book Ratio	= market value of Total assets/book value of total assets. market value of assets is the sum of Total debt and market value of equity.
Interest Coverage	= EBITDA/Interest paid
Tangible Assets Ratio	A ratio of tangible assets relative to firm total assets
Corr(Cash Flow, Investment)	The correlation coefficient between cash flow and investment expense. The calculation of cash flow is following Lang et al. (1991) as: Operating income before depreciation-interest expense-(income taxes-deferred tax change)-common dividends-preferred dividends. The investment expense is following Gay and Nam (1998) to define as the sum of capital expenditure, R&D expense and net PP&E.
Cash Holding	The value of cash and short term security scaled by firm total assets
Convertible Bonds Ratio	The value of convertible bond scaled by firm total assets
Positive Tax Credit (Dummy)	The dummy variable of one if the firm has non-zero tax loss carry-forwards.
Tax Convexity (MUSD)	= 4.88 + 7.15*(indicator variable of small negative taxable income) + 1.6*(indicator variable of small positive taxable income) + 0.019 *(absolute coefficient of variation of pervious taxable income) − 5.5 *(first-order serial correlation of taxable income) − 1.28*(indicator variable of investment tax credit) + (indicator variable of net operating loss carry-forward)*(3.29 − 4.77*(indicator variable of small negative taxable income)) − 1.93 *(indicator variable of small positive taxable income). It measures expected percentage tax savings from a 5% reduction in the volatility of taxable income. Graham and Smith (1999) use simulation to illustrate that this proxy is more precise to capture the shape of tax function than tax loss carry-forward.
Board Independence	The proportion of directors who are classified as outside directors serving on the board.
Institutional Blockholder Ownership	Defined as the sum of all ownership positions greater than or equal to 5% held by institutional investors.

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CEO Diversity, Political Influences, and CEO Turnover in Unstable Environments: The Romanian Case

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Abstract: This work expands the literature on a less studied topic, the Chief Executive Officer (CEO) turnover in post-communist economies, analyzed during an unstable and ambiguous economic and financial environment. For the period 2005–2010, the results indicate the political inference in CEO turnover decision for the Romanian listed companies. In this period, with great turmoil in the economy determined by the financial crisis of 2008, we also find that CEO gender helps to explain the probability of changing the CEO. Moreover, this paper empirically tests if the financial and corporate governance determinants that are validated in the existing literature work for the Romanian listed companies. We reinforce that CEO turnover decision is negatively related to accounting-based performance. We find evidence of the "voting with their feet" behavior of institutional investors, and of the lack of Board of Directors monitoring. The CEO–Chairman duality and the controlling power of the largest shareholder act as entrenchment mechanisms.

Keywords: CEO turnover; foreign CEO; female CEO; ownership structure; Romania

1. Introduction

A substantial literature base devoted to the causes and consequences of CEO succession has been developed in the last decades. Due to the key economic role played by top-executive managers, CEO turnover has become a subject of widespread attention. The decision of managerial succession stands at the crossroads of corporate finance, management, corporate governance, psychology, and sociology (Campbell et al. 2011). It can be considered a strategic decision, which helps to preserve the shareholders'/stakeholders' interest whenever major objectives of the firm are not achieved, or whenever resources of the company are not used according to a mutually agreed plan.

Although there is a large amount of literature on CEO turnover in developed countries (e.g., Parrino 1997; Kato and Long 2006; Hazarika et al. 2012), not much has been written about the difficulties in implementing the letter and spirit of corporate governance rules in this area for a transition economy. To the best of our knowledge, this is the first study considering a wide range of financial, social, political, and corporate governance determinants on CEO turnover in Romania. Little research has been conducted for Central and Eastern European (CEE) post-communist countries (Muravyev 2003 for Russia; Claessens and Djankov 1999, 2000; Muravyev et al. 2010 for Ukraine; Eriksson 2005 for Slovakia and Fidrmuc and Fidrmuc 2007 for Czech Republic). The above-mentioned studies are not entirely applicable to the Romanian case for several reasons. For example, these studies focus mainly oxn the enterprise restructuring process and its consequences from a corporate governance perspective. Moreover, even if Eastern and Central European countries have some economic and recent political similarities, important differences in terms of cultural and pre-communist political backgrounds can

be found (Filip and Raffournier 2010). In the last decades, these countries have become, to a certain extent, different in terms of the degree of economic[1] and stock market development.[2]

This paper contributes to CEO turnover research by taking into account three new variables, namely, the foreign origin of the CEO, the CEO's gender, and also the role of government ownership in connection with political changes. We find a positive correlation between the CEO foreign origin and the likelihood of CEO turnover. CEO gender helps explain both forced and voluntary CEO turnover: women chief executives are replaced more often than men. With regards to the specific corporate governance mechanisms in companies with governmental participation, we find that government ownership interaction with political changes is positively correlated with CEO turnover. The financial crisis also has a role in explaining the CEO turnover likelihood during the analyzed period, but only for the period of sharp downturn (the year 2009).

In addition, we analyzed the influence of "classical" corporate governance characteristics on CEO turnover in Romania. We partially validated the hypotheses usually proposed by the literature. Whenever it was necessary, we adapted them to better fit to the characteristics of the Romanian financial system and regulations.

The conclusions from this paper can be interesting for researchers, analysts, practitioners, and supervision authorities, also from the perspective of the analyzed period. This paper concentrates on a period of economic turmoil, namely, the period 2005–2010. Our choice has scientific but also practical reasons. From a scientific point of view, this paper covers the Romanian listed companies, the only relevant sample in terms of corporate governance implementation and data availability. Starting from 2011, the listing criteria and, consequently, the sample of listed companies suffered numerous changes, thus it is difficult to insure the homogeneity of the database.

In terms of practical interest for the study, our analyzed period, characterized by different researchers and analysts as turbulent in terms of economic and financial evolution, requires specific interest for corporate decisions. For example, Caruso et al. (2019) performed a model-based counterfactual exercise by estimating the model for the period 1983–2007 (pre-crisis sample) and by computing forecasts for 2008–2013 based on the pre-crisis parameters. They confirmed that households' and financial corporations' debts and house prices are weakly associated with the economic cycle in the pre-crisis sample. Additionally, an abnormal deep downfall in private investment and an increase in households' savings beyond historical regularities were registered. Finally, the major changes in the fiscal deficit–GDP and debt–GDP ratios in 2008–2009 were exceptional, similar to the fiscal consolidation that followed. Furthermore, international, but also national analysts, agree in declaring that during the year 2019, there was—and in the following years, there will be—a clear deceleration of the macroeconomic indicators. On 1 October 2019, when Ms. Kristalina Georgieva was appointed Managing Director and Chairman of the Executive Board of the International Monetary Fund, her discourse was focused on Europe being on the verge of a new financial crisis. One month later, the same institution released a warning for European countries to put in place emergency plans, ready to be implemented, in the eventuality of what seems to be an imminent crisis. Also, some European countries entered into technical recession according to different financial institutions:

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[1] The Gross Domestic Product (GDP) per capita (constant 2010 US$) varied between 5735 US$ for Serbia and 23437 US$ for Slovenia in the year 2010, in a comparision which included nine CEE countries (World Bank statistics). Romania had, in 2010, a GDP per capita of 8210 US$. Using the same CEE countries and the same database, Romania had, in 2008, the highest GDP growth rate (11.14%), but a decrease of −4.74% in 2009 (however, better than the case of the Czech Republic (−5.34%), Hungary (−6.46%), Croatia (−7.19%), and Slovenia (−8.63%)). In 2010, Romania had the slowest recovery in terms of GDP growth rate (−3.32%) out of all nine of the analyzed CEE countries.

[2] Romania had, in 2005, almost the least developed capital market out of all nine of the analyzed CEE countries, with a market capitalization of listed domestic companies (% of GDP) of 16.11%, whereas Poland, Hungary, and Croatia had market capitalization around 30% from GDP. Romania had an even weaker position in 2010 (8.54%), after the fall from 2008, and the gap with countries such as Poland (39.79%) and Croatia (42.76%) increased. At the same time, it can be noticed that Romania was not among the most affected countries by the crisis from the analyzed CEE countries (a decrease of market capitalization as % from GDP around 59% in 2008), while the CEE countries with the most developed capital markets had the highest drop rates (65% and above) (using the World Bank indicators).

Germany in September 2019 according to the Central Bank, and Italy according to the European Central Bank. Romania is a special case, because for the previous few years, the government led a pro-cyclical policy that is likely to increase the risk of a potential recession. Several analysts warned of the unsustainability of public policies, but also of the economic growth, with the National Bank of Romania Governor Mugur Isarescu and his counselors, as well as Nouriel Roubini in a press analysis in November 2019, being among them. At the beginning of 2020, the worst-case scenario was confirmed with the spread of the Covid-19 epidemy, that caused a big fall in most important financial markets, as well as in the Romanian one. Thus, the conclusions of the present study can be very relevant to better understand and anticipate the future period (for 2020 and beyond), that Europe, in particular, will go through.

The emerging and/or frontier markets can be of great interest for both national and foreign investors, looking for new investment opportunities and for diversified portfolios based on shares issued by companies, other than those listed on mature capital markets. Therefore, we believe that our conclusions may be of great interest for scientists, but also for analysts and other finance practitioners.

The remainder of the study is organized as follows. Section 2 provides a short description of the Romanian environment in terms of corporate governance and investors' protection. In Section 3, we present previous research on the determinants of CEO turnover and we develop the tested hypotheses, focusing on CEO diversity and on political influences. Section 4 describes the research methodology and the data set. The empirical results and discussion are then presented in Section 5, while Section 6 concludes the study.

2. A Short Description of the Romanian Environment in Terms of Corporate Governance and Investors' Protection

In 2009, the Romanian Corporate Governance Code was adopted on a comply-or-explain basis. It proposed principles harmonized to those of the European Union. For the most liquid listed companies in Romania, Dobroţeanu et al. (2010) provided empirical evidence of a corporate governance disclosure gap. Indeed, Romanian listed companies still have a hesitant evolution regarding the implementation of the corporate governance standards.

Romania has a small capital market, even in comparison with different CEE countries, with 73 listed companies in 2010 (compared with 240 in Croatia, 390 in Bulgaria, and 570 in Poland in the same year) and with low trading volumes (1% for stock traded value, as % of GDP, compared with 15% for Poland and 11% for Czech Republic in 2010) (World Bank indicators) and relatively few disclosure requirements (including those for corporate governance). Moreover, the development of the Romanian capital market, including the corporate governance domain, took place in a peculiar political and economic context, different from other CEE countries. Due to the fact that the Romanian governments focused more on political issues than on important and necessary economic decisions for the healthy development of an ex-communist country, the economic gap of CEE countries such as the Czech Republic, Poland, and Hungary increased, and Romania joined the European Union only in 2007 (Filip and Raffournier 2010).

Because we use market-based performance variables (alongside accounting-based performances), additional explanations are necessary for the Romanian capital market. Previous studies regarding the efficient market hypothesis (EMH) either reject it or provide evidence only for a relatively low degree of informational efficiency (Dragotă and Mitrică 2004). The most recent studies have both interesting and intricate conclusions. Dragotă and Ţilică (2014) reject the weak form of informational efficiency, but reveal that for some assets and indexes, it is hard to reach systematic abnormal earnings. In this context, we expect some questionable results for market-based performance in relation to CEO turnover.

Institutional investors' ownership is far less important in Romania than in developed capital markets. For the period 2005–2010, the average institutional investors' holdings for the companies listed on the Bucharest Stock Exchange (BSE) varied between 24% in 2005 and 30% in 2010, comparatively

to almost 50% for the US in 2006 (Helwege et al. 2012). Also, our sample confirms the high level of ownership concentration, with an average percentage of the voting rights owned by the largest shareholder of around 47% and a median value of 52%. Thus, more than half of the listed companies have a major shareholder, controlling at least 52% of the voting rights.

Regarding the minority shareholders' rights protection index, Romania stands slightly above the average of the transition countries (41 compared with the average value of 35.4), but with a lower index value than the average of the developed countries included in the study (the average value for the developed countries is 46.9). Claessens and Yurtoglu (2013) also emphasize a weak creditors' protection in Romania and a low efficiency of debt enforcement. Weak investor protection obstructs the function of corporate governance systems. Consequently, CEO turnover will most likely be less sensitive to firm performance when the strength of investor protection decreases (Hu and Kim 2019).

3. Literature Review and the Tested Hypotheses

We structured this section in two main parts. First, we review the existing literature on CEO turnover, firm performance (Section 3.1), corporate governance (Section 3.2), and also in connection with various financial indicators for leverage, dividend policy, and sector homogeneity (Section 3.3). There is a large body of empirical literature examining the impact of a wide range of economic, social, financial, and corporate governance determinants for CEO turnover. Then, in the second step, we propose three new determinants with corresponding hypotheses for foreign CEO, female CEO, and political influences on CEO turnover (Section 3.4).

3.1. CEO Turnover and Firm Performance

Many research studies put performance among the most important causes of CEO departure (see, among others, Weisbach 1988; Parrino 1997; Eisfeldt and Kuhnen 2013). A large body of evidence shows that CEO turnover (particularly forced replacements) is inversely related to firm and industry performances (Parrino 1997; Leker and Salomo 2000; Huson et al. 2001; Brunello et al. 2003; Kato and Long 2006; Jenter and Kanaan 2015; Muravyev et al. 2010; Hu and Leung 2012, among others).

Both market-based and accounting-based performance indicators are widely discussed in the literature and, in some cases, the conclusions are not similar. Market-based performance indicators are related to firm accounting performance, and also to investors' expectations regarding the perspectives of the firm, to their culture and optimism, and also to the degree of market efficiency. Weisbach (1988), Murphy and Zimmerman (1993), and Blackwell et al. (1994) claim that companies with low performance can use accounting manipulations to change investors' expectations. Altogether, Blackwell et al. (1994) affirm that accounting-based performance seems to be more important than market-based performance to explain CEO turnover, while Murphy and Zimmerman (1993) conclude that CEO replacement is inversely related to firm performance for both measures used.

Bushman et al. (2010), Kaplan and Minton (2012), Eisfeldt and Kuhnen (2013), and Jenter and Kanaan (2015) underline also the importance of industry and market performance. Eisfeldt and Kuhnen (2013) emphasize that the weight-skills industry shocks determine CEO turnover, while idiosyncratic shocks do not strongly influence this phenomenon. Their model provides a broad explanation to better understand CEO turnovers for both performing and under-performing companies that experience voluntary CEO departures. Another result is that companies with low industry-adjusted return are more likely to have forced CEO turnovers, and also that industry performance is negatively correlated with the probability of forced turnovers.

We tested a wide range of accounting- and market-based performance indicators to obtain a better understanding of the main performance objectives considered by shareholders when they decide to change the CEO and, at the same time, to better fit this study to the Romanian economic environment. We used the return on equity (ROE) as an alternative to the stock return to overcome the effects of weak market informational efficiency (see, for example, the study of Dragotă and Țilică 2014, regarding the market efficiency in Romania). We also analyzed if long-term return monitoring is more important

than short-term returns, to decide forced CEO turnover using a 3-year average return on assets (ROA), a 3-year average return on equity (ROE), and a 3-year average operating margin.

3.2. CEO Turnover and Corporate Governance

Country and firm characteristics in terms of corporate governance, ultimately resulting in a specific level of control of the managerial activity, are also expected to influence forced CEO turnover decisions. The existing literature proved that the CEO–Chairman duality is associated with a lower probability of forced turnovers (Kato and Long 2006; Helwege et al. 2012; Hu and Leung 2012; Hazarika et al. 2012). This correlation can be explained through a higher influence of the CEO on the Board of Directors and higher opportunities for the CEO to maintain informational asymmetries. On the other hand, the separation between CEO and Chairman leads to more efficient board control and improves firm performance.

CEO turnover occurrence is also related to the board's characteristics—such as size and independence. It is expected that a higher number of board members is associated with a higher level of managerial control, especially when independent directors prevail in the board. On the other hand, when the Board of Directors has numerous members, it could be more difficult to make changes in the company. Brunello et al. (2003) found a direct link between board size and the probability of forced CEO turnover. However, for Ukraine, a post-communist country, Muravyev et al. (2010) found that board size had no statistically or economically significant effects on the probability of CEO turnover.

To protect the interests of minority shareholders, the BSE Corporate Governance Code (2015) recommends that "the Board and its committees should have the appropriate balance of skills, experience, gender diversity, knowledge and independence to enable them to effectively perform their respective duties and responsibilities. It is recommended for the majority of non-executive members of the Board of Directors or Supervisory Board to be independent." Additionally, the same Corporate Governance Code (2015) recommends that "the majority of the members of the Board of Directors should be non-executive." Even though the Code does not establish an exact number or a proportion of independent directors, the Romanian listed companies have chosen to follow this recommendation. Helwege et al. (2012) provide weak evidence on board independence being associated with higher probability of CEO turnover. On the other hand, there are studies showing that companies with an independent board experience higher of forced CEO turnover to performance (Guo and Masulis 2015).

Ownership concentration is important to determine a forced CEO turnover. Many empirical studies show that listed companies in Western Europe, but also in East Asia, the Middle East, or Latin America have large shareholders (see, among others, Claessens and Djankov 2000; Barca and Becht 2001; Faccio and Lang 2002). The presence of large shareholders is also typical for Romania and other post-communist Eastern European countries. For the companies listed on the first and second tiers on the BSE, the average first shareholder ownership is 47.42%.

Concentrated ownership is considered by some authors more favorable for good corporate governance (Shleifer and Vishny 1997), based on the agency problem arising from the separation of ownership and control. On the contrary, when using asymmetric information models, different authors prove that a higher ownership concentration affects firm performance or dividend policy (see Holmström and Tirole 1983; Aghion and Tirole 1997; Bolton and Von Thadden 1998, or studies for CEE countries such as Hanousek et al. 2007; Bena and Hanousek 2008; Dragotă et al. 2013, among others). The high stake owned by the largest shareholder can also lead to a decrease in the interest of the companies in promoting firm-level corporate governance measures, as the controlling shareholder has additional and more effective instruments to monitor the firm (Bollaert and Dilé 2009).

The literature predicts a lower probability of forced CEO turnover associated with a concentrated ownership (see, for example, Parrino 1997; Brunello et al. 2003), while Kato and Long (2006) recognize the usefulness of ownership concentration as a control variable in order to eliminate endogeneity problems.

Institutional ownership is also important to explain CEO turnover occurrence, especially due to the commonly known activism, doubled by the advanced financial skills of the institutional investors.

It is expected that these "highly skilled and well-resourced professional shareholders would make informed use of their rights, promoting good corporate governance in companies in which they invest" (OECD 2011). Kaplan and Minton (2012), following the methodology applied by Cremers and Nair (2005), used the cumulative percentage of shares held in each firm by the large institutional shareholders (who own more than 5% ownership of the firm's outstanding shares). They found that the institutional investors' activism increases the probability of CEO turnover. Similar results can be found in the work of Brav et al. (2008) and Del Guercio et al. (2008). Parrino et al. (2003) found decreases of the share owned by institutional investors prior to forced turnovers, which can be considered as proof of the "voting with their feet" phenomenon.

The studies on agency models in connection with CEO ownership can be divided into at least two distinct groups. First, it is considered that CEO ownership can reduce the agency conflicts between managers and shareholders (especially with minority shareholders), because an executive with stocks (and stock options) is "in the same boat" as the rest of the owners. Contrary to this view, the second set of studies argues that an owner–manager can distort the main performance objectives of the company for private benefits, affecting the market prices and/or using his/her close ties with the controlling shareholders (Isakov and Weisskopf 2014). This could certainly be the case of the Romanian listed companies, controlled by major shareholders. In this context, minority shareholders can still be protected if managers (or controlling shareholders) develop a reputation for treating outside shareholders well (Gomes 2000; Maury and Pajuste 2002).

The results of previous studies confirm the negative correlation between CEO ownership and the probability of forced turnover (see, among others, Brunello et al. 2003; and Campbell et al. 2011). Muravyev et al. (2010) also found evidence of managerial ownership supporting entrenchment. CEO ownership, like board ownership (Helwege et al. 2012), becomes a mechanism of alleviating shareholder–manager agency conflicts and is expected to be negatively correlated to CEO forced turnover.

Particularly when CEOs are significant shareholders, it is possible that they mainly represent the interests of the controlling shareholders, more so than those of the firms. When the CEO is appointed directly by the controlling shareholder, the criteria for measuring the CEO's performance may possibly be connected more to the effectiveness in protecting the interests of the controlling shareholder, rather than those of the firm. In our models, we took into account the simple presence of the CEO as a shareholder and then we considered his/her presence as a significant shareholder (owning 5% or more of the voting rights).

3.3. CEO Turnover, Capital Structure, Dividend Policy, and Sector Homogeneity

The agency conflict between CEO and shareholders can also be mitigated using capital structure and dividend policy. The creditors have the concern and appropriate skills to monitor the firms, and the shareholders benefit from their financial expertise (Ross 1977). In the meantime, the CEO is less willing to undertake excessive risks and is more disciplined, which eventually leads to a lower probability of being forced to quit his/her position. On the other hand, capital structure is considered in the literature as a reflection of the financial risk undertaken by the company (Hazarika et al. 2012; Hu and Leung 2012; Cronqvist et al. 2012). Hence, the leverage is expected to be positively associated with CEO turnover (forced or voluntary), especially in economies based on capital markets. Hazarika et al. (2012) for the US, and Hu and Leung (2012) for China provide weak evidence of a positive correlation between leverage and CEO turnover (forced and voluntary). On the other hand, Lin and Liu (2004) found a negative relation between leverage and forced CEO turnover in Taiwan.

In recent decades, financial theory has offered several explanations for dividend policy, based on signaling theories, or taking into consideration the agency conflicts between corporate insiders and outside shareholders. The dividend signaling hypothesis predicts that dividends convey information to shareholders/investors regarding the firm's future prospects, and only good-quality firms can use it (Bhattacharya 1979). Even when managers are not sure whether their company has the ability

to generate cash flows in the future, they may keep dividends constant, or even gradually increase payments in order to avoid sending a negative signal to the market (Zwiebel 1996). Myers (2000) created a link between maintaining leading positions in the companies and the trustworthy perspective of dividend payments. Moreover, other studies argue that top-executive managers protect minority shareholders through dividend policy to create a reputation for treating outside shareholders well (Gomes 2000). Parrino et al. (2003) provide evidence that firms experience dividend cuts prior to forced CEO turnover.

Based on these arguments, we expect a company that pays dividends to have a lower probability of forced CEO turnover. High dividend yields increase the demand for the company's shares, which is expected to mitigate the potential conflict between managers and shareholders.

Parrino (1997) introduced sector homogeneity as a determinant of CEO turnover. He measured sector homogeneity through a volatility indicator of the company's stock return related to industry return. The intuition behind this assumption refers to the fact that in more homogeneous industries, the managerial skills required are similar, and managers can be easily replaced by others from the same industry. The low liquidity of the Romanian capital market did not allow us to follow the same methodology, but we indirectly studied the role of sector homogeneity on CEO turnover.

3.4. CEO Diversity, Political Influences, and CEO Turnover in Unstable Environments

3.4.1. Particularities of the Romanian Economic Environment

Due to the fact that Romania still has a poor corporate governance culture and a relatively high perceived level of corruption (Claessens and Yurtoglu 2013), we analyzed the possibility of political influences on CEO turnover decisions.

State ownership, and sometimes the state as the controlling shareholder, can significantly influence the decision to change the CEO or other board members. If the CEOs of privately controlled firms are politically connected, those companies could have increasing access to credit, as well as to regulatory favors and government financial assistance. In these cases, the likelihood of CEO turnover is lower. Also, if the CEOs are politically connected, this fact causes weaker turnover -performance sensitivity (Cao et al. 2016) and the criteria for executive evaluations may be different. State-owned companies are more likely to apply government-oriented executive evaluations that focus on political performance rather than on their economic performance (Liu and Zhang 2018).

Taking into account several references of CEO appointments based on political criteria in different Romanian listed companies where the state is a significant or controlling shareholder, we expect a greater likelihood for CEO turnover after political parties (coalitions) change in parliamentary elections. If the political forces in power change, more frequent CEO turnover could follow if political pressure is exercised in the economic environment. Based on these considerations, our first tested hypothesis is:

Hypothesis 1 (H1). *Forced CEO turnover probability is higher, subsequent to political changes in companies with governmental ownership, especially when the government is an important shareholder.*

3.4.2. Particularities Related to Post-Communist Economies

We also tested for potential inefficiencies in the labor market. A general practice of post-communist countries is to reproduce the mechanisms from developed market economies, usually without adapting them to their socio-cultural values (see, in this context, the complex analysis of King and Szelenyi 2005). The problem can be even more stringent when it is cumulated to the propensity toward the conservatism of experienced people. In this case, a foreign manager can bring an advantage in terms of experience in a highly competitive environment and knowledge regarding the newly implemented systems.

On the other hand, the appointment of foreign CEOs is not without risk, because they are not accustomed to the local economic environment. Due to the scarcity of the labor market, a bigger effort may be made to appoint a foreign manager, and therefore we can expect a lower probability for a

forced turnover. However, difficulties to adapt to the new environment may worsen the performance of the company and eventually lead to a forced CEO turnover. A correlation between a CEO's origin and CEO turnover points to a possible gap in the managerial skills between domestic and foreign CEOs. The second tested hypothesis is:

Hypothesis 2 (H2). *The foreign origin of a CEO is correlated with the likelihood of CEO turnover*.

Some previous empirical evidence shows that women have behavioral and attitudinal differences compared to males (Beck et al. 2018). Female CEOs/directors tend to be less overconfident in their decision making than men, and are more likely to express their independent views than male directors. Furthermore, Srinidhi et al. (2020) show that female CEOs/directors from US companies manage to overcome the obstacles of being in the minority and not having the reputational advantages of long-serving male directors, by acting as norm change catalysts to achieve substantial governance changes. In this context, the boardroom dynamics could be changed in the presence of a female CEO/director and, consequently, the intensity of discussions around difficult (financial) decision problems could be different (Kim and Starks 2016; Chen et al. 2019). In an unstable economic and financial environment resulting from a deep financial crisis, such as the one started in 2008, removing a female CEO may (or may not) be more likely, depending on the goals that the company management proposes in such a turbulent period.

Moreover, Johnson and Powell (1994), Bajtelsmit and VanDerhei (1997), and also Francis et al. (2015), Zigraiova (2015), and Skała and Weill (2018) proved that women tend to have a stronger risk aversion than men. Especially in the macroeconomic context of the analyzed period, a positive correlation between CEO gender (i.e., female CEO) and the likelihood of turnover can be related to women's risk aversion, but a discrimination hypothesis cannot be rejected. However, the evidence on gender differences in risk aversion is mixed. Croson and Gneezy (2009) conclude that the difference in risk aversion between men and women becomes less significant for managers and professionals in finance. The hypothesis of gender discrimination inside the company can be disputable, because they have already been appointed as CEOs. However, the hypothesis of more subtle gender discrimination from outside the company cannot be rejected. An example of such a form of discrimination is evidenced in the work of Muravyev et al. (2009). It occurs through the more financial constraints imposed on companies managed by female CEOs and, respectively, a lower number of approved loans or higher credit costs relative to male managers. These differences are more important in weakly competitive financial systems and in emergent countries and tend to diminish in developed countries. Consequently, our third tested hypothesis is:

Hypothesis 3 (H3). *Forced CEO turnover probability is higher when the CEO is a woman*.

These hypotheses were tested in an economic environment that can be considered as ambiguous and unstable, with a first sub-period of exceptional economic growth, followed by a severe financial crisis. The financial crisis, which started in 2008, brought a general deterioration of the economic conditions and we could thus expect an increase in the probability of forced CEO turnover (Kaplan and Minton 2012). At the same time, financial difficulties augment the occupational stress of CEOs and may lead to more frequent occurrences of CEO turnover. In times of crisis, companies are confronted with a great deal of ambiguity in the strategic planning process and in their business environment, and so should try to rely more on intuition and creativity in many parts of the management process, including in decisions regarding their top managers and whether to change them (e.g., CEO turnover). Based on the extensive literature in the field, Ogilvie (1998) showed that imagination and creativity become more suitable to manage unstructured, random, and contradictory data from the environment. In this context, we analyzed how the Romanian listed companies decide to manage a very turbulent period, with this study focusing on the criteria for CEO turnover (gender, nationality, and/or the level of political intrusion into a company's life).

4. Methodology and Data

To test our hypotheses, we used two different methodological approaches, which were also applied in the previous literature. First, similar to Brunello et al. (2003) and Hu and Leung (2012), among others, we applied a balanced panel data analysis. The (forced) CEO turnover dummy variable is equal to 1 if the firm had at least one (forced) CEO replacement during the year, and 0 otherwise. Second, we considered each CEO departure separately, and we applied an unbalanced panel data analysis (as a robustness check procedure), due to the fact that there are companies in our sample that registered more than one CEO turnover during the same year.

First, we identified and classified the reasons for CEO turnover using the methodology also applied by Warner et al. (1988) and Dherment-Ferere and Renneboog (2002), with necessary adjustments for the Romanian case, described below. Additionally, we considered the reasons for CEO turnover motivated by political manipulations and the battle for power as in Cannella and Shen (2001). We identified 12 reasons for CEO turnover (including both forced and voluntary CEO departures): retirement, health problems, political reasons, promotion, persona non-grata, change of ownership, common succession, pressure from shareholders, separation of the positions of CEO and Chairman of the Board, CEO resignation, other reasons, and no public reasons. A more detailed presentation for these reasons for our sample of Romanian listed companies can be found in the Appendix A.

Second, we divided these turnovers into two classes: forced and voluntary. However, identification of forced departures can sometimes be very difficult when press releases are the main source of documentation, because they rarely describe them as such. To isolate most likely forced departures, firstly we followed Fee and Hadlock's (2004) methodology for classifying turnover as forced. If an article in the business press indicates that the CEO was banished, forced, or equivalent, then turnover was defined as forced. Secondly, similar to Conyon and Florou (2002), we considered the turnover as forced if the CEO was replaced for reasons such as political misunderstandings, conflicts with the Board of Directors, weak performance, personality differences, and scandals. Thirdly, we followed Dahya et al.'s (2002) methodology, considering dismissal and resignation as forced turnover. Thus, we considered the following reasons as forced turnovers: persona non-grata, change of ownership, pressure from shareholders, political reasons (except for the CEO of Oil Terminal who was elected in the Romanian Parliament, due to incompatibility reasons), CEO resignation (due to conflicts with the Board of Directors), as well as the cases in which no reason was given for CEO replacement, in case of weak pre-succession performances.

The sample contained 58 CEO turnover events that occurred in 36 companies. In the balanced panel data approach, they represent 53 company year CEO turnover observations out of the 426 observations collected between 2005 and 2010 for the whole sample of 71 companies. Hence, CEO turnover occurred in 12.47% of the cases and forced CEO turnover in 6.81% of the observations.

In the balanced panel analysis, we considered both accounting-based and market-based returns, computed at the end of the year previous to that when the CEO turnover occurred. In subsidiary, we also took into account in our models the annual returns of the year when the CEO was changed. We presumed that effects of the dismissed CEO's activity might also occur after the CEO was changed, due to his/her strategic position in the company. In the unbalanced panel analysis, the performance indicators were determined for 12 months before the date of the succession announcement and, because we did not exclude observations for CEOs who served less than a year, we computed the return for the period when they held the position and annualized the result.

To compute industry annual return, we used all of the Romanian companies listed on the BSE and on the over-the-counter market (former RASDAQ) that had the same first two industry code digits. It has been proven that this classification offers a higher homogeneity of returns than statistical clustering or three- or four-digit classification (Chan et al. 2007; Clarke 1989). To minimize the possibility of biases in our results due to outliers, the performance variables, the price/book value, and the leverage ratios were winsorized at 1% and 99%. We did not include the same regression variables that had a correlation coefficient equal to or greater than 0.4. Following the literature and the

hypotheses presented in Section 2, we applied a binary logit model to estimate the forced CEO turnover equation. Logit regressions are commonly used in management turnover studies in order to show that the likelihood of turnover is sensitive to changes in firm performance (see Powers 2005 for an extensive literature in this field). Consistent with previous literature, we included as independent variables several accounting-based and market-based performance indicators, various corporate governance indicators, variables related to the financial features of the firm, and industry dummies. Additionally, we included new variables for foreign CEOs and female CEOs, for the financial crisis that started in 2008, as well as an interactional variable for government ownership and political changes.

The use of composite variables in logit regressions was proved to be problematic by Powers (2005) due to the non-linearity of the model employed. However, in our analysis, the composite variable acts as a stand-alone variable, as its components were not used separately in the regression. Consequently, it can be interpreted as such, the sign of its coefficient being statistically significant.

Our sample included all firms listed, during the 2005–2010 period, on the first and second tiers of the BSE, except for the BSE itself (a listed company which became public in June 2010). We studied public companies because, for small and/or unlisted Romanian companies, it would be very difficult to collect these data, and the corporate governance mechanisms are expected to not be properly implemented. The sample cannot be extended due to the small dimension of the Romanian capital market. The 36 companies that experienced CEO turnovers represent one half of all listed firms on the first and second tiers of the BSE in 2010, with average sales of 904 million RON, an average number of employees of 1728, and an average stock market capitalization of 985 million RON. The analyzed time span includes a period of exceptional development of the Romanian capital market (2005–2008), but also one of economic recession (2009–2010). Besides, this period is particularly interesting due to the ongoing corporate governance reforms and the adoption of the Romanian Code of Corporate Governance in 2009.

Most of the data regarding the CEO's identity, CEO ownership, board independence, the reasons for CEO turnover, the succession type (voluntary/forced), and the exact date when the CEO was changed were hand-collected through corporate websites. Additionally, different Romanian business newspapers (Ziarul Financiar, Capital, Săptămâna Financiară, and Business Magazin) and news agencies (Mediafax and Daily Business) were accessed. Data for corporate governance variables and the accounting and financial data were from quarterly and annual company reports provided by the BSE. The explanatory variables are described in Table 1.

Table 1. Description of explanatory variables used in the model.

Variable	Description
Panel A: Variables related to the characteristics of the economic environment	
Political change	The variable 'political change' equals 1 for the years with governmental changes and 0 otherwise
Crisis dummy 1	1 for the years 2009 and 2010 and 0 otherwise
Crisis dummy 2	1 for the year 2009 and 0 otherwise
Industry dummies	
Panel B: Variables related to peculiarities of post-communist countries	
Foreign CEO	1 if the CEO is a foreign citizen and 0 otherwise
Female CEO	1 if the CEO is a woman and 0 otherwise
Firm and industry performance variables	
Panel C: Accounting-based performance variables	
Return on assets (ROA)	Operating profit/(total equity + long term debt)
Operating margin	Operating profit/net sales
Return on equity (ROE)	Net income/Shareholders' equity
Industry-adjusted ROA	ROA – Industry average ROA
Industry-adjusted operating margin	Operating margin-Industry average operating margin

Table 1. *Cont.*

Variable	Description
Panel D: Market-based performance variables	
Total stock return	Dividend yield + capital gains yield
Price to book value	Stock price/book value per share
Panel E: Other firm specific variables	
Firm size	Ln (net sales)
Leverage	Long term debt/Equity
Dividend dummy	1 if the company paid dividends during the year and 0 otherwise
Corporate governance variables	
Panel F: Ownership structure	
First shareholder ownership	Proportion of votes/cash flow rights held by the largest shareholder when the CEO was changed
First shareholder ownership dummy	1 if the largest shareholder's ownership exceeds 50% and 0 otherwise
Government ownership	Proportion of votes held by the state
CEO ownership dummy	1, if current CEO is also shareholder and 0 otherwise
Significant CEO ownership dummy	1, if CEO's ownership exceeds 5% and 0 otherwise
Institutional cumulative ownership	The sum of votes held by all institutional investors, each of them holding more than 5% of the votes
Institutional cumulative ownership dummy over 33%	1 if the cumulative ownership of the institutional shareholders exceeds 33% of the votes and 0 otherwise
Institutional cumulative ownership dummy over 50%	1 if the cumulative ownership of the institutional shareholders exceeds 50% of the votes and 0 otherwise
Change in institutional investors ownership	
Panel G: Board characteristics	
Board size	Number of Directors of the Board
Board independence	Number of independent directors divided by the number of the non-independent ones
Board independence dummy	1 if the number of independent directors is half or more of the board size and 0 otherwise
CEO-Chairman duality	1 for a CEO who simultaneously holds the positions of Chairman of the Board and CEO and 0 otherwise

Notes: Furthermore, we constructed two variables for the second largest shareholder ownership, as a percentage of common shares, and respectively as a dummy variable equal to 1, if the second shareholder's ownership equals or exceeds 10% of the total voting rights and 0 otherwise. We found no empirical evidence of a correlation between these variables and the CEO turnover occurrence.

Some descriptive statistics for the variables used in the model are presented in Table 2. These data emphasize that the average values for the firm's performance ratios are low, reflecting a negative influence of the global financial crisis starting in late 2008. The same trend is sustained by the price to book median value of 0.95, suggesting that, for more than half of the companies in the sample, the market value of the company is lower than the book value of shareholders' equity. This finding may also be related to the low liquidity and low degree of informational efficiency of the Romanian capital market.

Table 2 shows that 11% of the listed companies have foreign CEOs. We found evidence that the foreign origin of a manager is associated with the fact that the company is part of a foreign group. Almost 12% of the managers in our sample were women. This is not a high figure, but compared to other statistics, we can expect a relative significance of the manager's gender on the likelihood of CEO turnover occurrence. For instance, Kato and Long (2006) emphasize that in 2002, the proportion of female CEOs was only 4% in China.

The average first shareholder's ownership was around 47%, with a median value slightly above 50%. This result is important to characterize the corporate governance context of the Romanian market. It is presumably associated with important agency problems, especially between controlling and

minority shareholders, and with high opportunities of extracting private benefits from control on a capital market with high control premiums.[3]

Table 2. Summary statistics on CEO turnover for the Romanian listed companies during the 2005–2010 period.

Indicator	Average Value	Median Value	Minimum Value	Maximum Value	Standard Deviation
Variables related to the characteristics of the economic environment					
Crisis dummy 1	0.500	0.500	0	1	0.500
Crisis dummy 2	0.167	0	0	1	0.373
Political change	0.333	0	0	1	0.471
Variables related to peculiarities of post-communist countries					
Foreign CEO	0.113	0	0	1	0.317
Female CEO	0.116	0	0	1	0.320
Firm and industry performance variables (values in coefficients)					
Return on assets	0.038	0.047	−1.152	0.458	0.165
Operating margin	0.032	0.009	−0.334	0.581	0.135
Return on equity	0.056	0.058	−0.785	0.446	0.148
Industry-adjusted ROA	0.001	0.003	−0.624	0.576	0.122
Industry adjusted operating margin	0.099	0.072	−0.456	0.715	0.165
3-years average ROA	0.069	0.066	−0.542	0.387	0.117
3-years average ROE	0.065	0.069	−0.408	0.402	0.119
3-years average operating margin	0.105	0.072	−0.228	0.688	0.153
Total stock return	0.343	0.180	−0.935	4.976	0.779
Price to Book value	1.543	0.950	0.080	8.560	1.688
Other firm specific variables					
(ln) Firm size	18.558	18.322	14.996	23.670	1.604
Leverage (coefficients)	0.172	0.045	0	1.992	0.314
Dividend dummy	0.324	0	0	1	0.468
Corporate governance variables					
CEO Turnover	0.125	0	0	1	0.331
CEO forced turnover	0.068	0	0	1	0.252
First shareholder ownership (%)	47.418	52.000	0.0001	98.000	25.864
First shareholder ownership dummy	0.542	1	0	1	0.499
Government ownership (%)	3.816	0	0	79	14.475
CEO ownership dummy	0.399	0	0	1	0.491
Significant CEO ownership dummy	0.241	0	0	1	0.429
Institutional cumulative ownership (%)	26.070	11	0	93	30.771
Institutional cumulative ownership over 33%	0.340	0	0	1	0.475
Institutional cumulative ownership over 50%	0.298	0	0	1	0.458
Change in institutional investors' ownership (%)	0.980	0	−58.000	93.000	10.182
Board size	5.556	5	2	11	2.233
Board independence	2.369	2	0	6	1.713
Board independence dummy	0.817	1	0	1	0.388
CEO-Chairman duality	0.373	0	0	1	0.485

Source: Authors' calculation based on data provided by Bucharest Stock Exchange and the annual reports of the companies in the sample.

The average percentage of votes held by all institutional investors, each of them holding more than 5% of the votes, was 26.07%, but in half of the cases, it was below 11%. The average ownership of institutional investors was around half of the average institutional ownership for US firms in the work by Helwege et al. (2012). The standard deviations for all the variables regarding institutional ownership recorded high values, showing significant differences between the listed companies in our sample. Only 29% of the companies had institutional investors who own more than 50% of the equity. This may lower the incentives of institutional investors to be actively involved in controlling

[3] Dragotă et al. (2013) documented an average value of control premium around 115% and a median one of 25% for 173 tender offers carried through the BSE and RASDAQ for the period 2000–2011.

the companies efficiently. Due to the fact that, in the existing literature, it was shown that the role and involvement of institutional investors in the decision to change CEOs (forced) is even greater as they hold more shares (Kang et al. 2018), the results for this independent variable in the case of Romania are somewhat uncertain.

The average board size is around five members, with a maximum value of eleven members. These values are somewhat similar to the size in other one-tier board systems, such as in the US (Yermack 1996; Denis et al. 1997; Denis and Sarin 1999), Belgium (Renneboog 2000), Italy (Brunello et al. 2003), and China (Kato and Long 2006). We can bring into the discussion the arguments of Yermack (1996) for smaller and more efficient boards that monitor the executive managers more effectively. Thus, smaller board size can emphasize the negative relation between firm performance and CEO turnover.

5. Results and Discussion

Table 3 presents evidence on the relation between firm performance, CEO characteristics, political influence, industry sector, or financial crisis and CEO turnover likelihood. In accordance with H1, the interactional variable for political change and governmental ownership is positively and significantly correlated with forced CEO turnover. This relation is proof of the political influence on the Board of Directors' decisions, especially when the Romanian government owns an important share of total equity.

Consistent with H2, the foreign origin of the CEO for the Romanian listed companies is positively and significantly correlated with the likelihood of forced CEO turnover (see Table 3). The probability of forced turnover was higher (i.e., 15–20%) if the CEO was of foreign origin. This result is in line with Boenisch and Schneider (2013), who found that one of the communist legacies is the formation of strong closed informal connections, difficult to breach, and it can also be a clue for explaining foreign managers' difficulties to adapt to the Romanian environment.

We found a positive and significant correlation between the female CEO dummy and CEO forced turnover likelihood (similar to the results from Kato and Long 2006). The probability of forced turnover was higher (i.e., 7–8%) when the CEO was a woman.

We also found evidence that the crisis dummy is positively and significantly correlated with forced CEO turnover. The probability of forced CEO turnover was around 7% higher in 2009, amidst the crisis, than in other years from the database. This result is in accordance with Kaplan and Minton (2012), concluding that the expectations regarding the industry and market performances (decreasing during an economic crisis) negatively influence the probability of forced CEO turnover. An unstable economic and financial environment also puts pressure on the Romanian listed companies' management, and, consequently, the probability of forced CEO turnover is higher than in more stable economic times.

Our results are in line with the results from the existing literature and show that CEO turnover (particularly forced replacements) is inversely related to firm and industry performances (Hu and Leung 2012; Kato and Long 2006; Muravyev et al. 2010, among others). We also found that companies with low industry-adjusted return are more likely to have forced CEO turnovers (see Eisfeldt and Kuhnen 2013). Due to the anomalies of the Romanian capital market, we expected the accounting-based performance indicators to be more reliable than the market-based returns. We used similar models for forced CEO turnover and the three different market-based performance measures (price to book value, total stock return, and capital gains return), but we found no significant relation with the probability of forced CEO turnover[4].

The average marginal effects explain how sensitive the probability of CEO forced turnover is to independent variables. Some differences can be noticed in the amplitude of the average marginal effects, depending on the performance measures used. A 1% decrease in the return was correlated with an increase of the probability of CEO forced turnover of around 0.3% if we measured firm

[4] These results are available upon request.

performance using ROE, 0.5% if the performance indicator was ROA, and 0.54% for the operating margin. These results suggest that the Romanian listed companies put less emphasis on shareholders' interests than on the whole capital invested by creditors and shareholders for CEO turnover decisions.

A 1% decrease of the three-year average return was correlated, with slightly lower increases in the likelihood of forced CEO turnover than in the case of the performance indicators computed for the previous year. This result could be an argument for the assumption that for the Board of Directors, the short-term perspective of the performance is prevalent before the long-term perspective in their forced CEO replacement decisions. Our results are similar to Kaplan and Minton (2012), but with lower magnitude than those of Eisfeldt and Kuhnen (2013). One possible explanation for the difference in the magnitude of the changes can be the occurrence of the financial crisis during the analyzed period.

We found almost similar results for the likelihood of forced CEO turnover when we used contemporary firm performance measures. When we used three-year average ROA and ROE, the results were no longer statistically significant.

Regarding the scarcity of the managerial labor market, we found evidence that the utilities, energy, and pharmaceutics sectors are more likely to force CEOs to leave their positions. Our result is in accordance with Parrino (1997), who found that the utilities and energy sectors are among the most homogeneous.

With regards to the relation between CEO turnover and different corporate governance characteristics, first we found that the CEO–Chairman duality is inversely related to the likelihood of forced CEO turnover (Hazarika et al. 2012; Helwege et al. 2012; Hu and Leung 2012). This correlation can be explained through a higher influence of the CEO on the Board of Directors and higher opportunities for the CEO to maintain informational asymmetries. For our sample, the probability of forced CEO turnover was lower, by around 10%, for companies where CEOs held a dual position, compared to the rest of the sample.

Second, the presence of the controlling shareholder was associated with a lower probability of forced CEO turnover (see Brunello et al. 2003; Parrino 1997), which is consistent with a greater probability of type II agency conflicts. All other variables related to ownership had no statistical significance.

Third, similar to Parrino et al. (2003), the "voting with their feet" behavior can be validated for the Romanian listed companies. By some means, this result is expected for a transitional country with an enforced Corporate Governance Code only from 2009. Moreover, the results may be due to the lower holdings of the institutional investors compared to developed countries. For US companies, Helwege et al. (2012) showed that although the net change in institutional ownership prior to forced CEO turnover is negative and significant in the first sub-period of their analysis, the extent of "voting with their feet" is small and declines over time, and so becomes irrelevant in the second sub-period. The authors signal that the role of institutional investors in forced CEO turnover tends to diminish and that research must move toward other determinants. Such empirical evidence could also explain a lower statistical significance for this variable, registered for our Romanian sample for the period 2005–2010.

Fourth, we found no influence of board size and independence (as in Muravyev et al. 2010). This result can be explained by a limited effectiveness of corporate governance mechanisms, or through the activism of the first large shareholders, who put in place other mechanisms to control the managers. Additionally, we cannot exclude the assumption of a passive attitude of the outside directors. The results are somewhat similar to Miyajima et al. (2018), where the independent outside directors have no significant effect of enhancing CEO turnover sensitivity to ROE. The CEO turnover sensitivity to ROA is higher when boards have three or more independent outside directors than when boards have only one outside director.

Leverage is negative and statistically significantly correlated with the likelihood of forced CEO turnover (see Table 3). This link shows the existence of agency conflicts between managers and shareholders, which can be alleviated using the supplementary monitoring realized by the creditors. The creditors have the concern and appropriate skills to monitor the firms, and the shareholders benefit from their financial expertise.

Table 3. Estimates of binary logit models on forced CEO turnover using the accounting-based returns.

Variables	Expected Sign	Equation (1)	Equation (2)	Equation (3)	Equation (4)	Equation (5)	Equation (6)	Equation (7)	Equation (8)
Industry-adjusted return on assets	-	−9.1228 [0.00] **−0.493**							
Return on assets (ROA)	-		−4.54623 [0.00] **−0.469**						
Return on equity (ROE)	-			−5.72032 [0.00] **−0.323**					
Industry-adjusted operating margin	-				−5.94133 [0.00] **−0.351**				
Operating margin	-					−9.01518 [0.00] **−0.542**			
3 years average return on assets	-						−5.2662 [0.01] **−0.312**		
3 years average return on equity	-							−5.18364 [0.00] **−0.302**	
3 years average operating margin	-								−7.0803 [0.02] **−0.432**
Foreign CEO	+/−	2.034089 [0.02] **0.152**	1.259163 [0.00] **0.161**	1.866373 [0.02] **0.15**	2.31829 [0.00] **0.202**	2.197453 [0.00] **0.183**	2.40688 [0.00] **0.219**	2.12277 [0.00] **0.187**	1.98776 [0.01] **0.177**
Crisis dummy 2	+	1.292348 [0.02] **0.083**	0.645056 [0.06] **0.073**	0.951188 [0.09] **0.061**	1.072577 [0.05] **0.075**	1.069988 [0.05] **0.075**	0.896042 [0.07] **0.061**	0.815577 [0.097] **0.055**	0.82362 [0.02] **0.058**
Female CEO	+	1.279092 [0.08] **0.081**	0.537237 [0.15]	1.122408 [0.098] **0.075**	0.869574 [0.23]	1.096683 [0.09] **0.078**			1.13084 [0.08] **0.084**

Table 3. *Cont.*

Variables	Expected Sign	Equation (1)	Equation (2)	Equation (3)	Equation (4)	Equation (5)	Equation (6)	Equation (7)	Equation (8)
Government ownership × Political change	+	0.040583 [0.01]	0.025951 [0.00]	0.040694 [0.00]	0.035569 [0.07]	0.040903 [0.01]	0.035542 [0.07]	0.034834 [0.07]	0.03583 [0.045]
CEO–Chairman duality	–	−3.3509 [0.08] **−0.104**	−1.60233 [0.00] **−0.136**	−2.57295 [0.02] **−0.100**	−2.57654 [0.00] **−0.109**	−2.33399 [0.01] **−0.100**	−2.65378 [0.00] **−0.110**	−2.48547 [0.00] **−0.106**	−1.9570 [0.02] **−0.091**
Change in institutional investors ownership	Insignificant/–							−0.03460 [0.08] **−0.002**	
First shareholder dummy	–	−1.45821 [0.05] **−0.084**	−1.05737 [0.00] **−0.113**	−1.84211 [0.02] **−0.115**	−2.06363 [0.00] **−0.135**	−1.50065 [0.03] **−0.096**	−1.74685 [0.00] **−0.115**	−1.77616 [0.00] **−0.116**	−1.4832 [0.03] **−0.099**
Ln (net sales)	–	−0.35245 [0.09] **−0.019**	−0.26063 [0.02] **−0.027**	−0.42307 [0.08] **−0.024**	−0.53417 [0.01] **−0.032**	−0.35748 [0.099] **−0.022**	−0.4673 [0.01] **−0.028**	−0.43460 [0.03] **−0.025**	−0.3281 [0.08] **−0.020**
Leverage	–	−4.08264 [0.06] **−0.220**	−2.21574 [0.01] **−0.229**	−4.10193 [0.09] **−0.232**	−4.60895 [0.02] **−0.272**	−4.34411 [0.09] **−0.262**	−4.22106 [0.01] **−0.250**	−3.76608 [0.02] **−0.220**	−3.8271 [0.05] **−0.234**
Utilities dummy		6.210834 [0.00] **0.646**	4.110076 [0.00] **0.636**	6.852578 [0.00] **0.764**	8.024094 [0.00] **0.824**	6.278387 [0.00] **0.724**	6.748419 [0.00] **0.757**	6.545332 [0.00] **0.759**	6.68263 [0.00] **0.8**
Energy dummy		2.572995 [0.08] **0.21**	2.218322 [0.00] **0.321**	2.87868 [0.08] **0.278**	4.258439 [0.00] **0.465**	2.697677 [0.06] **0.256**	3.908447 [0.00] **0.426**	3.332632 [0.00] **0.358**	2.8089 [0.00] **0.299**
Pharmaceutics dummy			1.524418 [0.00] **0.206**		2.459127 [0.00] **0.23**		2.255324 [0.01] **0.208**	2.281926 [0.00] **0.213**	
Constant C		3.636597 [0.98]	3.432823 [0.08]	5.683193 [0.19]	7.762265 [0.03]	4.091619 [0.30]	6.629814 [0.05]	6.062318 [0.095]	4.13335 [0.22]
Prob (LR Statistic)		0	0	0	0	0	0	0	0
Pseudo R^2		0.37	0.4	0.33	0.3	0.3	0.29	0.3	0.27

Notes: The estimated coefficients for board independence, board size, institutional investors' ownership, CEO ownership and second largest shareholder's ownership are not statistically significant and are not reported. We report p-value in brackets. Marginal effects of independent variables on likelihood of forced CEO turnover are shown in bold. Source: authors' estimation.

Due to a relatively high homogeneity in our sample regarding the size of the Romanian listed companies, firm size becomes less important, but remains significant in explaining the CEO turnover decisions. The results for average marginal effects show that a 1% increase of the logarithm of net sales was associated with a decrease of around 2.5% of the likelihood of forced CEO departure.

Additionally, we analyzed separately voluntary and forced CEO turnovers. For voluntary CEO turnover, we found similar results as for all CEO turnovers in regard to the foreign origin of CEOs and ownership, supporting the explanations mentioned above. We found no statistically significant relation between firm performance and the likelihood of voluntary CEO turnovers, neither for accounting-based nor market-based returns. This result is consistent with mainstream literature, concluding that forced CEO turnovers are related to firm and industry performances, whereas other forms of managerial turnover are not linked to firm performance (see Eisfeldt and Kuhnen 2013).

The unreported results for the pooled data analysis were similar for CEO turnover, and also for forced and voluntary CEO turnovers.[5] Additional robustness tests were performed by gradually introducing into the logit models the explanatory variables for both specifications (balanced and unbalanced panel data). The results confirm the significance of all variables.

6. Conclusions

We revisited a widely studied topic in the literature—the determinants for the likelihood of CEO turnover. To the best of our knowledge, this is the first paper to focus on CEO turnover in Romania using a detailed and comprehensive analysis and considering financial, social, political, and corporate governance determinants, applied to an intricate period of time, with both exceptional development and economic recession.

For the Romanian case, our study took into consideration, for the first time, explanatory variables for the foreign origin of a CEO, CEO gender, and the incidence of political intrusions in corporate decisions in companies with governmental ownership. Thus, the occurrence of CEO turnover was positively correlated with the foreign origin of the manager, supporting the hypothesis that foreign managers experience difficulties in adapting to the Romanian economic environment. The political influence on the CEO turnover decision was revealed when firms had large state ownership. We found evidence that female CEOs were more likely to leave their positions than male CEOs. We also showed that the financial crisis boosted the probability of CEO forced turnover.

We examined, as well, the role of other important corporate governance variables in the CEO turnover process, and the results are mixed. The empirical evidence confirmed that some reforms have been implemented. Two particular entrenchment mechanisms were emphasized, namely, the CEO–Chairman duality and the controlling power of the largest shareholder. Additionally, we emphasized the "voting with their feet" behavior of the institutional investors. The CEO ownership is not significant as an entrenchment mechanism for forced CEO turnovers, but we found some intriguing evidence of its direct relation to the likelihood of voluntary CEO turnover occurrence. Other well-known corporate governance mechanisms, such as the second largest shareholder and the institutional investors' activism, seem ineffective in the sample considered.

As for the relation to several performance indicators, our results were similar to those identified in the previous financial literature for other countries. The CEO turnover decision was strongly and negatively related only to accounting-based performance ratios. Whatever model applied, the market-based performance variables did not have a significant influence, and a possible explanation could relate to the features of the Romanian capital market.

As per many empirical studies, this one has some limitations. The most important limitation concerns the sample, which was relatively small (426 observations, with 58 CEO turnover events) compared to similar studies in this field. This limit can usually be found in empirical studies that

[5] The results are available upon request.

analyze emerging economies, especially those of Eastern and Central Europe. Due to the fact that their capital markets are newly created or recently reopened, in many cases, the whole number of listed companies is small and thus it is not possible to collect data sets as large as those of studies conducted in highly developed countries (Filip and Raffournier 2010). In our study, this criticism should be mitigated, given that the sample includes all of the Romanian listed companies (except the BSE).

Our results can be useful for practitioners, as well as for academics. The conclusions are important for investors, and especially for foreign investors not accustomed to the Romanian economic environment. Additionally, our findings provide a better understanding of the managerial labor market in a transitional Eastern European country and evidence that it is still subject to political interference in corporate decisions of state-owned companies subsequent to a change of the political party in power.

We expect the development of post-communist economies to determine substantial improvements in corporate governance mechanisms and practices, and the CEO turnover phenomenon to follow the trends revealed in the literature for developed countries. It would be interesting for future analysis to mainly capture this evolution for a better understanding of the causes that trigger it.

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Appendix A. The Main Reasons for CEO Turnover for the Romanian Listed Companies 2005–2010

1. Retirement (4 cases). We consider retirement before the age of 63 as forced retirement.
2. Health problems (2 cases). We consider these cases as unforced reasons.
3. Political reasons (4 cases). Hu and Leung (2012) define three types of government intervention: (1) the government can play the role of "invisible hand" and senior executives of state-owned companies are political appointments; (2) the government has no control over the selection and appointment processes; or (3) the appointment is "just window dressing, as politically affiliated directors are puppets of management." In Romania, the first case is the most common practice for state-owned companies. In our sample are two state-owned companies, Transelectrica and Transgaz, with CEO replacement in 2009. The replacement was made in both cases by the Ministry of Economy in the first months after the new political party won the general election. Additionally, in both cases, there was an exchange between the position of the CEO and the deputy director. It can be noticed that the deputy directors were previously former CEOs in the same companies. The new senior executives appointed are controversial people, influential politicians with strong connections to the political party who won the general election.
4. Promotion (3 cases). This refers to a CEO who was promoted and made "a step forward" to take a new position within the company. From our sample, the most relevant example is the CEO from OMV, who resigned following the decision of the OMV group to become senior counsellor of the Chairman of the OMV group.
5. Persona non-grata (4 cases). Multiple reasons can be considered to justify the decision to replace the former CEO, from prolonged conflict with the board to conflict of interests or fraud; all of

them are seen as forced and illegal decisions by the CEO who was changed. Often, the real reason for CEO replacement is not publicly announced, and thus the mass-media becomes the main source to learn about the internal conflicts within the company.

6. Change of ownership (4 cases). If the ownership changes, CEO turnover is inevitable. In this study, we consider these replacements as involuntary.
7. Common succession (4 cases). In our sample, these CEOs just finished their four-year mandate and took other functions after their contract expired.
8. Pressure from the shareholders (16 cases). This is the most common reason for CEO replacements for the Romanian listed companies for the period 2005–2010. These cases are as follows: CEO dismissal due to low performance, change of jobs to improve firm performance, and a new approach of the company or CEO turnover decided by the majority shareholder(s).
9. Separation of the Positions of CEO and Chairman of the Board (5). The BSE Corporate Governance Code recommends avoiding CEO duality, as per many other similar Codes, in an international context. On the contrary, the Romanian listed companies can be considered as following the CEO–Chairman duality pattern.
10. CEO resignation (3). Only one case can be considered a CEO resignation, due to prolonged conflicts with the Board concerning the company's future direction. For the other two cases, the public announcement mentioned only that it was the decision of those CEOs to resign from their current positions.
11. Other reasons (2). We include two cases of CEOs who decided to remain only shareholders in their companies and to be actively involved in other businesses.
12. No reason (8). From 59 cases of CEO turnover, in 8 cases, the companies did not give any public motivations for these decisions.

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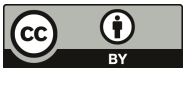

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The Impact of Brand Relationships on Corporate Brand Identity and Reputation—An Integrative Model

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Abstract: The current literature focuses on the cocreation of brands in dynamic contexts, but the impact of the relationships among brands on branding is poorly documented. To address this gap a concept is proposed concerning the relationships between brands and a model is developed, showing the influence of the latter on the identity and reputation of brands. Therefore, the goal of this study is to develop a brand relationships concept and to build a framework relating it with corporate brand identity and reputation, in a higher consumer involvement context like higher education. Structural equation modelling (SEM) was used for this purpose. In line with this, interviews, cooperatively developed by higher education lecturers and brand managers, were carried out with focus groups of higher education students, and questionnaires conducted, with 216 complete surveys obtained. Data are analyzed using confirmatory factor analysis and structural equation modelling. Results demonstrate that the concept of brand relationships comprises three dimensions: trust, commitment, and motivation. The structural model reveals robustness regarding the selected fit indicators, demonstrating that the relationships between brands influence brand identity and reputation. This suggests that managers must choose and promote brand relationships that gel with the identity and reputation of the primary brand they manage, to develop an integrated balanced product range.

Keywords: brand interrelationships; corporate identity; brand reputation; higher education; students' perceptions

1. Introduction

Consumer brand knowledge is multidimensional and needs to be understood and accounted for, in order to provide the right perspective and background for research on branding as it relates to consumers (Keller 2003). This research aims at developing a concept that defines the relationships

among brands and analyzes the influences on brand identity and the reputation of corporate brands. The context under study is higher education. We propose a model for higher education institutions which integrates the particularities of brand relationships in the management of corporate brand identity and reputation. Academics and professionals value reputation as a precious asset, as it reduces stakeholders' uncertainty about the future and increases the value of goods and services. Where branding is concerned, the strength of reputation lies in the corporate brand's promise, therefore companies should keep it as a means of managing corporate reputation (Argenti and Druckenmiller 2004). The scientific community believe that brand reputation depends on brand identity, so a good brand reputation is the result of a good management of that identity.

While brand relationships are known to have impacts on brand identity, the literature on this subject is scarce. Relationships have been traditionally positioned in the theory of networks among companies (Ford et al. 2003; Hakansson and Ford 2002; Hakansson and Snehota 1989, 1995). Although previous studies may acknowledge the influence of brand relationships on the identity of organizations (Hakansson and Snehota 1989, 1995), no empirical studies have supported this.

In the current context, where the environment is increasingly dynamic and transformations are difficult to predict, the development of technology results in increasing interactions among corporate brands, as well as between corporate brands and their consumers. These end-users are now, more than ever, considered as cocreators of brands (Hatch and Schultz 2010; Madden et al. 2006; Payne et al. 2009; Prahalad and Ramaswamy 2004; Da Silveira et al. 2013). Similarly, we argue that the identity of a corporate brand is developed as it adapts to consumers' demands. It develops alongside other recognized brands to build an identity with a desirable reputation among all stakeholders, especially consumers.

In line with the development of the proposed model regarding branding, a number of researchers, Kapferer (1986, 2008), Fombrum (1996, 2006) and Vidaver-Cohen (2007), focus on reputation. Other recent studies on reputation in higher education (Priporas and Kamenidou 2011; Suomi 2014) were based on the reputation of researchers and consultants, so that the model could provide insights from academics with responsibilities in the field. The current study is intended to constitute policy advice to general managers and to those in positions of responsibility for higher education brands. This study is distinctive because it:

- helps fill a gap in the literature by supplying a concept of brand relationships
- introduces the concept of brand relationships in the management of brand identity and reputation in higher education;
- relates the concept of corporate brand reputation with the management of corporate brand identity;
- leads brand managers into new perspectives for building a new dynamic construct under a brand relationship approach.

This paper is organized as follows. Section 2 highlights the relevant literature and describes the structure of the proposed framework for managing corporate brand identity under a relational approach. Section 3 provides an explanation of methods used to assess the concept of corporate brand relationships and the structural model, together with a brief description of the sample. The hypotheses and definitions of the measures used are provided in this section. Section 4 reports our findings and summarizes the model validity and applicability. Section 5 offers a brief discussion of the results and draws the conclusion together with recommendations for future research.

2. Literature Review

This review provides detailed information about the conceptualization of the constructs and measures used in the developed model, to manage corporate brand identity under a relational approach. The methodology used to assess the references was search and analysis of the databases at our disposal, like B-ON, Science Direct, JSTOR, ISI Web of knowledge, Scopus, Springer Link, and others.

2.1. Brand Relationships

The concept of brand relationships needs clarification in order to investigate the influence of relationships on corporate brand identity, since relationships are vital for the interactions between consumers and brands. Consumer–brand interactions extend beyond mere utilitarian benefits (Aggarwal 2004). According to Fournier (1998), relationships constitute a series of repeated exchanges between two parties known to each other, who also evolve in response to these exchanges and to fluctuations in the contextual environment. Fournier (1998) and Muniz and Muniz and O'Guinn (2001) argue that people form relationships with brands in the same way that they form relationships with each other in social contexts. We can extend this approach to the relationships between brands and state that brands tend to relate to each other in a social context and that this association can be used to attract specific members of the public. This is not the same thing as a brand alliance, because such alliances involve all joint marketing activities in which two or more brands are simultaneously presented to consumers (Rao et al. 1999; Simonin and Ruth 1998). In this study, brand relationships are mutually oriented interactions among corporate brands whose target is education (universities and other higher education institutions) and other reputed brands which may attract students to create a commitment. The definition of relationships between companies (Hakansson and Snehota 1995) supports this perspective. A relationship is a mutually oriented interaction between two reciprocally committed parties (p. 25). The parties agree that the notion of a relationship is defined by concepts of mutual orientation and commitment over time, which are common in interactions between brands.

The specific characteristics of corporate brands make them different from other brands: Their bases are brand promise, multidisciplinary roots, and medium to long-term gestation. Their focus is external focused, but they are largely supported by internal stakeholders, who value highly communication and visual identity (Balmer and Gray 2003); these facts make it necessary to adapt the dimensions of brand relationships to these notions. This required that we review the literature on services focused on the theory of relational networks and branding and search for characteristics that suited the concept of the relationships among brands connected to education services.

Five different but related dimensions were used to assess the quality of the relationships in the context of services in the B2B markets: recognized quality of the service, trust, commitment, satisfaction, and service quality (Rauyruen and Miller 2007), but there is little empirical investigation on the subject. However, the empirical studies of Dwyer et al. (1987) and Moorman et al. (1992) concluded that the quality of relationships is characterized by three dimensions: trust, commitment, and satisfaction. Berry (1995) emphasizes the relationships that customers have with service companies. Beatty et al. (1988) are in favor of trust and commitment to explain the mechanisms underlying stable preferences. Other researchers examined the roles of trust and commitment in the relationships that customers develop with service companies (Garbarino and Johnson 1999; Sirieix and Dubois 1999). Chaudhuri and Holbrook (2001) and Kennedy et al. (2000) found a positive relationship between trust and commitment to consumer products. Most recently, Alkhawaldeh et al. (2020) accessed the effect of brand familiarity and perceived service quality on brand image as and explored the position of brand image on student´s satisfaction. The findings showed that familiarity with the brand and perceived quality of service had an important and beneficial connection with the image of the brand and there was an important and positive connection between brand image and students´ satisfaction. Yet, these results were tested in the private field, and ours is focused on public institutions.

Next to trust we take commitment, recently described as an important major aspect of strategic partnerships (Søderberg et al. 2013). We followed the definition of Hardwick and Ford (1986) and Wilson (1995). Commitment influences or benefits internal and external stakeholders' perceptions of future value. Failing to find a scale characterizing the commitment among brands, we developed a scale procedure to select items for this dimension.

Motivation has to do with the internal and external variables stakeholders consider when choosing an educational institution. It is also based on the relationships that the university/institution is able to provide. The scale procedure that we followed had to be adapted, so we decided to develop a scale

procedure to select items for this dimension as well, because we could not find a suitable scale in the literature.

2.2. Corporate Brand Identity

The past few years have witnessed a burgeoning interest—among both practitioners and academics—in consumers' "love" for brands (Batra and Bagozzi 2012). Brands are frequently represented in the minds of consumers as a set of humanlike characteristics (van der Lans et al. 2014). In this context, recognized higher education institutions tend to evoke feelings and emotions like "love" in students and prospective students. Most of the recognized faculties in the country in which this research was conducted behave like corporate brands by demonstrating specific characteristics that distinguish them from their peers. Legally, they are part of a university that aggregates them, but brand images of faculties are so strong and distinctive from one another that they can be considered as corporate brands. According to Muniz and O'Guinn (2001) there are brand communities of faculties. These authors define a community as a core construct in social thought and a brand community is a specialized, nongeographically-bound community, based on a structured set of social relations among admirers. We readily become aware of these faculty brand communities when students choose one in which to study after finishing high school. Balmer et al. (2010) used business schools as a model to investigate corporate brand management and identification. In addition, according to Han et al. (2018), the establishment of good interpersonal relationships among community members will enable members to have a sense of belonging and social identity, thereby enhancing customer satisfaction within the community.

Kapferer (1986, 2008) refers to the prism of brand identity as consisting of an internal part-brand "culture," "personality," and "self-image", as well as an external part—"physical dimension," "relation," and "reflected consumer." He considers the external part of the identity prism highly important, especially in the case of corporate brands, since it is exposed to constant interactions with the public. "Reflected consumer" is an external and intangible dimension which reflects the way the consumer wishes to be regarded for "using" a certain brand (Kapferer 1986, 2008). This dimension is characterized by the following features: being better prepared for the labor market; being more capable of creating/innovating as successful professionals; and professionals with high credibility. The relation dimension has tangible and intangible aspects. It defines the behavior that identifies the brand and the way it interacts with its consumers (Kapferer 1986, 2008). It is characterized by the following: friendliness, respect, trust, motherly and close. Finally, the "physical" dimension of brand identity is defined by Kapferer (2008), as an exterior dimension that communicates the physical traits, colors, forms, and qualities of the brand. This dimension has features such as: the physical traits of the university/institution; modernity, sophistication, functional, and adequate.

2.3. Brand Reputation

Reputation is considered the most valuable asset of an organization, for the following reasons: its positive effects on reducing stakeholder uncertainty about future performance; the trust it creates in the public; the expectation of being rewarded for the excellence of goods and services. Fortune Magazine published a list of The World´s Most Admired Companies, which reveals that a 5 percent increase in reputation of an entity corresponds to a 3 percent increase in its market value. According to Fombrum (1996), such an organization attracts qualified employees and external investors; so, the defense of reputation is the cause of the growing interest in corporate brands. Vidaver-Cohen (2007) based her concept of reputation on the Rep Trak model (Fombrum 2006), which was successfully adapted to a business school. Suomi (2014) and Priporas and Kamenidou (2011) followed the same model in their studies of branding and reputation in higher education. The prime objectives of this study are: to measure and define the concept of brand relationships (relationships among brands) and demonstrate the validity and reliability of its dimensions; to integrate the concept of brand relationships in the management of corporate brand identity as an antecedent of the external part of identity; and to

integrate the concept of brand reputation in the management of corporate brand identity, showing that it is a result of the management of the external part of identity under a relational approach.

3. Methodology

Service brands act in dynamic contexts, where brand building is developed with the help of consumers. In higher education, this is particularly visible, as students are consumers (they pay to attend university) and staff are part of the university´s identity. We thought it would be appropriate to interview a sample of engineering students, as engineering faculties are recognized for developing highly salient brand identities based on their societal interventions (e.g. building bridges and private infrastructure, developing innovative artifacts, processes, and technologies for industries that are frequently funded by national/international research centers).

3.1. Research Stages

We developed this research into the two stages explained below.

1. Exploratory research used a case study methodology developed in two engineering faculties to find items to characterize the dimensions proposed in the model; and
2. Confirmatory research was pursued by developing a questionnaire for higher education engineering students. A total of 216 complete surveys were obtained.

In the first stage, we followed King (1991), Balmer (2001), and Aaker (2004), who stated that senior management members must be selected as informants because they are important in terms of corporate brand management. Further, informants who had day-to-day strategic management responsibilities were also selected. We conducted in-depth interviews with lecturers/researchers and focus groups with students. Interviews were developed for senior management and staff, and focus groups were created for students at undergraduate, master, and doctoral levels. Before the interviews were conducted, several preparatory procedures were undertaken. These included discussions with academics and practitioners national and internationally recognized in higher education (Barros et al. 2011). These discussions indicated the necessity of having a protocol in the interviews and focus groups. This initial study marshaled insights from thirteen in-depth interviews (seven in one faculty and six in the other), following a predesigned interview protocol. Each interview lasted for about two hours, and some informants were interviewed more than once. All interviews were recorded with the permission of interviewees. Four focus groups of students were created, two in each institution. Each focus group had six to eight students. To ensure the accuracy of interview data, we conducted member checks (Lincoln and Guba 1985). In addition to interviews, desk research was conducted by consulting faculties' websites and media news.

Data were coded first by hand, because we thought this would bring us closer to the data. Both stages were coded separately. In accordance with the general protocol for a previously designed qualitative study, data collection, analysis, and interpretation were undertaken simultaneously, generating tables of synthesized data. Simultaneously, several long meetings were held between the authors to obtain an in-depth understanding of the phenomena under study.

This exploratory research suggested that, in contexts of high consumer involvement, the relationships of a corporate brand with highly recognized brands have a definite impact on the identity and reputation of the corporate brand, by influencing the perceptions of the stakeholders and the educational services being offered.

This initial research suggested that corporate brand relationships with recognized brands have impacts on identity and reputation. To confirm this conclusion, a second stage was designed, in which the proposed model (with the selected dimensions and items previously selected in the first stage) was tested. See Figure 1. A questionnaire was developed for higher education engineering students; 216 complete surveys were obtained. The data permitted us to validate a new concept defining the relationships among brands from the students' point of view. The investigated relationships were the

ones among corporate brands whose mission was education; these included universities and other higher education institutions and strategic partnerships with national reputed research centers or international reputed universities such as MIT, Harvard, and Oxford, with which these brands interact in the context of conjoint degrees, international mobility, or other forms of interaction. To define each dimension, we adopted a holistic perspective for reviewing the literature on several fields of study, including B2B marketing, psychology, and organizational studies. We developed a procedure to determine the pool of items to use in this research; these are shown in Table 1.

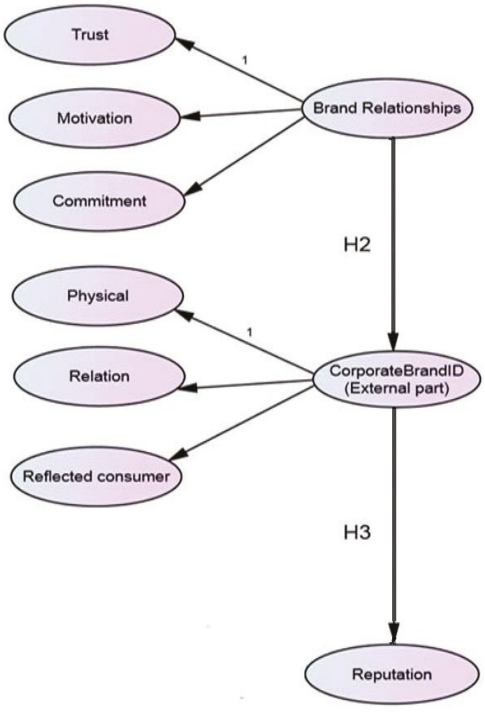

Figure 1. Proposed Model (developed by the authors).

Table 1. Summary of Procedures to Develop New Multi-Item Scales.

Procedure to Develop Multi-Item Scales	Techniques and Indicators
1—Develop a theory	Literature review and discussion with experts
2—Generate an initial pool of items for each dimension/scale	Theory, secondary data, and thirteen interviews with lecturers and university managers, four focus groups of students (bachelor, master, and doctoral)
3—Select a reduced set of items based on qualitative judgment	Panel of ten experts (national and international, academics, and practitioners)
4—Collect data from a large pretest sample	Pretest on a sample of eighty higher education Students
5—Perform statistical analysis	Reliability; factor analysis
6—Purify the measures	Analysis of the results of the pretest sample and discussion with experts
7—Collect data	Survey of higher education students (216 complete surveys)

Table 1. *Cont.*

Procedure to Develop Multi-Item Scales	Techniques and Indicators
8—Assess reliability and unidimensionality	Cronbach's alpha and factor analysis
9—Assess validity	Construct (AVE and CR), discriminant (comparison between the squared root of AVE and the simple correlations), and nomological validity (significant simple correlations examination)
10—Perform statistical analysis	Confirmatory factor analysis (CFA) Structural equation modelling (SEM)

Sources: Adapted from Churchill (1979) and Malhotra (1981, 2004). AVE—Average Variance Extracted; CR—Construct Validity.

3.2. Proposed Model and Testing

Regarding the first construct—brand relationships—we found that it is formed by three dimensions: trust, commitment, and motivation. Trust was adapted from existing scales in the literature, but motivation and commitment (although based on the concepts of Hardwick and Ford (1986) and Wilson (1995)) were developed in this research, by using confirmatory factor analysis (CFA). The scales used to define the brand relationships construct were found to be valid and reliable.

To test the structural model, we used corporate brand identity (external part), which was developed in a previous study. The items used to characterize the physical dimension, the relation and the reflected consumer dimension were the result of previous research pursued by Barros et al. (2016). The authors used the external part of the brand identity prism to argue that the relationships among brands (brand relationships) influence the external part of corporate brand identity and reputation.

The result of a well-managed corporate brand identity is a positive reputation. Therefore, brand reputation is the expected result of an active corporate brand identity management under a relational approach. It is widely suggested in the literature that identity precedes reputation (Burmann et al. 2009; de Chernatony 1999; Kapferer 1986, 2008). Corporate brands should actively choose and select recognized brands with which to develop relationships, to bridge the gap between brand identity and reputation. The result of this management should be an increase in brand reputation.

We also used the reputation concept unidimensionality, developed by Vidaver-Cohen (2007), to connect with this research. Data were analyzed using CFA and structural equation modeling (SEM). A structural equation model was developed to test the brand relationships concept as an antecedent to corporate brand identity and reputation. According to Nachtigall et al. (2001), SEM represents the relationship between latent variables (brand relationships, corporate brand identity, and brand reputation in our model) and their manifest or observable indicators (the items that characterize the latent variables). The most prominent feature of SEM is the capability to deal with latent variables. These variables are connected to observable ones by a measurement model (Edwards and Bagozzi 2000).

3.3. Research Hypotheses

Authors like de Chernatony (1999) and Kapferer (1986, 2008) state that brand identity precedes brand reputation. It is our aim to confirm this hypothesis, in order to be able to argue that the management of corporate brand identity is developed under a relational approach. It follows that the choice and selection of recognized brands to develop should be carried out by the brand management team, taking into account the fact that brand identity develops and interacts with the external dynamic environment. We propose three research hypotheses:

Hypothesis 1 (H1). *The constructs trust, commitment, and motivation are a part of a higher dimension construct named brand relationships;*

Hypothesis 2 (H2). *The brand relationships construct influences the external part of corporate brand identity; and*

Hypothesis 3 (H3). *The external part of corporate brand identity influences brand reputation.*

We conducted CFA with the three second-order constructs: brand relationships, corporate brand identity, and brand reputation, using a total of 34 measures, detailed as follows:

(a) A list of eighteen items was obtained from qualitative research to measure the constructs that define the brand relationships concept: trust (7 items), motivation (7 items), and commitment (four items);
(b) Eight items were considered before testing the validity of the measurement model. The guidelines followed by the literature regarding SEM suggested a drop of T4. In line with this, the trust dimension was characterized by seven items;
(c) A list of thirteen items was derived from previous research by Barros et al. (2016), regarding corporate brand identity (external part) and its measures: physical (four items); relation (five items); reflected consumer (four items);
(d) A list of four items was adapted from the brand reputation scale developed by Vidaver-Cohen (2007). Previously, ten items had been selected from the framework, but we found that this concept was bidimensional, so, we selected one dimension that we considered to be more connected with this research. After analyzing the measurement model, we decided to maintain three of the four items.

We began by developing measures for the concepts we intended to connect: brand relationships, corporate brand identity (external part), and brand reputation. First, we tested construct reliability and unidimensionality for the proposed measures for brand relationships: trust, commitment, and motivation. The same procedure was followed for brand reputation. The measures that formed corporate brand identity have been analyzed previously, and the construct has been found to be reliable and unidimensional. Next, we developed the measurement model for the brand relationships concept (using CFA). The results regarding the selected fit indices were considered acceptable. After dropping one item from the trust dimension, we developed the second-order model. The results revealed robustness regarding the selected criteria. Finally, we tested the structural model, using brand relationships as the cause of the salience of the external part of corporate brand identity and brand reputation as the result of the management of corporate brand identity (external part), using a relational approach.

4. Results

4.1. Unidimensionality and Reliability of Scales for Measuring Brand Relationships, Reputation and Corporate Identity

The first-order model had three factors (trust, commitment, and motivation) and nineteen corresponding reflective indicators, as listed in Tables 2 and 3. The goal of most research projects is not just to develop unidimensional and reliable measurement scales, but to build and test theory. To summarize the data in terms of a set of underlying constructs, a factor analysis was conducted. We measured the unidimensionality and reliability of the proposed scales. To measure unidimensionality, we conducted principal component analysis with varimax rotation and Kaiser normalization to each scale. The scale items that did not show factorial stability were candidates for elimination. To measure reliability, we selected Cronbach's alpha.

Table 2. Initial and final research constructs and measures.

Construct	Initial Full Measured Items *	Source
Trust	The connections between my university/institution and the recognized brands (INESC, INEGI, ISISE, CCT, CALG, ALGORITMI; MIT, Harvard, Oxford . . .) with whom it relates T1—make me feel safe T2—are trustable T3—are a guarantee T4—are transparent (honest)—deleted while testing the measurement model of brand relationships for the sake of discriminant validity between trust and commitment T5—are sincere T6—are interesting T7—influence the curricula offer of my university/institution T8—contribute to improving the answers to students' needs	Adapted from Morgan and Hunt (1994) and Gurviez and Korchia (2002)
Commitment	Attending this university/institution allows me C1—to achieve (have access to) important relationship networks C2—to be able to play a major professional and social role C3—to be influential C4—to reach technical and scientific excellence	Concept based on Hardwick and Ford (1986) and Wilson (1995), but the scales are new in the literature; Sources of influence: informants + focus groups + experts + desk research
Motivation	The connections between my university/institution and the recognized brands (INESC, INEGI, ISISE, CCT, CALG, ALGORITMI; MIT, Harvard, Oxford . . .) with whom it relates M1—give credibility to the lecturing process M2—facilitate access to research M3—facilitate access to the labor market M4—facilitate access to a top career M5—give credibility to the university/institution in the eyes of the labor market M6—facilitate access to an international career M7—foster entrepreneurship	New scale in literature; sources of influence: informants + focus groups + experts + desk research
Reflected consumer	I believe that society in general considers graduates of my university/institution RC1—better prepared for the labor market RC2—more capable of creating/innovating RC3—successful professionals RC4—professionals with high credibility	Developed in previous research
Relation	I feel that the relationship between my university/institution and me is R1—friendly R2—respectful R3—trustable R4—motherly R5—close	Developed in previous research
Physical	F1—the facilities of my university/institution are modern F2—the facilities of my university/institution are sophisticated F3—the facilities of my university/institution are functional F4—the facilities of my university/institution are adequate	Developed in previous research

Table 2. *Cont.*

Construct	Initial Full Measured Items *	Source
Reputation	Please classify the items below from 1—poor to 5—high: Rep2.1—intellectual performance (retain/recruit prestigious lecturers/investigators; high levels of scientific publications . . .) Rep2.2—network performance (attracts first-class students; high employment rate; strong links between students and the industry . . .) Rep2.3—products (prestigious degrees; competent graduates . . .) Rep2.4—innovation (innovative methodologies; rapid adaptation to changes; innovating curricula . . .) deleted after analyzing the measurement model (standardized residual values) Rep2.5—provided services (strong relations with the exterior; specialized tasks; high level of instruction by lecturers and staff . . .) Rep2.6—leadership (strong and charismatic leaders; organized and competent management; vision for future . . .) Rep2.7—corporate governance (open and transparent management; ethical behavior; fair in transactions with stakeholders . . .) Rep2.8—work environment (equal opportunities; reward systems; care for the welfare of the staff and students . . .) Rep2.9—citizenship (promotes services to society; supports good causes; acts positively in society; open to the industry and to society . . .) Rep2.10—financial performance (fees and value-added programs.) From Rep2.5 to Rep2.10 all deleted after analyzing the dimensionality of the construct, because SEM demands unidimentionality of the scales as previously mentioned—see Table 3	Adapted from Vidaver-Cohen (2007)

* Items measured on a five-point Likert scale, ranging from (1) strongly disagree to (5) strongly agree.

Table 3. Analysis of the dimensionality of reputation.

Reputation	Factor Loadings	
	Factor 1	Factor 2
Rep2.1—intellectual performance (retain/recruit prestigious lecturers/investigators; high levels of scientific publications . . .)	0.800	
Rep2.2—network performance (attracts first-class students; high employment rate; strong links between the students and industry . . .)	0.813	
Rep2.3—products (prestigious degrees; competent graduates . . .)	0.736	
Rep2.4—innovation (innovative methodologies; rapid adaptation to changes; innovative curricula . . .)	0.685	
Rep2.5—provided services (strong relations with the exterior; specialized tasks; high level of instruction by lecturers and staff . . .)	0.591	0.449
Rep2.6—leadership (strong and charismatic leaders; organized and competent management; vision for future . . .)		0.616
Rep2.7—corporate governance (open and transparent management; ethical behavior; fair in transactions with stakeholders . . .)		0.822
Rep2.8—work environment (equal opportunities; reward systems; care for welfare of staff and students . . .)		0.821
Rep2.9—citizenship (promotes services to society; supports good causes; acts positively in society; open to the industry and to society . . .)		0.709
Extraction Method: Principal Component Analysis		

Next, we analyze the measures of the brand relationships construct. We start by analyzing Trust, commitment and Motivation. Then we define guidelines and criteria to assess a model for Brand Relationships.

4.1.1. Trust

This scale was adapted from Morgan and Hunt (1994) and Gurviez and Korchia (2002) and had eight reflexive items. We measured the reliability of the scale defined by the selected items. Cronbach's alpha was 0.898 (higher than the 0.8 suggested by Nunnally (1978)). Dekovic et al. (1991) and Holden et al. (1991) characterized reliabilities of 0.60 or 0.70 as good or adequate. However, Ping (2004) stated that higher reliability measures tend to avoid low average variance extracted (AVE) when running the CFA. Regarding dimensionality, the scale was shown to be unidimensional, with an explained variance of 59.213 percent extracted by that component.

4.1.2. Commitment

This was a new scale proposed for this research and consisted of four reflexive items. Regarding the reliability of the scale, Cronbach's alpha was high (0.819). We then analyzed the dimensionality of the scale and found that the scale was unidimensional, with an explained variance of 64.898 percent by that component.

4.1.3. Motivation

This was also a new scale proposed for this research and consisted of seven reflexive items. Assessing the reliability, the Cronbach's alpha was high (0.886). Analyzing the dimensionality, we found that the scale was unidimensional, with an explained variance of 60.417 percent.

Results regarding the other constructs (external brand identity and brand reputation), the initial measures, the analysis of the dimensionality of reputation, and the final research measures are summarized in Tables 2 and 3. More information regarding the technical procedures can be provided on request.

4.2. Guidelines and Criteria to Assess Model for Brand Relationships

We used the following guidelines:

- CMIN/DF < 2.00 (Byrne 1989, 2010);
- CFI > 0.90 (Bentler 1990; Browne and Cudeck 1993; Hu and Bentler 1999; Marsh et al. 1996);
- RMSEA < 0.08 (Bentler 1990; Browne and Cudeck 1993; Hair et al. 2006; Hu and Bentler 1999; Marsh et al. 1996). where CMIN/DF = Chi-square value/degrees of freedom, CFI = comparative fit index, RMSEA = root mean square error of approximation.

Following these guidelines, we applied the first-order measurement model to the brand relationships concept. A summary of the psychometric properties for the first-order constructs is provided in Table 4. Discriminant validity was tested, and after dropping item T4, no problems were reported, as can be seen in Table 5. Taking these results into account, we tested the second-order model for the brand relationships construct. The results showed robustness regarding the selected indicators (see Table 6).

We assessed the reliability and validity of the second-order factor for the brand relationships construct. Construct validity is demonstrated by plausible correlations of the second-order construct with first-order indicators, whereas convergent validity can be suggested by an AVE for the second-order construct that is greater than 0.5 (Bagozzi et al. 1991; Ping 2004).

The values of CR = 0.87 and AVE = 0.68 are greater than the recommended values, suggesting higher reliabilities and convergent validity for the second-order construct. In line with this, we can conclude that the results support the first hypothesis (H1) and state that the constructs of trust, commitment, and motivation are a part of a higher dimension construct of brand relationships.

Table 4. Psychometric properties for first-order constructs for brand relationships.

Measured Items	Factor Loadings λ	∑ [a]	Delta [b]	AVE	CR	Cronbach's α
Trust (T)				0.53	0.89	0.885
T1	0.713		0.492			
T2	0.816		0.334			
T3	0.713		0.492			
T5	0.657		0.568			
T6	0.733		0.463			
T7	0.759		0.424			
T8	0.683	5.074	0.534			
Commitment (C)				0.77	0.82	0.819
C1	0.705		0.308			
C2	0.716		0.487			
C3	0.653		0.574			
C4	0.717	2.791	0.316			
Motivation (M)				0.52	0.89	0.886
M1	0.647		0.581			
M2	0.723		0.477			
M3	0.696		0.516			
M4	0.761		0.421			
M5	0.735		0.460			
M6	0.771		0.406			
M7	0.731	5.064	0.466			

[a] Sum of the factor loadings; [b] Delta is a measure that is used to calculate CR (construct reliability), and the formula to obtain it is $1 - \lambda^2$.

Table 5. Construct and discriminant validity for brand relationships.

Construct validity (before drop T4)			
	Motivation	**Trust**	**Commitment**
AVE	0.52	0.51	0.77
CR	0.89	0.89	0.82
Discriminant validity (before drop T4)			
Motivation	0.72		
Trust	0.67	0.72	
Commitment	0.65	0.73	0.88
Construct validity (after drop T4)			
	Motivation	**Trust**	**Commitment**
AVE	0.52	0.53	0.77
CR	0.89	0.89	0.82
Discriminant validity (after drop T4)			
Motivation	0.72		
Trust	0.67	0.73	
Commitment	0.65	0.72	0.88

Notes: Squared root of AVE on the diagonal; correlation estimates below the diagonal.

Table 6. Summary of second-order factors for brand relationships.

Model	χ^2	**DF**	p	**CMIN/DF**	**CFI**	**RMSEA**
Brand relationships (three factors)	219.023	129	0.000	1.698	0.955	0.057 [0.044; 0.070]

The theoretical propositions justifying the second-order model were assumed to directly estimate the empirical. Model; no further tests were used.

4.3. Model Evaluation

The first analysis of the proposed measurement model suggested that the item Rep2.4 (innovation) be dropped. We re-calculated the reliability and unidimensionality of the scale and found the following for the new three items. The brand reputation scale had a Cronbach's α of 0.777 (higher than the threshold of 0.7 defined by Bland and Altman 1997; DeVellis 2003; Nunnally 1978; Nunnally and Bernstein 1994) and a percentage of explained variance of 68.481 percent, which is highly acceptable. In line with these findings, we re-specified the model and conducted CFA again. The results are summarized in Table 7.

Table 7. Summary of the indices of fit of the measurement model.

Model	χ^2	**DF**	p	**CMIN/DF**	**CFI**	**RMSEA**
Measurement model (Brand relationships; corporate brand identity (external) and reputation)	726.149	503	0.000	1.444	0.944	0.045 [0.038; 0.053]

These fit indices were satisfactory according to the selected guidelines. This means that the second-order construct named brand relationships was related to the second-order corporate brand identity construct (external part) and to the brand construct reputation formed by three measures.

An analysis of all loadings showed that all except one were higher than the threshold of 0.5. The "physical" dimension was the exception; it contributed poorly to the external part of the corporate brand identity construct (0.420 < 0.5). Even so, the model fit was satisfactory. We can conclude that, in contrast to what Kapferer (1986, 2008) suggests, the used sample did not greatly value the physical

dimension of corporate brand identity (external part). This is consistent with the sample, which was composed of goal-oriented engineering students. They demonstrated that they assign more value to the dimensions reflecting consumer (loading: 0.784) and relation (loading: 0.750), because they believe that these dimensions are more connected with their lives as students and future professionals. The reflected consumer dimension (the one with the highest loading) was strictly connected with the aspirations of students. However, this finding should be further investigated in other contexts, using other samples. The following standardized residual values also deserve further attention: 2.629 between F4 and Rep2.2; 2.731 between R5 and C3; and 2.716 between R5 and C2.

Rep2.4 (innovation), that was immediately deleted because it had a high standardized residual. Rep2.2 (network performance) also had a relatively high standardized residual, yet we had to maintain one of them because CFA demands at least three items to run an analysis. We considered Rep2.2 more in line with the theoretical background and the factor loadings gave us the same cue (Rep2.2 0.813 vs. Rep2.4 0.685). All the other standardized residuals were below the cut-off point of 2.58, as suggested by Jöreskog and Sörbom (2001). The other items were a part of other second-order constructs, which were previously analyzed and evaluated and revealed as valid (convergent, discriminant, and nomological). Therefore, considering that the mentioned values were far from the cut-off point of 4.0 (Hair et al. 2006) and required no further considerations and that the model fit was satisfactory, we decided to keep these items and test the structural model.

Regarding the modification indices, the one between R5 and C3 had a value of 11.588 (>11). This was expected, given the standardized residual value between both items. However, as mentioned above, the difference was very small, and it was decided to keep both items. All other modification indexes (Mis) had values below 11. No problems regarding multicollinearity were found, and no other indices required our attention; with these findings, we tested the structural model.

4.4. Final Structural Model Estimation and Testing

By developing this causal model, we aimed to demonstrate that universities/institutes of higher education need to invest in and select recognized brands for developing relationships, as well as manage the corporate brand identity in the part that is more exposed to interaction with the public.

In the proposed model, the brand relationships construct was an antecedent of the corporate brand identity construct (external part), and the brand identity (external part) was an antecedent of the brand reputation construct. Corporate brand identity (external part) and reputation were latent variables. Consistent with Hair et al. (2006), Marôco (2010), and James et al. (1982), we added a parsimony fit index (PCFI) to the analysis. We selected PCFI because it represents the result of applying James et al. (1982) parsimony adjustment to the CFI:

$$\text{PCFI} = \text{CFI} \times d/db$$

where d is the degree of freedom for the model being evaluated, and db is the degree of freedom for the baseline model. Values are between [0–1], and better fits are closer to 1. Table 8 summarizes the indices of fit of the structural model:

Table 8. Summary of the indices of fit of the measurement model.

Model	χ^2	DF	p	CMIN/DF	CFI	RMSEA	PCFI
Structural model (Brand relationships; corporate brand identity (external) and reputation)	727.239	504	0.000	1.443	0.944	0.045 [0.038; 0.053]	0.847

As expected, the χ^2 was higher than the one calculated with the measurement model, because a recursive structural model cannot fit better (to have a lower χ^2) than the overall CFA. The difference between both χ^2 was quite small (727.239 − 726.149 = 1.09), demonstrating that the model was strongly

suggestive of adequate fit (Hair et al. 2006). The loadings, standardized residuals, and modification indices maintained approximately the same values. Regarding the standardized residuals: 2.704 between F4 and Rep2.2; 2.805 between R5 and C3; and 2.787 between R5 and C2.

The problematic items relating to the modification indices are:

$$-\text{R5 and C3} = 11.752$$

These small differences did not require further analysis, because, at this stage, the focus was on diagnosing the relationships among constructs. A good model fit alone is insufficient to support a structural theory. It is also necessary to examine the individual parameter estimates that represent each specific hypothesis (Hair et al. 2006). Table 9 summarizes the main indicators and conclusions.

Table 9. Structural equation model results.

Relationships between the Constructs			Regression Estimates			Statistics		
			Unstandardized	S.E.	Standardized	C.R.	*p*-Value	Decision
External Corporate Brand ID	<—	Brand relationships	0.652	0.135	0.876	4.830	<0.001	H2 supported
Physical	<—	External Corporate Brand ID	1.000		0.421			
Relation	<—	External Corporate Brand ID	1.419	0.302	0.762	4.695	<0.001	
Reflected consumer	<—	External Corporate Brand ID	1.185	0.242	0.797	4.890	<0.001	
Trust	<—	Brand relationships	1.000		0.801			
Motivation	<—	Brand relationships	0.625	0.093	0.771	6.698	<0.001	
Commitment	<—	Brand relationships	1.031	0.144	0.937	7.156	<0.001	
Reputation	<—	External Corporate Brand ID	1.302	0.260	0.824	5.012	<0.001	H3 supported

Notes: S.E.—standard error; CR—Critical ratio.

Examining the paths among constructs showed that they were all statistically significant in the predicted direction. The path that represented the weight between brand relationships and external corporate brand identity was characterized by βBR.ECBI = 0.652; S.E. = 0.135; βBR.ECBI = 0.876; $p < 0.001$. This means that the regression weight for brand relationships in the prediction of external corporate brand identity was significantly different from zero at the 0.001 level (two-tailed). The path that represented the weight between external corporate brand identity and reputation was characterized by βECBI.Rep = 1.302; S.E. = 0.260; βECBI.Rep = 0.824; $p < 0.001$, meaning that the regression weight for external corporate brand identity in the prediction of reputation was significantly different from zero at the 0.001 level (two-tailed).

We analyzed the variance explained estimates for the endogenous constructs in Table 10 and found that the predictors of the physical construct explained 17.7 percent of variance. This means that the error variance of the physical dimension was approximately 82.3 percent of the variance of this dimension itself. As for the other constructs, no problems were found. We can conclude that our model supported both Hypotheses 2 and 3. Therefore, the relationships among brands (brand relationships) influenced external corporate brand identity, and later, the brand reputation.

Table 10. Squared correlations (R^2).

Endogenous Construct	R^2
External Corporate Brand ID	0.768
Physical	0.177
Relation	0.581
Reflected consumer	0.636
Trust	0.641
Motivation	0.595
Commitment	0.878
Reputation	0.680

Because theory has become essential in assessing the validity of a structural model, we examined an equivalent model, with the purpose of testing an alternative theory. For the previous model, we dropped the physical dimension, for comparison purposes. In line with these findings, we accepted the second and third hypotheses and concluded that the brand relationships construct influences the external part of corporate brand identity (H2) and that the brand identity influences brand reputation (H3). Therefore, the management of corporate brand identity depends on the investment and selection of strong relationships with reputed brands, to attract students and increase brand reputation.

5. Discussion and Conclusions

This study presents empirical findings in the field of higher education branding, where studies are mainly limited to business schools (Balmer and Liao 2007; Priporas and Kamenidou 2011; Suomi 2014; Vidaver-Cohen 2007). It contributes to filling a gap in the literature regarding the relationships among brands, as well as their influence on brand identity management and reputation. Students' perceptions of relationships among their higher education institutions indicate that the concept of brand relationships is formed by three dimensions: trust, commitment, and motivation. Trust and commitment are also considered relevant variables in the car industry (Morgan and Hunt 1994), as well as in a branding context: development of a scale to brand confidence (Gurviez and Korchia 2002).

The relationships concept has been traditionally positioned in the theory of networks among companies (Ford et al. 2003; Hakansson and Ford 2002; Hakansson and Snehota 1989, 1995); however, although the literature may acknowledge corporate brand identity's influence on the organizational identity (Hakansson and Snehota 1989, 1995), empirical research on this topic is scarce. An initial step is to further examine the relationships and clients' experience (Keller and Lehmann 2006). This study empirically supports the statements of Hakansson and Snehota (1989, 1995), by connecting brand relationships with the corporate brand identity construct.

This finding empirically proves that brand identity can also be managed by issues considered external to identity.

Previous researchers have established links between corporate brand and reputation (de Chernatony 1999), as well as between brand identity and reputation (de Chernatony and Harris 2000); and between reputation, satisfaction, and loyalty (Helm 2007). But few authors have examined the links among brand relationships and the impact of those relationships on corporate brands' identity or reputation. Our research establishes these missing links by empirically testing this impact. It is important to analyze brands in the services sector, because of its particular characteristics, especially the intangibility of the relationships that allow services to materialize. We particularly selected higher education because of its higher consumer involvement. In the higher education context, students are internal stakeholders and consumers at the same time. It is our own view that students' base part of their appreciation of the university/institution they attend on the relationships it has with other recognized brands, by means of trust, commitment and motivation. Such features improve the visibility of the reflected consumer and their image in society.

We measured the external corporate brand identity in line with the proposed definition of external brand identity by Kapferer (1986, 2008). We concluded quantitatively that the three dimensions:

relation, reflected consumer and tangible physical, make sense together and that there is a higher external dimension formed by these three factors. This a very important input for academics and also for brand managers in order to adapt the external dimensions of the corporate brand identity to their publics. Moreover, the use of quantitative methods allowed us to find a higher dimension called corporate brand identity, formed by five of the six factors proposed by Kapferer (1986, 2008): self-image, personality, relation, reflected consumer and tangible physical. The brand identity prism of the mentioned author also includes the culture dimension. We also included it in this research by using the findings revealed by Deshpande et al. (1993). We were able to identify the perceived culture by each student regarding their university/institution. In line with this, we demonstrated that cultures perceived as being performance oriented develop more salient corporate brand identities (measured by the model fit). We divided the sample into two groups in accordance with Deshpande et al. (1993) and verified that the sample compound by the students that perceived their university/institution as being performance oriented revealed better identity salience than the other sample. We consider this of great importance to the management of brand identity in universities/higher education institutions. It reveals the power of the students' perceptions and its influence in the corporate brand identity dimensions. The perceptions regarding brand culture must be managed by the brand managers so as to create the desired perceptions in the students making the desired corporate brand identity coincident with the existing one. This finding also reveals the influence of the culture dimension in the other dimensions of the corporate brand identity, something that we have not found in previous studies.

This research also revealed the importance of joining qualitative and quantitative methodologies and proved that the latter is also applicable to a field of studies where quantitative studies are scarce.

As far as our knowledge is concerned, it is the first time that the brand identity prism developed by Kapferer (1986, 2008) is measured in the mentioned context.

6. Limitations of the Research, Future Directions and Contributions

Even though the sample of engineering students was adequate for the purposes of this research, it would be extremely useful to compare these findings with those of other samples, consisting of students with other characteristics. Such studies would confirm our findings and improve generalizability. A new perspective of the physical dimension in the brand identity prism was revealed. We named it "Intangible Physical". This dimension is present in the physical dimension defined by Kapferer (1986, 2008). Yet, taking in account the used sample, the research revealed that this dimension, although valid and reliable, did not show enough discriminant validity to be considered a single differentiated factor. Therefore, we consider that other samples with different characteristics should be studied. Furthermore, other services with high levels of consumer involvement should be tested for generalization purposes, such as insurance or medical services.

Regarding the contributions to the literature and to brand management, the conclusions of this research highlight the importance of designing, choosing, and investing in relationships with brands. These relationships should be coherent with the desired brand identity and reputation, in such a way that they cocreate value for stakeholders. The brand managers of higher education corporate brands should pay more attention to the process of engaging with other brands that are perceived by students and stakeholders as providing value to their institution.

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Corporate Governance Quality, Ownership Structure, Agency Costs and Firm Performance. Evidence from an Emerging Economy

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Abstract: The purpose of this paper is to investigate the effect of corporate governance quality and ownership structure on the relationship between the agency cost and firm performance. Both the fixed-effects model and a more robust dynamic panel generalized method of moment estimation are applied to Chinese A-listed firms for the years 2008 to 2016. The results show that the agency–performance relationship is positively moderated by (1) corporate governance quality, (2) ownership concentration, and (3) non-state ownership. State ownership has a negative effect on the agency–performance relationship. Various robust tests of an alternative measure of agency cost confirm our main conclusions. The analysis adds to the empirical literature on agency theory by providing useful insights into how corporate governance and ownership concentration can help mitigate agency–performance relationship. It also highlights the impact of ownership type on the relationship between agency cost and firm performance. Our study supports the literature that agency cost and firm performance are negatively related to the Chinese listed firms. The investors should keep in mind the proxies of agency cost while choosing a specific stock. Secondly; the abuse of managerial appropriation is higher in state-held firms as compared to non-state firms. Policymakers can use these results to devise the investor protection rules so that managerial appropriation can be minimized.

Keywords: corporate governance; ownership concentration; agency cost; firm performance; dynamic panel model

1. Introduction

Opportunistic managers, rather than maximizing the shareholder's wealth, tend to misuse the organizational resources for their own benefit. A good set of governance practices and ownership structures can mitigate the conflict of interest between the principles and the agents, hence enhancing the firm value. The purpose of this paper is to investigate the effect of corporate governance quality and ownership structure on the relationship between agency cost and firm performance. This is one of the few studies to explore the relationship between agency costs and firm performance in a dynamic modeling approach. Specifically, this study aims to address the following research questions: (1) Does corporate governance quality mitigates the relationship between agency cost and firm performance? (2) How do ownership concentrations affect the relationship between agency cost and firm performance? (3) How do state and non-state companies moderate the relationship between agency cost and firm performance?

Data is extracted of 2248 Chinese A-listed companies for the period 2008–2016. Using both fixed effects and dynamic panel generalized methods of moment estimation, the results show that agency cost is negatively related to firm performance. At the same time, corporate governance and ownership concentration enhances firm performance. When corporate governance and ownership concentration are taken as a moderating variable, we find a positive impact on the agency–performance relationship. We also studied the effect of ownership type on the association between agency cost and firm performance. Non-state ownership positively moderates the relationship between agency cost and firm performance. In contrast, the agency cost keeps its negative sign when the state ownership is taken as a moderating variable. Our conclusions are supported by taking alternative measures of independent variables for robustness.

2. Background of the Study

The motivations for this study can be broken down into the following aspects: (1) Why China should be used as the test case to conduct this research. (2) Why corporate governance quality matters in an emerging economy like China. (3) Why dynamic panel modeling approach was used in this study. The following Sections 2.1–2.3 briefly discuss these questions.

2.1. Why China?

Emerging markets are prone to managerial discretion to a greater extent compared to in Anglo-American countries. Managers in these economies tend to manage funds inefficiently, which directly affects firm performance. Compared to developed economies, the extent of agency cost is different in emerging economies, specifically in China. Many researchers have used the proxy of agency cost based on either the managerial discretion or ineffective use of shareholder's funds.

We chose Chinese listed firms for this study because China's market for corporate control and the stock market mechanism is unique. Established in the early 1990s, the Chinese stock market was used as a vehicle to transform the "planned economy" to a "market economy." The Chinese Securities Regulatory Commission (CSRC hereafter) under the umbrella of the Chinese government made these reforms possible. Chinese listed firms rely heavily on internal financing, such as retained earnings, rather than external funding. The reliance on internal financing gives managers discretion to manipulate funds for self-empire building or investing inefficiently.

During the wave of recent privatization, about 60% of the Chinese market is still under the direct or indirect control of the state. The word corporatization is used instead of privatization by Lin (2001). He suggested that although the market for corporatization falls in the hands of the state, the firm's governance will be improved. The corporatization process has made it difficult for stakeholders to distinguish between state-held and non-state-held companies (Milhaupt and Zheng 2015). State control leads to more market power and easy access to external financing, which ultimately leads to a considerable amount of funds at the disposal of managers. Firms with concentrated state ownership behave differently when compared to non-state firms. For this purpose, the agency cost in state-owned institutions is much higher than in privately held firms. Clarke (2003) suggested that state-owned enterprises lack any clearly defined principles, which incites managers to fulfill their interest rather than the interest of the shareholders. Additionally, these managers have strong political backing, which makes them unaccountable for their actions. Therefore, as described by Ding et al. (2007), the performance of state-held firms falls well short of that of privately owned firms. Based on the argument above, we try to answer the research question, whether the ownership type affects the agency–performance relationship or not?

2.2. Why Governance Quality Matters in China

In 2001, China became a member of the World Trade Organization (WTO) and adopted the Organization for Economic Co-operation and Development (OECD) principles of corporate governance and started improving the corporate governance of its listed companies. CSRC, in cooperation with

National Trade and Economic Commission, issued the code of corporate governance in 2002. The laws were based on the principles of investor protection and the code of conduct of the directors and managers. A continuous improvement took place that led the listed companies to shift the reporting from Chinese Accounting Standards to the International Accounting Standards in 2006. A two-tier board system is a unique aspect of the Chinese corporate governance mechanism. A one-tiered system such as that of USA has all the directors (executives and non-executives) being part of one Board, known as the Board of directors. In the two-tier board system, there is an executive board (consisting of all executive directors) and a supervisory board (consisting of all non-executive directors). The CSRC has taken many steps for the good of corporate governance in listed companies and to protect minority shareholders. Now companies are being encouraged to have at least one third independent directors on Board, the information disclosure act (2007) was explicitly introduced during IPO, and rules relating to shareholder meetings (2006) related to the convening of shareholder meetings and their resolution were introduced. Most of the state and legal person companies were either fully or partially privatized during this transition period.

The steps taken by CSRC to improve the corporate governance mechanism in China are remarkable. They can be used as one of the tools to curtail the opportunistic behavior of the managers. As an emerging economy, the Chinese market is still in the earliest steps of adopting good corporate governance practices.

2.3. Why Dynamic Panel Data?

The traditional agency framework was reexamined outside the jurisdiction of the Anglo-Saxon market, especially in the emerging markets. The development in the corporate governance literature has suggested that the governance variables plays an important part (endogenously) in the value maximization process of the shareholders (Nguyen et al. 2015). The agency cost can affect firm performance. Still, due to the link between the agency cost and firm governance variables, we cannot be sure about the relationship, e.g., studies have shown that state ownership is positively related to the presence of agency cost (Wei et al. 2005). Therefore, a dynamic model is required to cater to the endogeneity problem, specifically in the case of China, where investor protection is weak. Additionally, the motivation for using a dynamic panel model in the corporate governance literature is derived from the recent calls by Zhou et al. (2014) and Nguyen et al. (2015).

3. Literature Review

3.1. Theoretical Literature Review

Two sets of approaches in literature have been distinguished by the researchers to mitigate the agency problem. The first approach is the refraining approach, which proposes that the manager's interest could be aligned with that of the shareholders only if they are forced to refrain from opportunistic behavior. The refraining approach consists of leverage (Emanuel et al. 2003; Malmquist 1990; Siregar and Utama 2008), dividend payment (Easterbrook 1984; Lang and Litzenberger 1989), the risk of corporate takeover (Bethel and Liebeskind 1993; Shleifer and Vishny 1991), a strong board structure (Bathala et al. 2017; Jackling and Johl 2009; Miller 2002), independent audit committees (Collier and Gregory 1999; Islam 2010), well-reputed external auditors (Eshleman and Guo 2014; Hope et al. 2012), and oversight by institutional shareholders (Singh and Davidson 2003).

The second approach is known as the encouraging approach, and motivates the managers to do desirable actions. This approach includes performance-based remuneration (Abowd 1990) and employee stock ownership programs (Fox and Marcus 1992; Nikoskelainen and Wright 2007; Singh and Davidson 2003). Agrawal and Knoeber (1996) suggested a different agency-mitigating mechanism and concluded that a single measure could be misleading. Shan (2015) prepared a corporate governance index for eight different corporate governance measures and explored their effect on earnings management and value relevance. Our study also focusses on the design of the corporate governance index, consisting of agency-mitigating variables, and investigates the impact of corporate

governance in moderating the relationship between agency cost and firm performance. The result shows that an effective monitoring mechanism (corporate governance quality) can align the interests of shareholders and managers.

Studies on ownership concentration and firm performance follow two contradicting theories. The monitoring argument implies that in the presence of weak governance mechanism, the majority shareholders helps in reducing the agency cost and increasing the overall firm value (Porta et al. 1999; Shleifer and Vishny 1986; Bhagat et al. 2017; Su et al. 2008; Li et al. 2008). The principal–principal theory states that the minority shareholders are exploited when the control of the ownership lies with the majority shareholders. They are the key decision-makers and appoint the management based on personal preferences. The management works to maximize value for the majority shareholders, while the minority shareholders are continuously overlooked (Denis and McConnell 2003; Hu and Izumida 2009). China is regarded as an emerging economy with corporate governance procedures still at an evolving stage. Shareholders are subject to managerial expropriations, and hence concentrated ownership may help mitigate the agency problem.

3.2. Empirical Literature Review and Hypothesis Development

3.2.1. Agency Cost and Firm Performance

Emerging markets are prone to managerial discretion to a greater extent compared to Anglo-American countries. The managers in these economies tend to manage the funds inefficiently that directly effects the firm performance. Compared to developed economies, the extent of agency cost is different in emerging economies, specifically in China. Many researchers have used a proxy of agency cost based either on managerial discretion or effective use of shareholder funds. The proxies for agency cost mostly used in China are discretionary accruals as a mean to earnings management (Wang et al. 2015; Wang and Campbell 2012; Guo and Ma 2015), free cash flow coupled with low growth opportunities (Chung et al. 2005b; Chen et al. 2016; Chiou et al. 2010), research and development expenditure (Shust 2015; Dinh et al. 2016; Ruiqi et al. 2017), and administrative expense ratio, which usually includes executives' salaries, travelling allowances, conference levies, etc. (Li et al. 2008; Huang et al. 2011; Zhang et al. 2016).

Most of the literature cited on the relationship between the agency cost and firm performance has established a negative relationship. For example, management earnings lead to the negative market performance of firms listed in Hong Kong (Ching et al. 2006). Higher levels of leverage in terms of short-term debt and long-term debt also have a negative effect on firm performance (Yazdanfar and Öhman 2015). A study conducted by Lang et al. (1995) showed that managers' discretion in selling assets led to lower firm performance. Khidmat and Rehman (2014) empirically tested the relationship between agency cost and firm performance in the emerging economy of Pakistan. They found a negative association between the selling and administrative expense ratio and firm performance. The Chinese market is prone to agency cost, and we expect a negative effect of agency cost on Chinese listed firm performance.

H1. *Agency costs have a negative effect on the firm performance.*

3.2.2. Corporate Governance, Agency Cost, and Firm Performance

Managers' opportunistic behavior increases their wealth, which leads to a decrease in firm performance. This opportunistic behavior of managers can be curtailed through a good set of internal and external corporate governance principles. Leverage is considered to be an agency mitigating mechanism, as outsiders monitor the actions of managers with respect to efficient contracting (Jensen 1986; Lang et al. 1995; Malmquist 1990). Debt covenants are considered an essential part of efficient contracting that, in addition to active monitoring, prevents specific risk-taking activities by management. All these efforts reduce the agency cost on one hand, while the value of the firm is increased on the other.

Dividend policy is also considered to be an agency mitigating variable, as elaborated by Ghosh et al. (2000). Two ways in which shareholder wealth can be maximized, either by increasing the share price by investing in value-enhancing projects or by distributing the excess cash in the form of dividends if managers fail to identify value-maximizing projects. Managers try to gain hold of the firm's resources when they have no positive NPV projects; hence, the agency cost of free cash flow occurs. In this case, dividends play an essential role in alleviating the agency problem (Jensen 1986). Porta et al. (2000) claimed that with the country having low investor protection, dividend policy becomes a robust governance mechanism for alleviating agency cost.

Studies have shown the effects of different board characteristics on firm performance in emerging economies (Borlea et al. 2017). A strong and independent board structure aligns the interest of managers and shareholders. Jackling and Johl (2009), in their study, concluded that from the perspective of agency theory, having independent directors on the Board enhances firm performance. Independent directors not only the have experience and the knowledge required to scrutinize the opportunistic behavior of the managers, but can also dissent from the other board members if they find any irregularities (Marchetti et al. 2017). The literature has shown mixed results regarding the size of the board, e.g., Mappadang et al. (2018) found that larger board size led to tax avoidance. Some studies have suggested that the optimal board size is either very small or very large (U-shaped), when assessed with respect to performance (Coles et al. 2008). However, a study conducted by Beiner et al. (2004) shows that the choice of the board size is dependent on environmental factors. Pearce and Zahra (1992) suggested that large boards were characterized by efficient monitoring and had a larger impact on corporate performance than small boards. Similarly, in advanced economies, studies have shown a positive association between board size and firm performance (Guest 2009). In the context of the Chinese market, board size has a negative impact on risk taking (Huang and Wang 2015; Haider and Fang 2016). Since board size leads to less risk taking in Chinese listed firms, we can propose that managerial appropriations can be curtailed through having a larger board size, thus boosting firm performance. CEO duality is taken as an important component of board characteristics, and generally, empirical research has shown that the separation of the CEO and the chairman results in an alleviation of the agency cost (Goyal and Park 2002; Kula 2005; Lei et al. 2013). Board diversity is also considered an important element of corporate governance. Research has shown that the representation of females on the board reduces the agency cost and enhance the firm value. For example, the relationship between gender diversity and firm performance in Chinese listed firms was investigated by Sial et al. (2018a). They concluded that board diversity influences firm performance, and that corporate social responsibility mediates the relationship. Similarly, research conducted by Sial et al. (2019) highlighted the importance of gender diversity in moderating the relationship between corporate social responsibility and earnings management. Board activity has a significant negative effect on agency costs. Frequent meetings of the Board of directors mean that they are actively involved in the matters of the company, and managers refrain from self-empire building (Ma and Tian 2009; Sahu and Manna 2013).

Some other corporate governance variables, in addition to board structure, also help in mitigating agency cost. The presence of an audit committee with independent members can proactively identify misappropriations in the financial records and can play a significant role in mitigating the agency problem. The agency cost is reduced when an independent committee is devised voluntarily (Collier and Gregory 1999). Additionally, it enhances firm value (Chan and Li 2008). A well-reputed and experienced external auditor can carefully scrutinize the financial statements. They have the required expertise, as well as having market knowledge of harmful financial practices. A Big Four auditor can mitigate the agency cost, as well as help in enhancing the firm value (Eshleman and Guo 2014; Hope et al. 2012). Some researchers have shown a profound effect of corporate social responsibility (CSR) on firm performance. The study conducted by Sial et al. (2018b) suggested CSR to be an important determinant of corporate governance in enhancing the firm performance. However, the earnings management had the negative impact on the relationship between CSR and firm performance.

The encouraging approach to agency cost states that managers can be motivated to carry out specific desirable behavior. Jensen and Meckling (1976) proposed the convergence of interest hypothesis, in which managers who were given stock ownership have a better effect on firm performance. Brander and Poitevin (1992) explained that the terms offered in the compensation contract reduced the agency cost. In China, the same results were established by Zhang et al. (2016), who concluded that the perks of senior executives were negatively related to the agency cost. Managerial ownership is one of the ways to align the interest of the shareholders and managers. By having an ownership stake in the company, the managers would now take ownership of the company and would do their best to increase its value. However, in the literature, this relationship has not been not found to be linear. Still, there is a monotonic relationship, which suggests that at a lower level of managerial ownership, the agency cost is reduced, but the agency cost increases when a certain level of managerial ownership is reached (Jensen and Meckling 1976; McConnell and Servaes 1990).

Many recent studies have examined a combination of agency mitigating governance variables instead of focusing on the effect of an individual variable. Agrawal and Knoeber (1996) suggested a different agency mitigating mechanism and concluded that a single measure could be misleading. Shan (2015) prepared a corporate governance index for eight various corporate governance measures and explored their effect on earnings management and value relevance. Achim et al. (2016) investigated the effect of overall corporate governance quality in the performance of Romanian firms. They found a positive association between the governance quality and business performance in the emerging economy. This study focuses on the design of the corporate governance index comprising agency mitigating variables, and examines the impact of corporate governance in moderating the relationship between agency cost and firm performance. Dey (2008) used seven different proxies of agency conflict and generated seven principal factors from 22 individual governance variables. She concluded that the existence and role of governance mechanism is a function of the level of agency conflict in the firm. The link between corporate governance, agency cost and the firm performance is elaborated in Table A1, Appendix A.

From the literature above, we establish the link between corporate governance variables, agency cost and firm performance. The corporate governance quality mitigates the corporate expropriation through efficient monitoring. The corporate governance is also linked with better performance specifically in emerging markets (Klapper and Love 2004). With effective corporate governance mechanisms, the agency cost can be curtailed, while higher firm performance can simultaneously be achieved. Based on the link between corporate governance attributes and agency cost reduction, as well as the positive association between the corporate governance dimensions and firm performance, we can devise our hypothesis:

H2. *Corporate governance quality moderates the agency–performance relationship.*

3.2.3. Ownership Concentration, Agency Cost, and Firm Performance

The literature on ownership provides two contradicting theories with respect to ownership concentration and the agency problem. The first theory is based on efficient monitoring. The theory postulates that the majority shareholders have more stake in the firm. They are more vigilant than the minority shareholders. Their monitoring skills make them distinct from the rest of the minority shareholders. Due to efficient monitoring, they are able to reduce managerial expropriation. The second theory, known as principle–principle agency theory, postulates that the majority shareholders exert undue power on management to obtain their own benefits. The minority shareholders are hence exploited by the managers as well as the majority shareholders (Denis and McConnell 2003; Hu and Izumida 2009). In countries where the corporate governance mechanism is weak, ownership concentration works as a substitute for corporate governance (Porta et al. 1999). An increase in ownership concentration leads to shareholder activism. Therefore, agency costs can be reduced (Kroll et al. 1993; Li et al. 2008; Su et al. 2008). As the percentage of individual ownership increases in the firm, more individuals are inclined to incur monitoring costs (Porta et al. 1997).

Ma et al. (2010) studied the effect of ownership concentration and firm performance in Chinese listed companies. They found a positive impact of ownership concentration and firm performance, irrespective of who the majority shareholder was. Heugens et al. (2009) performed a meta-analysis of the relationship between ownership concentration and firm performance in Asian countries. They concluded a positive association between the two variables. They further elaborated that ownership concentration was an active corporate governance mechanism for protecting the minority shareholders from managerial appropriation.

In summary, concentrated ownership is linked with better firm performance in emerging economies (Heugens et al. 2009). The concentrated ownership structure helps in the protection of the minority shareholders from the managerial expropriation. Based on the alignment of interest argument, the concentrated ownership mitigates the agency cost in the emerging economies, resulting in improved performance (Chen 2001). The link between ownership concentration, agency cost, and firm performance is stated in the following hypothesis:

H3. *Ownership concentration moderates the agency–performance relationship.*

3.2.4. Ownership Type, Agency Cost, and Firm Performance

Although ownership concentration has a significant effect on alleviating the agency problem, different studies have shown that it depends upon the type of majority shareholder. The objective of the government is to provide employment and social solidity in the economy. In this way, a conflict of interest arises between state-owned enterprises and shareholders (Chong-En et al. 2002). As illustrated by Gunasekarage et al. (2007), the performance of firms decreases if the ultimate shareholder is the state. State-owned companies have substantial market power, easy access to finance, and less monitoring, which makes them difficult to default (Li et al. 2008). Keeping in view the agency perspective, many researchers have found a negative relationship between state ownership and firm performance (Chen 2001; Jia et al. 2005; Wei and Varela 2003; Xu and Wang 1999).

Clarke (2003), in his article "Corporate Governance in China: An Overview", demarcated the objectives of state-owned firms as the generation of employment, direct control over strategic industries, and politically motivating employment. This results in state-owned firms having a suboptimal level of performance and higher agency costs. According to Xu and Wang (1999), the ownership concentration in Chinese listed companies is positively related to firm performance. Additionally, state-owned firms have an adverse effect on firm performance and labor productivity. Similarly, Chen et al. (2016), in their study, investigated the impact of free cash flows and corporate governance characteristics on a firm's investment decisions, using data from 865 Chinese listed firms. The results showed that state ownership concentration boosted over-/underinvestment, while firms with good governance attributes mitigated the over-/underinvestment. On a similar note, Huang et al. (2011) examined the effect of agency cost on the relationship between top executives' overconfidence and investment–cash flow sensitivity. Their results showed that investment–cashflow sensitivity was higher in state-owned companies.

Furthermore, they constructed an agency cost proxy and concluded that the agency cost was higher in state-owned companies. A comparative study between state and non-state firms and their effect on earnings management was carried out by Ding et al. (2007). They analyzed 273 privately owned and state-owned companies. They concluded that the privately owned companies tended to maximize their earnings more than the state-owned companies, despite the reported discretionary accruals reported in non-state companies exceeding those of the state-owned companies.

In summary, state-owned firms in China are characterized by having higher agency costs. Hiring in Chinese firms is based on political connections (Jonge 2014). The performance of non-state firms is better than that of state-owned firms (Hess et al. 2010). The effect of state ownership on agency cost and firm performance will be different from that of non-state ownership.

Accordingly, our next hypothesis would be as follows:

H4. *State (non-state) ownership negatively (positively) moderates the agency–performance relationship.*

4. Research Design

4.1. Data Collection

The data collection started by taking all the Chinese A-listed firms over the period 2008 to 2016. However, we dropped firms based on the following criteria: (i) Firms belonging to financial sector. These firms have different accounting mechanisms and are not subject to current data collection process. (ii) Firms with ST (special treatment) and PT (particular treatment) status. These firms are financially distressed and may give spurious results. (iii) Firms with missing values for dependent, independent or control variables. (iv) We winsorized 1% of the data from upper and lower values to control for outliers. After all the adjustments, the final sample comprised 2248 firms. The data was extracted from the Chinese Stock Market and Research (CSMAR) database.

4.2. Model Specification and Estimation Techniques

The fixed-effects model and system GMM proposed by Blundell and Bond (1998) were used to test our hypothesis and cater to the un-observed endogeneity problem (Nakano and Nguyen 2013; Nguyen et al. 2014).

In the first equation, we want to explore the effect of agency cost and corporate governance on firm performance.

$$FP_{it} = \alpha_o + \alpha_1 AC_{it} + \alpha_2 CGQ_{it} + \sum \alpha_n CTR + \mu_o \quad (1)$$

where FP represents firm performance and has more than one measure, AC is the measure of agency cost, while CGQ is the corporate governance quality index. CTR represents the control variables used in the equations.

We added the interaction term in Equation (1) to capture the impact of corporate governance quality and ownership structure on the relationship between agency cost and firm performance.

$$FP_{it} = \alpha_o + \alpha_1 AC_{it} + \alpha_2 CGQ_{it} + \alpha_2 \left(AC \times Moderators_{it}\right) + \sum \alpha_n CTR + \mu_o \quad (2)$$

where the moderators are corporate governance quality, ownership concentration, and ownership type, respectively.

The financial performance of the firm is time-dependent, i.e., the current performance of the firm is affected by the past performance and testing the effect of two-year lagged performance on current performance does not give us a significant impact. This leads us to conclude that the AR (1) dynamic panel model is sufficient. The literature on corporate governance suggests that corporate governance, as well as ownership structure, are endogenously determined (Nguyen et al. 2015). Therefore, this study first uses the fixed effect model to control the governance variables when estimating the agency–performance relationship. However, the use of a fixed-effect estimator does not eliminate the endogeneity lag performance measures. Following Nguyen et al. (2015), this study uses the system GMM recommended by Blundell and Bond (1998). The major advantage of constructing the system GMM estimator is that it enhances the power of estimation (Hoechle et al. 2012).

4.3. Dependent Variables

Following Le and Buck (2011), we incorporated two measures of performance return on assets (ROA) and earnings per share (EPS) as dependent variables. We decided to include only the book measures of performance as the market measure of performance lacks accuracy and precision of valuation (Le and Buck 2011; Park and Luo 2001; Wan and Yuce 2007).

4.4. Independent Variables

Agency Cost

Our first independent variable is the proxy for different agency cost measures. We measured the agency cost as the ratio of administrative expense to sales. The administrative expense includes the majority of the costs that have been incurred by the management, such as salaries, executive travel allowances, entertainment expenses, conferences and tour expenses, welfare payments, utilities, and other expenses that fall under this category. According to Li et al. (2008), Chinese managers misuse administrative expenses in automobiles, lavish office designs, recreational activities, and traveling. Therefore, administrative overhead can be regarded as a close proxy of agency costs.

Free cash flow is also considered to be a determinant of agency costs (Jensen and Meckling 1976). Still, the financial flexibility view suggests that managers intentionally keep a higher proportion of cash to meet future needs (Arslan-Ayaydin et al. 2014). An alternative definition of free cash flow as a measure of agency cost was used by Rahman and Mohd-Saleh (2008). First, we calculated free cash flow and growth opportunities following Chung et al. (2005a). Then, we created a dummy variable for agency cost that took the value of 1 if the firm in a particular industry in a specific year had free cash flow in excess of the industry median and a price-to-book ratio less than the industry median.

Three additional variables for measuring the extent of agency cost were provided as a robust check of our results. Earnings management, measured by absolute discretionary accruals following Dechow et al. (1995), is considered to be a proxy of agency cost. Research has determined that firms having high agency costs tend to manage their accruals (Christie and Zimmerman 1994; Teoh et al. 1998; Cormier and Martinez 2006). Next, we measured research and development expenditure (R&D-AC). R&D-AC is a dummy variable that takes the value of 1 if the firm 'i' in the year t has a price-to-book ratio less than the industry median and research and development expenditures higher than the industry median. Finally, we constructed an agency cost index through principal component analysis. We took the first principle component as the measure of agency cost.

4.5. Corporate Governance Quality

The second independent variable used in this study was the corporate governance quality index. Due to the adoption since 2007 of the new accounting standards and the availability of data under the compliance and explanation statement, we constructed the index with different agency mitigating governance variables. The variables used in the construction of the index were dividend payment, board size, board independence, board diversity, board meeting, CEO duality, Big Four auditor, managerial ownership, managerial compensation, institutional investors, number of commissions established, and separation of control rights and cashflow rights. The collection of corporate governance variables data was based on the study conducted by Shan (2015), who developed a governance index for Chinese listed firms. The detailed measurement of these variables is given in Table 1 below. Following Achim et al. (2016), we used the compliance and explanation statement for the measurement of corporate governance index.

Table 1. Constructing the Corporate Governance Index.

Corporate Governance Mechanism	Description	Measurement with Supporting Literature
CEO Duality	When CEO is also the board chairman.	Assigned value 1 to firm i in year t if CEO Duality does not exist, 0 for otherwise (Dey 2008; Gaio 2010; Lei et al. 2013).
Independent Directors	The number of independent directors on the Board of directors	Award 1 mark if Board Independence of firm i in fiscal year t is greater than the median value of the sample in fiscal year t, 0 mark otherwise (Shan 2013; Shan and Xu 2012).
Board size	The number of directors on the Board of directors	Award 1 mark if Board Size of firm i in fiscal year t is greater than the median value of the sample in fiscal year t, 0 mark otherwise (Pearce and Zahra 1992; Berghe and Levrau 2004).

Table 1. *Cont.*

Corporate Governance Mechanism	Description	Measurement with Supporting Literature
Number of board meetings held	Total number of board meetings held.	Award 1 mark if Board Meeting held in the firm i in year t is greater than the median value of the sample in fiscal year t, 0 mark otherwise (Dey 2008; Vafeas 1999).
Female Director	If the Board has female representation or not.	Award 1 mark if firm i in fiscal year t has a female director on the Board, 0 mark otherwise (Ararat et al. 2010; Carter et al. 2003; Erhardt et al. 2003).
Managerial Compensation	Total compensation awarded to the top three highest-paid managers in the same industry.	Award 1 mark if managerial compensation paid in the firm i in year t is greater than the median value of the sample in fiscal year t, 0 mark otherwise (Lei et al. 2013).
Managerial Ownership	It is the shareholding percentage of top three officials of the firm.	Award 1 mark if managerial ownership held in the firm i in year t is greater than the median value of the sample in a specific industry, 0 marks otherwise (Chong-En et al. 2002; Agrawal and Knoeber 1996).
Dividend Payment	Measured by the dividend per share.	Award 1 mark if Dividend paid in the firm i in year t is greater than the median value of the sample in a specific industry, 0 marks otherwise (Easterbrook 1984; Porta et al. 2000).
Institutional Ownership	Measured as the ownership held by institutions in the firm	Award 1 mark if institutional ownership held in the firm i in year t is greater than the median value of the sample in a specific industry, 0 marks otherwise (Tang and Chang 2015).
Big Four auditor	Hiring a Big Four auditor	Award 1 mark if firm i in fiscal year t hires a Big Four auditor, 0 marks otherwise (Gao and Kling 2008; Lei et al. 2013).
Separation of control rights and cash flow rights	Degree of separation between the control right and cash flow right	Award 1 mark if separation between the control right and cash flow right in the firm i in year t is less than the median value of the sample in a specific industry, 0 marks otherwise (Lei et al. 2013).
Number of committees established	Total number of committees a firm has.	Award 1 mark if the Committee established in the firm i in year t is greater than the median value of the sample in a specific industry, 0 marks otherwise.

Note: The corporate governance index is made under the compliance and explanation statement rule.

4.6. Ownership Concentration

Large shareholders have a lot of stake in the company and can actively monitor the activities of the managers. The greater the degree of ownership, the more active the shareholders are (Kroll et al. 1993; Su et al. 2008; Li et al. 2008). Therefore, we measured ownership concentration as the percentage of shares held by the largest shareholder.

4.7. Ownership Type

We divided ownership type into two categories depending upon whether it was held by the state or by a non-state entity. State ownership was measured as the percentage share held by the state. Non-state ownership was defined as the percentage of shares held by non-state entities (Ding et al. 2007).

4.8. Control Variables

In this study, we controlled the firm size by taking the natural logarithm of total assets (Nguyen et al. 2014; Richardson et al. 2003). The second control variable was leverage, which was measured as the ratio of total debt to total assets (Arthurs et al. 2008). Growth opportunities also affect the firm value, so their effect was also controlled. This was calculated as the difference between current year sales and previous sales divided by the previous sales (Gill and Biger 2013). We also controlled the firm age, which was calculated as the number of years for which the firms had been listed in the stock exchange (Shan 2015). The summary of all the variables is given below in Table 2.

Table 2. Summary of the variables.

Variables	Symbol	Measurement with Supported Literature
Return on Assets	ROA	ROA is measured as the ratio of earnings before interest and taxes scaled by total assets (Le and Buck 2011; Zahra 2007; Zahra et al. 2000)
Earnings per share	EPS	EPS is calculated as the net income scaled by several shares outstanding (Zhang et al. 2014).
Independent Variables		
Administrative Expense Ratio	AC1	AC1 is measured as the ratio of administrative expenses to sales (Lei et al. 2013).
Free Cash Flows	FCFE_AC	FCFE_AC is a dummy variable that takes the value of 1 if the firm 'i' in year t has a price-to-book ratio less than the industry median and free cash flows greater than the industry median (Rahman and Mohd-Saleh 2008).
The absolute value of discretionary accruals	EM	EM is the measure of earnings management. The discretionary accruals are calculated through a modified Jones model (Dechow et al. 1995).
Research and Development expenditures	R&D-AC	R&D-AC is a dummy variable that takes the value of 1 if the firm 'i' in year t has a price-to-book ratio less than the industry median and R&D greater than the industry median.
The first principle component of agency cost variables	PC-AC	PC_AC is the first principle component generated through principal component analysis of four agency cost proxies i-e AC1, FCF_AC, EM, and R&D-AC (An et al. 2016).
Corporate Governance index	CGQ	CGQ represents the corporate governance index comprising of twelve individual corporate governance measures. The detailed calculation is discussed in Table 1 (Shan 2015; Lei et al. 2013).
Ownership Concentration	Top1	Top1 is measured as the shareholding percentage of the largest shareholder. (Su et al. 2008; Lei et al. 2013)
State	SOE	Percentage of shares held by state.
Non-state	NSOE	Percentage of shares held by non-state entity (Ding et al. 2007).
Control Variables:		
Firm Size	SIZE	The natural logarithm of total assets (Nguyen et al. 2014; Richardson et al. 2003).
Leverage	Lev	Following (Arthurs et al. 2008), we measure leverage as the book value of total debt over the book value of debt plus the book value of equity.
Growth in Sales	Growth	(Current year sales less previous year sales)/previous year sales (Gill and Biger 2013).
Firm Age	AGE	Firm's age measures the age of the firm from the first year of listing (Shan and Xu 2012).
Industry Dummy	INDUSTRY	Industry dummy shows the effect of each company listed in a particular the industry according to CSRC coding (Arora and Dharwadkar 2011; Filatotchev et al. 2007).
Year Dummies	YEAR	The year dummies represent the year effect from the year 2008 to 2016.

5. Empirical Results and Discussion

5.1. Descriptive Statistics and Multicollinearity Diagnostic

Table 3, Panel A reports the descriptive statistics of all the variables used in our methodology. The overall descriptive statistics show the mean value of performance measures used in our analysis at 4.3 percent, 6.49 percent, and 0.39 per share for ROA, ROE, and EPS, respectively. The average value of the administrative expense ratio is 9.8 percent, while the free cash flows to total assets have a negative average value of −18.7 percent of total assets. The absolute value of discretionary accruals denoted by EM has a mean value of 5.43 percent of total assets. The mean value of the corporate governance quality index represented by CGQ is 5.79. The maximum amount of the shareholding percentage of the largest shareholder (top 1) is 89.99 percent.

Table 3. Summary statistics.

	Overall Sample						State Owned						Non-State Owned					
Variables	**Obs.**	**Mean**	**SD**	**Min**	**Med**	**Max**	**Obs.**	**Mean**	**SD**	**Min**	**Median**	**Max**	**Obs.**	**Mean**	**SD**	**Min**	**Median**	**Max**
ROA	15,075	0.0430	0.0619	−1.097	0.045	2.632	8791	0.0496	0.063	−1.097	0.051	2.632	5761	0.035	0.057	−0.688	0.033	0.373
ROE	15,349	0.0649	1.646	−176.4	0.066	100.7	8925	0.0866	1.073	−1.881	0.088	100.7	5795	0.0327	2.322	−176.4	0.037	4.126
EPS	15,349	0.397	0.592	−4.828	0.399	17.82	8925	0.401	0.473	−2.880	0.42	17.82	5795	0.402	0.742	−4.828	0.421	15.38
AC1	15,349	0.0988	0.0819	0.00976	0.10	0.791	8925	0.081	0.086	0.0097	0.079	0.791	5795	0.102	0.066	0.0097	0.114	0.791
FCF/TA	14,292	−0.187	0.239	−4.333	−0.17	1.091	8006	−0.170	0.230	−2.717	−0.161	1.091	5677	−0.212	0.237	−3.615	−0.192	0.500
R&D/TA	13,591	0.0023	0.0102	0	0.0025	0.277	7870	0.0027	0.0110	0	0.0024	0.277	5187	0.0017	0.007	0	0.0019	0.170
EM	12,218	0.0543	0.0554	0.00041	0.056	0.794	7106	0.06	0.057	0.0001	0.05	0.794	4607	0.07	0.052	0.0004	0.043	0.461
CGQ	15,075	5.792	1.565	0	5.81	11	8791	6.074	1.523	1	6.061	11	5761	5.354	1.525	0	5.82	11
TOP1	15,349	35.63	15.09	2.197	35.67	89.99	8925	33.66	14.24	2.197	34.63	89.99	5795	39.42	15.49	4.159	39.25	89.09
SIZE	15,075	21.86	1.244	17.64	21.79	28.04	8791	21.49	0.981	17.64	21.41	25.86	5761	22.46	1.371	17.67	22.34	28.04
Lev	14,897	0.413	0.203	0.0460	0.42	0.903	8925	0.353	0.192	0.0460	0.38	0.903	5795	0.505	0.185	0.0460	0.53	0.903
Growth	12,219	0.173	0.362	−0.484	0.154	2.077	7065	0.198	0.372	−0.484	0.22	2.077	4635	0.136	0.338	−0.484	0.146	2.077
Firm Age	15,075	8.071	6.252	0	8.20	26	8791	5.748	5.573	0	5.712	26	5761	11.50	5.564	0	11.58	26
Governance Variables																		
Board Size	14,623	8.809	1.773	0	8.82	18	5632	9.468	1.941	0	9.78	18	8816	8.387	1.505	3	8.42	16
Board Independence	14,625	3.229	0.635	0	3.23	8	5632	3.444	0.760	0	3.47	8	8818	3.090	0.491	1	3.19	6
CEO Duality	14,681	0.263	0.440	0	0.252	1	5671	0.105	0.307	0	0.18	1	8835	0.364	0.481	0	0.352	1
Female Directors Ratio	15,075	0.167	0.106	0	0.168	0.647	5761	0.135	0.0933	0	0.11	0.600	8791	0.187	0.109	0	0.194	0.647
Board Meetings	15,064	9.526	3.727	1	9.61	46	5759	9.330	3.688	2	9.46	46	8782	9.626	3.745	1	9.66	38
Top 3 Compensation	14,877	14.15	0.726	10.71	14.18	17.45	5779	14.14	0.752	10.71	15.41	17.45	8921	14.14	0.698	11.13	14.05	17.35
Managerial ownership	14,558	14.98	3.735	3.045	14.94	21.93	5757	11.57	2.767	4.605	11.51	20.82	8646	16.63	2.945	3.045	15.93	21.93
Commission established	14,869	3.884	0.556	0	3.93	8	5780	3.889	0.620	0	3.95	7	8912	3.882	0.511	0	3.04	8
Dividend payments	15,349	0.121	0.209	0	0.132	6.787	5795	0.111	0.248	0	0.12	6.787	8925	0.131	0.183	0	0.141	3
Big 4 Auditor	14,897	0.0498	0.218	0	0.051	1	5795	0.0871	0.282	0	0.045	1	8925	0.0245	0.155	0	0.0296	1
Separation of two rights	14,825	5.543	8.070	0	5.55	53.42	5566	4.388	7.665	0	4.334	39.43	8852	6.266	8.246	0	7.07	53.42
Institutional shareholders	13,337	7.092	9.497	0	7.10	87.89	5244	8.810	12.33	0	8.91	85.77	7542	5.885	6.658	0.0020	5.72	87.89

Note: Table 3 reports the summary statistics of the variables used in Equations (1) and (2). Additionally, the Table reports the summary statistics for the state and non-state enterprises. The detailed calculations are presented in Table 1. The detailed measurements of governance variables are presented in Table 2.

We divided the descriptive statistics into two more panels based on state ownership and non-state ownership. The mean values of ROA, ROE, and EPS in Non-SOE (4.9 percent, 8.6 percent, and 4.01 respectively) are higher than those of the SOE (3.5 percent, 3.27 percent, 4.02 per share respectively). State-owned enterprises have a higher level of absolute discretionary accruals (0.07 > 0.06), as well as a higher administrative expense ratio (0.102 > 0.081) compared to non-SOE. The non-state companies have a better corporate governance score of 6.07 compared to state companies, which have a score of 5.35. The state-owned companies are larger (22.46 > 21.49), as well as having a higher average leverage (0.505 > 0.353), than non-state-owned companies.

Panel B presents the descriptive statistics of the corporate governance variables used in this study divided into three groups: Overall, State, and Non-State. The A-listed companies from the period 2008 to 2016 have an average independent director of 3.29, reported CEO duality of 26.27 percent of the total sample, average board size of 8.8, while 16.7 percent on average present female representation on the board. On average, non-state firms pay a higher level of dividends (0.13 > 0.11), have a higher female ratio on the board (0.18 > 0.13), have higher managerial ownership (16.63 percent > 11.57 percent), and a higher degree of separation between control rights and cash flow rights (6.26 percent > 4.38 percent) as compared to state-owned companies. All these governance attributes lead to a better governance environment, resulting in less managerial expropriation. State-owned companies have a greater board size (9.46 > 8.38), more institutional ownership (8.8 > 5.8), more access to getting audited by Big Four auditors (0.087 > 0.02) and more independent directors on the board (3.44 > 3.09).

Table 4 shows the results for pairwise correlation analysis. Looking at all of the independent variables, we find no sign of multicollinearity, as the values of the coefficients are less than 0.8. Additionally, we performed individual VIF analysis and found all the values to be less than the critical level of 10 in every case (Shan 2015). When performing the regression analysis for the moderating effect, the interaction term usually gives a value for VIF greater than 10. Following Allison (2010), we mean-centered the interaction terms (agency cost variables and their interaction with CGQ, Top1, SOE, and NSOE). The use of mean centering does not affect the probability values, and at the same time, the multicollinearity is reduced, as seen from Table 5. All the dependent variables are positively correlated with corporate governance quality. On the other hand, the agency cost proxies are negatively related to the performance measures. Ownership concentrations also have a positive association with the firm performance.

5.2. Moderating Effects of Corporate Governance Quality

Table 6 shows the effect of corporate governance and agency cost on firm performance by using the fixed-effect model and system dynamic panel data estimation. ROA and EPS were the dependent variables, while agency cost and corporate governance were the independent variables. Four variables, namely, Size, Leverage, Growth, and Firm age, were used as control variables. The asset size used has a positive effect on firm performance while, on the contrary, a higher level of leverage hampers performance. These results are similar to the study conducted by Vithessonthi and Tongurai (2015).

Table 4. Correlation analysis.

	ROA	EPS	AC1	FCF-AC	R&D-AC	EM	F1	CGQ	Top1	SOE	NSOE	SIZE	LEVERAGE	GROWTH	FIRM AGE
ROA	1														
EPS	0.5956 *	1													
AC1	−0.1460 *	−0.1453 *	1												
FCF-AC	−0.0344 *	−0.0495 *	−0.0610 *	1											
R&D-AC	−0.0605 *	−0.0245 *	−0.0011	0.1738 *	1										
EM	−0.0302 *	−0.008	0.0036	−0.0556 *	−0.0258 *	1									
F1	−0.0728 *	0.0118	0.017	0.5568 *	0.4603 *	−0.0604 *	1								
CGQ	0.0653 *	0.0915 *	−0.0564 *	−0.0072	−0.0801 *	−0.0219 *	−0.0414 *	1							
Top1	0.0889 *	0.1191 *	−0.1935 *	0.0168 *	−0.0594 *	−0.0024 *	−0.0367 *	−0.0332 *	1						
SOE	−0.1214 *	−0.0003	−0.1703 *	−0.0937 *	−0.0241 *	−0.0323 *	0.0624 *	−0.2252 *	0.1873 *	1					
NSOE	0.1248 *	0.0085	0.1402 *	0.0733 *	0.0175 *	0.0299 *	−0.0451 *	0.2129 *	−0.1643 *	0.21	1				
SIZE	−0.0176 *	0.2028 *	−0.3230 *	0.1898 *	0.1876 *	−0.0555 *	0.2388 *	0.1495 *	0.2321 *	0.3825 *	−0.3600 *	1			
LEVERAGE	−0.3121 *	−0.1126 *	−0.3177 *	0.0646 *	0.0861 *	0.0715 *	0.0608 *	0.1547 *	0.0681 *	0.3665 *	−0.3513 *	0.5097 *	1		
GROWTH	0.2309 *	0.1920 *	−0.1004 *	−0.0277 *	0.0157 *	0.141 *	−0.0193 *	0.1110 *	0.0132	−0.0850 *	0.0818 *	0.0423 *	0.0193 *	1	
FIRM AGE	−0.1682 *	−0.0814 *	−0.0530 *	0.0715 *	0.0974 *	0.025 *	0.0931 *	−0.0372 *	−0.0585 *	0.4509 *	−0.4395 *	0.4068 *	0.4176 *	−0.0854 *	1

Note: Table 4 reports the correlation coefficients of the variables used in Equations (1) and (2); the detailed calculation is presented in Table 1. * signify *p*-values of 1 percent.

Table 5. VIF diagnostic.

Variables	VIF	SQRT VIF	Tolerance
AC1	1.01	1.005	0.810474
FCF-AC	1.24	1.114	0.994244
CGQ	1.12	1.058	0.444664
CGQ × AC	4.38	2.093	0.614631
CGQ × FCF-AC	4.51	2.124	1.257379
TOP1	1.26	1.122	0.436769
TOP1 × AC1	3.57	1.889	0.549014
TOP1 × FCF-AC	4.92	2.218	1.2473
SOE	1.37	1.170	0.481675
SOE × AC1	3.43	1.852	0.526637
SOE × FCF-AC	3.96	1.990	1.670354
NSOE	1.03	1.015	0.415938
NSO × AC1	3.44	1.855	0.41766
NSOE*FCF-AC	3.74	1.934	1.681659
Size	1.15	1.072	0.864823
Leverage	1.24	1.114	0.959959
Growth	1.16	1.077	1.045663
Firm age	1.03	1.015	0.69513

Note: Table 5 reports the VIF diagnostics with tolerance values; the detailed calculation is presented in Table 1.

Table 6. Moderating effect of CGQ on agency costs and firm performance.

Variables	Return on Assets (ROA)				Earnings per Share (EPS)			
	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM
AC1	−0.282 ***	−0.386 ***	−0.301 ***	−0.315 **	−1.299 ***	−1.527 ***	−1.187 ***	−1.691 ***
	(0.011)	(0.057)	(0.027)	(0.13)	(0.088)	(0.508)	(0.216)	(0.640)
FCF-AC	−0.004 ***	−0.002	−0.009 *	0.001	−0.032 ***	−0.008 *	−0.113 ***	−0.055
	(0.001)	(0.003)	(0.005)	(0.006)	(0.019)	(0.013)	(0.041)	(0.052)
Top1	0.005 ***	0.00287 ***	0.00316 ***	0.00418 **	0.0330 ***	0.0193 ***	0.0350 ***	0.0163 *
	(0.002)	(0.004)	(0.006)	(0.001)	(0.003)	(0.004)	(0.004)	(0.008)
AC1 × Top1			0.004 **	0.013 *			0.021 **	0.029 *
			(0.044)	(0.017)			(0.035)	(0.075)
FCF-AC × Top1			0.009 ***	.007 *			0.014 **	0.079 *
			(0.082)	(0.088)			(0.006)	(0.008)
Size	0.008 ***	0.047	0.086 ***	0.045	0.180 ***	0.129 ***	0.18 ***	0.13 ***
	(0.001)	(0.003)	(0.001)	(0.003)	(0.011)	(0.04)	(0.011)	(0.04)
Growth	0.002 ***	0.023 **	0.002 ***	0.003 **	0.004 ***	0.088 *	0.003 ***	0.088 *
	(0.0006)	(0.001)	(0.000)	(0.001)	(0.005)	(0.004)	(0.0005)	(0.04)
Leverage	−0.118 ***	−0.135 ***	−0.119 ***	−0.134 ***	−0.725 ***	−0.535 ***	−0.724 ***	−0.537 ***
	(0.005)	(0.012)	(0.005)	(0.012)	(0.043)	(0.089)	(0.043)	(0.089)
Firm Age	−0.003 ***	−0.002 ***	−0.003 ***	−0.002 ***	−0.038 ***	−0.006	−0.038 ***	−0.006
	(0.000)	(0.001)	(0.000)	(0.006)	(0.002)	(0.011)	(0.002)	(0.011)
L.ROA		0.102 **		0.105 **		0.522 ***		0.508 ***
		(0.047)		(0.044)		(0.071)		(0.07)
Constant	−0.062 **	0.026	−0.061 **	0.021	−3.008 ***	−2.387 ***	−3.017 ***	−2.379 ***
	(0.0285)	(0.0718)	(0.0286)	(0.0727)	(0.230)	(0.793)	(0.231)	(0.796)
Observations	13,178	11,930	13,178	11,930	13,178	11,983	13,178	11,983
R-squared	0.129		0.129		0.088		0.088	
Number of Firms	2404	2248	2404	2248	2404	2252	2404	2252
Wald test (Prob > Chi^2)		(0.00) ***		(0.00) ***		(0.00) ***		(0.00) ***
Hansen-J test (p-value)	-	0.145	-	0.149	-	0.55	-	0.58

Note: Table 6 reports the regression results from estimating Equations (1) and (2) respectively. Variable definitions are provided in Table 2. *, **, *** signify p-values at 1 percent, 5 percent, and 10 percent, respectively.

Looking at the primary results, agency cost (administrative expense ratio and free cash flow) has a significant adverse effect on firm performance measured by ROA and EPS. Corporate governance has a positive impact on both returns on ROA (FE: $\beta = 0.003$, $p < 0.01$; GMM: $\beta = 0.002$, $p < 0.01$) as well as EPS (FE: $\beta = 0.003$, $p < 0.01$; GMM: $\beta = 0.004$, $p < 0.01$). The objective of the study was to investigate the moderating effect of corporate governance quality on the relationship between agency cost and firm performance. To do so, we incorporated the interactions terms of corporate governance quality with agency cost proxies. The results are depicted in Table 6 with ROA and EPS as dependent variables. Corporate governance quality significantly positively moderates the relationship between agency cost and firm performance. When interaction terms are introduced, the coefficient of agency cost has changed the sign from negative to positive for both AC1 × CGQ (ROA—FE: $\beta = 0.004$, $p < 0.01$; GMM: $\beta = 0.012$, $p < 0.01$ and EPS—FE: $\beta = 0.002$, $p < 0.05$; GMM: $\beta = 0.03$, $p < 0.1$) and FCF-AC × CG (ROA—FE: $\beta = 0.009$, $p < 0.01$ta; GMM: $\beta = 0.007$, $p < 0.1$ and EPS—FE: $\beta = 0.002$, $p < 0.05$; GMM: $\beta = 0.007$, $p < 0.1$). These results indicate that the objectives of the principles and agents are aligned if the firms have the adopted good corporate governance practices reported by Jensen and Meckling (1976). Looking at the control variables, the size of the firm has a positive effect on the firm performance in all cases, which is in agreement with what we found in the literature. Leverage is negatively related to the performance, as can be seen by the signs of the negative coefficients in the table. Based on these results, we can accept our alternative hypothesis that corporate governance positively moderates the agency–performance relationship.

5.3. Moderating Effects of Ownership Concentration

Table 7 indicates the effect of ownership concentration measured by the shareholding percentage of the top shareholder on the relationship between agency cost and firm performance. The results show a positive impact of ownership concentration on the ROA and EPS for both the fixed-effect model and GMM. These results are in line with those of Shleifer and Vishny (1986) and Li et al. (2008). We introduced two interaction terms to measure the moderating effect of ownership concentration on the relationship between firm performance and agency cost. As shown in the results, the interactions terms possess a positive coefficient value, with ROA (TOP_1 × AC1 $\beta = 0.002$, $p < 0.01$ and TOP_1 × FCF-AC $\beta = 0.0014$, $p < 0.1$) and EPS (TOP_1 × AC1 $\beta = 0.002$ and TOP_1 × AC2 $\beta = 0.006$) in the fixed effect model. Similarly, the GMM model also exhibits a positive moderating effect of ownership concentration on the relationship between agency cost and firm performance. At higher levels of ownership concentration (for the largest shareholder), the shareholders are highly vigilant, and this helps facilitate the alignment of interests among the agents and the principles. The results show that as the ownership concentration is increased, the firm performance increases on the one hand, while the agency cost is decreased on the other side. These results support the second hypothesis that the ownership concentration positively moderates the relationship between agency cost and firm performance.

5.4. Moderating Effects of Ownership Types

The effect of ownership type on the relationship between agency cost and firm performance is reported in Table 8 State ownership is taken as a primary independent variable. A firm is described as state-owned if more than 50 percent of shares are held by the government and its affiliates. The results of the table report the adverse effect of state ownership on firm performance for both the fixed-effect model and GMM. These two sets of results are in line with the studies conducted in the Chinese context by Wei and Varela (2003) and Wei et al. (2005). According to these authors, the agency cost in state enterprises is higher, and this negatively affects the firm value. To test our third hypothesis, we introduced two interaction terms for agency costs with the state ownership variable to measure the effect on firm performance. All the interaction terms (SO × AC1, SO × FCF-AC) report negative coefficients, showing that state enterprises are significantly motivated by political motives; therefore, they focus less on performance.

Table 7. Moderating effect of ownership concentration on agency costs and firm performance.

Variables	Return on Assets (ROA)				Earnings per Share (EPS)			
	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed EFFECTS	System GMM	Fixed Effects	System GMM
AC1	−0.28 ***	−0.387 ***	−0.206 ***	−0.258 **	−1.274 ***	−1.529 ***	−0.136	0.303
	(0.011)	(0.057)	(0.021)	(0.105)	(0.088)	(0.507)	(0.173)	(0.764)
FCF-AC	−0.004 ***	−0.004	0.007	0.005	−0.035 ***	−0.009	−0.033	−0.004
	(0.002)	(0.001)	(0.003)	(0.004)	(0.019)	(0.013)	(0.027)	(0.0349)
Top1	0.003 ***	0.019	0.006 ***	0.006 **	0.004 ***	0.003 *	0.008 ***	0.009 ***
	(0.004)	(0.007)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.002)
AC1 × Top1			0.002 ***	0.004 *			0.042 ***	0.064 ***
			(0.000)	(0.002)			(0.005)	(0.019)
FCF-AC × Top1			0.00143 **	0.00155 *			0.005	0.014
			(.000)	(.000)			(0.007)	(0.008)
Size	0.009 ***	0.005 *	0.00949 ***	0.00593 *	0.189 ***	0.136 ***	0.188 ***	0.131 ***
	(0.001)	(0.003)	(0.002)	(0.003)	(0.011)	(0.040)	(0.011)	(0.039)
Growth	0.001 **	0.002 **	0.001 ***	0.002 **	0.003 ***	0.088 *	0.003 ***	0.089 *
	(0.002)	(0.001)	(0.000)	(0.001)	(0.000)	(0.049)	(0.000)	(0.049)
Leverage	−0.114 ***	−0.133 ***	−0.114 ***	−0.133 ***	−0.682 ***	−0.527 ***	−0.688 ***	−0.548 ***
	(0.005)	(0.011)	(0.005)	(0.012)	(0.043)	(0.09)	(0.042)	(0.089)
Firm Age	−0.002 ***	−0.001 **	−0.002 ***	−0.001 **	−0.032 ***	−0.004	−0.034 ***	−0.003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.011)	(0.002)	(0.011)
L.ROA		0.105 **		0.109 **		0.505 ***		0.496 ***
		(0.047)		(0.045)		(0.067)		(0.068)
Constant	−0.0814 ***	0.00856	−0.0873 ***	−0.00594	−3.220 ***	−2.549 ***	−3.309 ***	−2.624 ***
	(0.0288)	(0.0733)	(0.0289)	(0.0741)	(0.233)	(0.825)	(0.233)	(0.812)
Observations	13,178	11,930	13,178	11,930	13,178	11,983	13,178	11,983
R-squared	0.125		0.126		0.084		0.089	
Number of Firms	2404	2248	2404	2248	2404	2252	2404	2252
Wald test (Prob > Chi^2)		(0.00) ***		(0.00) ***		(0.00) ***		(0.00) ***
Hansen-J test (p-value)		0.25		0.23		0.31		0.33

Note: Table 7 reports the regression results from estimating Equations (1) and (2), respectively. Variable definitions are provided in Table 2. *, **, *** signify p-values at 1 percent, 5 percent, and 10 percent, respectively.

Table 8. Moderating effect of ownership type (SOE) on agency costs and firm performance.

Variables	Return on Assets (ROA)				Earnings per Share (EPS)			
	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM
AC1	−0.304 ***	−0.414 ***	−0.314 ***	−0.436 ***	−1.405 ***	−1.665 ***	−1.233 ***	−1.239 *
	(0.011)	(0.066)	(0.012)	(0.095)	(0.093)	(0.582)	(0.107)	(0.658)
FCF-AC	−0.004 ***	−0.002	−0.005 ***	−0.001	−0.036 ***	−0.014	−0.063 ***	−0.022
	(0.001)	(0.001)	(0.001)	(0.001)	(0.011)	(0.013)	(0.015)	(0.014)
SOE	−0.019 ***	−0.014	−0.023 ***	−0.023	0.144 ***	0.327 **	−0.074 *	0.475 ***
	(0.004)	(0.011)	(0.005)	(0.02)	(0.038)	(0.143)	(0.043)	(0.172)
AC1 × SOE			−0.034 ***	−0.069			−0.576 ***	−1.276 *
			(0.021)	(0.251)			(0.176)	(0.773)
FCF-AC × SOE			−0.002 **	−0.002			−0.057 ***	−0.025
			(0.002)	(0.002)			(0.022)	(0.027)
Size	0.009 ***	0.008 **	0.009 ***	0.008 **	0.197 ***	0.140 ***	0.197 ***	0.142 ***
	(0.001)	(0.004)	(0.001)	(0.004)	(0.011)	(0.043)	(0.011)	(0.042)
Growth	0.001 ***	0.001 *	0.001 ***	0.002 *	0.003 ***	0.089 *	0.003 ***	0.091 *
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.059)	(0.000)	(0.055)
Leverage	−0.115 ***	−0.135 ***	−0.115 ***	−0.135 ***	−0.700 ***	−0.582 ***	−0.698 ***	−0.579 ***
	(0.005)	(0.013)	(0.005)	(0.012)	(0.044)	(0.096)	(0.044)	(0.094)
Firm Age	−0.003 ***	−0.002 ***	−0.003 ***	−0.002 ***	−0.039 ***	−0.008	−0.039 ***	−0.008
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.011)	(0.002)	(0.011)
L.ROA		0.103 **		0.104 **		0.475 ***		0.474 ***
		(0.051)		(0.047)		(0.065)		(0.064)
Constant	−0.052 *	−0.028	−0.04 *	−0.023	−3.12 ***	−2.575 ***	−3.149 ***	−2.667 ***
	(0.0287)	(0.0838)	(0.0287)	(0.0930)	(0.240)	(0.848)	(0.240)	(0.841)
Observations	12,700	11,518	12,700	11,518	12,700	11,552	12,700	11,552
R-squared	0.136		0.137		0.085		0.086	
Number of Firms	2381	2224	2381	2224	2381	2227	2381	2227
Wald test (Prob > Chi^2)		(0.00) ***		(0.00) ***		(0.00) ***		(0.00) ***
Hansen-J test (p-value)		0.17		0.22		0.24		0.22

Note: Table 8 reports the regression results from estimating Equations (1) and (2), respectively. Variable definitions are provided in Table 2. *, **, *** signify p-values of 1 percent, 5 percent, and 10 percent, respectively.

The effect of non-state ownership on the relationship between agency cost and firm performance is shown in Table 9. Non-state ownership has a positive impact on both performance measures, as depicted in the fixed-effect model and GMM. We introduced two interaction terms to specifically explore the effect of non-state ownership on agency–performance relationships. The interaction terms show a positive and significant moderating effect on firm performance in the fixed effect model as well as GMM. Looking at the ROA model, NSO × AC1 and NSO × AC2 have coefficients of 0.0381 and 0.0027 in the fixed-effect model, and of 0.068 and 0.0026 in GMM. The EPS model also shows positive coefficients with both fixed-effect models (FE: $\beta = 0.019$, $p < 0.01$; GMM: $\beta = 0.005$, $p < 0.01$) and GMM (FE: $\beta = 0.597$, $p < 0.05$; GMM: $\beta = 0.028$, $p < 0.1$). These results are in alignment with the study conducted by Ding et al. (2007), who found better performance by non-state enterprises as compared to state-owned ones. Based on the above analysis, we support our third hypothesis, that state ownership has an adverse effect on the agency–performance relationship. In contrast, non-state ownership positively moderates the agency–performance relationship.

5.5. Additional Analyses

Alternative Measures of Agency Costs

Tables 10 and 11 display the alternative measures of agency cost incorporated into our analysis. We have taken three variables, namely, earnings management using the absolute value of discretionary accruals as a proxy denoted by EM; research and development expenditures, denoted by R&D-AC; and the first principle component, obtained through principal component analysis using four agency cost proxies used in this paper, denoted by PC-AC. The results show the positive moderating effect of alternative measures of agency cost and corporate governance (R&D-AC × CGQ, EM × CGQ, and PCA-AC × CGQ) on ROA and EPS for both the fixed-effect model and the system GMM approach. These results again strengthen our hypothesis that corporate governance positively moderates the agency–performance relationship.

Tables 10 and 11 also explore the moderating effect of ownership concentration on the agency–performance relationship. Again, from the results, we can accept our alternative hypothesis that the ownership concentration has a positive influence on the agency–performance relationship. Ownership structure has a negative moderating effect on the agency–performance association when the firms are state-owned. On the contrary, we witness a positive moderating effect when the ownership rests in the hand of non-state entities. These results support our third hypothesis that SOE has a negative impact on the agency–performance relationship, while NSOE has a positive moderating effect.

Table 9. Moderating effect of ownership type (NSOE) on agency costs and firm performance.

Variables	Return on Assets (ROA)				Earnings per Share (EPS)			
	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM
AC1	−0.283 ***	−0.388 ***	−0.259 ***	−0.344 ***	−1.310 ***	−1.547 ***	−1.429 ***	−1.925 ***
	(0.011)	(0.057)	(0.015)	(0.119)	(0.088)	(0.509)	(0.126)	(0.509)
FCF-AC	−0.004 ***	−0.004	−0.003	0.007	−0.035 ***	−0.007 *	−0.005	−0.008
	(0.001)	(0.001)	(0.001)	(0.002)	(0.019)	(0.013)	(0.015)	(0.022)
NSOE	0.008 ***	0.003	0.013 ***	0.015	0.061 ***	0.059 *	0.037	−0.137 **
	(0.002)	(0.004)	(0.003)	(0.018)	(0.021)	(0.035)	(0.027)	(0.068)
AC1 × NSOE			0.0381 ***	0.0689 *			0.190 ***	0.597 **
			(0.017)	(0.148)			(0.143)	(0.444)
FCF-AC × NSOE			0.002 ***	0.002 ***			0.058 ***	0.028 *
			(0.002)	(0.002)			(0.021)	(0.026)
Size	0.009 ***	0.005	0.009 ***	0.005	0.187 ***	0.134 ***	0.187 ***	0.135 ***
	(0.001)	(0.003)	(0.0014)	(0.003)	(0.011)	(0.04)	(0.011)	(0.039)
Growth	0.001 ***	0.002 **	0.001 ***	0.002 **	0.003 ***	0.088 *	0.003 ***	0.089 *
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.049)	(0.000)	(0.044)
Leverage	−0.113 ***	−0.131 ***	−0.113 ***	−0.132 ***	−0.679 ***	−0.520 ***	−0.679 ***	−0.519 ***
	(0.005)	(0.011)	(0.005)	(0.012)	(0.043)	(0.089)	(0.043)	(0.088)
Firm Age	−0.003 ***	−0.002 ***	−0.003 ***	−0.001 **	−0.037 ***	−0.006	−0.037 ***	−0.007
	(0.000)	(0.000)	(0.001)	(0.000)	(0.003)	(0.016)	(0.002)	(0.016)
L.ROA		0.106 **		0.108 **		0.506 ***		0.504 ***
		(0.047)		(0.044)		(0.068)		(0.068)
Constant	−0.066 **	0.022	−0.068 **	0.019	−3.037 ***	−2.348 ***	−3.024 ***	−2.321 ***
	(0.028)	(0.072)	(0.028)	(0.073)	(0.231)	(0.794)	(0.232)	(0.787)
Observations	13,178	11,930	13,178	11,930	13,178	11,983	13,178	11,983
R-squared	0.124		0.124		0.081		0.081	
Number of firms	2404	2248	2404	2248	2404	2252	2404	2252
Wald test (Prob>Chi^2)		(0.00) ***		(0.00) ***		(0.00) ***		(0.00) ***
Hansen-J test (p-value)		0.19		0.24		0.25		0.27

Note: Table 9 reports the regression results from estimating Equations (1) and (2), respectively. Variable definitions are provided in Table 2. *, **, *** signify p-values of 1 percent, 5 percent, and 10 percent, respectively.

Table 10. Baseline models with alternative measure of agency costs.

Variables	Dependent Variable: Return on Assets (ROA)							
	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM
EM	−0.126 ***	−0.291 ***	−0.108 ***	−0.234 ***	−0.0112	−0.0723 *	0.0255	−0.0656 **
	(0.038)	(0.094)	(0.025)	(0.087)	(0.012)	(0.039)	(0.015)	(0.033)
R&D-AC	0.018	0.002	−0.004	−0.011	0.005	0.002	0.002	0.001
	(0.012)	(0.013)	(0.007)	(0.008)	(0.003)	(0.003)	(0.004)	(0.004)
F1-PCA	−0.165	−0.007	−0.003	0.002	−0.004 ***	−0.003 ***	−0.003 **	−0.002
	(0.217)	(0.003)	(0.002)	(0.003)	(0.001)	(0.000)	(0.002)	(0.002)
CGQ	0.015	0.002 *						
	(0.022)	(0.002)						
EM × CGQ	0.021 ***	0.036 ***						
	(0.006)	(0.012)						
R&D-AC × CGQ	0.002 ***	0.003 *						
	(0.001)	(0.002)						
F1 × CGQ	0.005 **	0.009						
	(0.002)	(0.004)						
TOP1			0.003 ***	0.008				
			(0.000)	(0.002)				
EM × TOP1			0.003 ***	0.003 *				
			(0.000)	(0.000)				
R&D-AC × TOP1			0.002 *	0.004 **				
			(0.000)	(0.001)				
F1-PCA × TOP1			0.003	−0.008				
			(0.000)	(0.001)				
SOE					0.023 ***	0.011		
					(0.005)	(0.013)		
EM*SOE					−0.012 ***	−0.002		
					(0.021)	(0.005)		
R&D-AC × SOE					−0.003 ***	−0.024 *		
					(0.005)	(0.053)		
F1-PCA × SOE					0.002	0.003		
					(0.001)	(0.001)		
NSOE							0.012 ***	0.002
							(0.003)	(0.004)
EM × NSOE							0.036 *	0.001
							(0.021)	(0.005)

Table 10. *Cont.*

Variables	Dependent Variable: Return on Assets (ROA)							
	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM
R&D-AC × NSOE							0.002 *	−0.022
							(0.005)	(0.055)
F1-PCA × NSOE							0.021 ***	0.022 *
							(0.001)	(0.001)
Size	0.015 ***	0.011 **	0.015 ***	0.012 ***	0.016 ***	0.015 ***	0.015 ***	0.012 ***
	(0.002)	(0.004)	(0.002)	(0.004)	(0.001)	(0.004)	(0.002)	(0.004)
Growth	0.002 ***	0.005 **	0.002 ***	0.005 **	0.002 ***	0.005 **	0.002 ***	0.005 **
	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)	(0.002)
Leverage	−0.122 ***	−0.138 ***	−0.117 ***	−0.135 ***	−0.117 ***	−0.138 ***	−0.116 ***	−0.134 ***
	(0.005)	(0.013)	(0.005)	(0.013)	(0.005)	(0.014)	(0.005)	(0.013)
Firm Age	−0.047 ***	−0.003 ***	−0.004 ***	−0.003 ***	−0.004 ***	−0.004 ***	−0.004 ***	−0.003 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
L.ROA		0.147 ***		0.153 ***		0.151 ***		0.153 ***
		(0.052)		(0.053)		(0.054)		(0.052)
Constant	−0.340 **	−0.113	−0.232 ***	−0.157 *	−0.210 ***	−0.198 **	−0.224 ***	−0.152 *
	(0.165)	(0.082)	(0.031)	(0.086)	(0.031)	(0.099)	(0.031)	(0.085)
Observations	11,964	10,833	11,964	10,833	11,557	10,487	11,964	10,833
R-squared	0.073		0.070		0.072		0.067	
Number of firms	2210	2066	2210	2066	2191	2045	2210	2066
Wald test (Prob > Chi^2)		(0.00) ***		(0.00) ***		(0.00) ***		(0.00) ***
Hansen-J test (*p*-value)		0.14		0.12		0.13		0.17

Note: Table 10 reports the regression results from estimating Equations (1) and (2), respectively. Variable definitions are provided in Table 2. *, **, *** signify *p*-values at 1 percent, 5 percent, and 10 percent, respectively.

Table 11. Results of baseline models with alternative measure of agency costs.

Variables	Dependent Variable: Earnings Per Share (EPS)							
	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM
EM	−0.176	−0.400	0.0792	−0.555	0.284 ***	−0.116	0.326 ***	−0.311
	(0.275)	(0.469)	(0.181)	(0.344)	(0.0904)	(0.192)	(0.114)	(0.244)
R&D-AC	0.077	0.082	−0.061	−0.06	−0.002	0.012	−0.004	0.027
	(0.082)	(0.121)	(0.050)	(0.076)	(0.022)	(0.031)	(0.019)	(0.041)
F1-PCA	−1.275	−0.017	−0.014	0.0184	−0.036 ***	−0.021 **	−0.011	−0.003
	(1.560)	(0.031)	(0.015)	(0.022)	(0.008)	(0.009)	(0.008)	(0.013)
CGQ	0.097	0.02 ***						
	(0.160)	(0.005)						
EM × CGQ	0.077 ***	0.011 ***						
	(0.04)	(0.018)						
R&D-AC × CGQ	0.014	0.026						
	(0.013)	(0.068)						
F1 × CGQ	0.001	0.008						
	(0.000)	(0.005)						
TOP1			0.004 ***	0.004 **				
			(0.000)	(0.001)				
EM × TOP1			0.005 **	0.002				
			(0.004)	(0.001)				
R&D-AC × TOP1			0.001	0.009				
			(0.001)	(0.008)				
F1-PCA × TOP1			0.002	0.004				
			(0.039)	(0.000)				
SOE					−0.164 ***	0.302 **		
					(0.037)	(0.130)		
EM × SOE					−0.083	0.018		
					(0.150)	(0.057)		
R&D-AC × SOE					0.007	−0.082 *		
					(0.042)	(0.324)		
F1-PCA × SOE					0.026 **	0.016		
					(0.012)	(0.015)		

Table 11. *Cont.*

Variables	Dependent Variable: Earnings Per Share (EPS)							
	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM	Fixed Effects	System GMM
NSOE							0.087 ***	−0.063 *
							(0.022)	(0.036)
EM × NSOE							0.043	0.006
							(0.145)	(0.055)
R&D-AC × NSOE							0.005 ***	0.117 ***
							(0.042)	(0.306)
F1-PCA × NSOE							0.025 **	0.017
							(0.011)	(0.015)
Size	0.191 ***	0.193 ***	0.200 ***	0.200 ***	0.209 ***	0.203 ***	0.201 ***	0.200 ***
	(0.011)	(0.032)	(0.011)	(0.033)	(0.011)	(0.036)	(0.011)	(0.032)
Growth	0.015 ***	0.047 **	0.014 ***	0.045 **	0.014 ***	0.047 **	0.014 ***	0.047 **
	(0.000)	(0.022)	(0.000)	(0.021)	(0.000)	(0.023)	(0.000)	(0.022)
Leverage	−0.793 ***	−0.555 ***	−0.751 ***	−0.557 ***	−0.770 ***	−0.616 ***	−0.744 ***	−0.539 ***
	(0.042)	(0.106)	(0.042)	(0.106)	(0.043)	(0.112)	(0.042)	(0.105)
Firm Age	−0.041 ***	−0.016	−0.03 ***	−0.012	−0.042 ***	−0.017	−0.041 ***	−0.017
	(0.002)	(0.011)	(0.002)	(0.011)	(0.002)	(0.011)	(0.002)	(0.017)
L.EPS		0.568 ***		0.562 ***		0.536 ***		0.567 ***
		(0.082)		(0.079)		(0.077)		(0.080)
Constant	−4.256 ***	−3.855 ***	−3.547 ***	−4.053 ***	−3.480 ***	−4.021 ***	−3.441 ***	−3.843 ***
	(1.184)	(0.624)	(0.226)	a (0.632)	(0.232)	(0.680)	(0.226)	(0.630)
Observations	11,964	10,886	11,964	10,886	11,557	10,521	11,964	10,886
R-squared	0.080		0.073		0.074		0.070	
Number of Firms	2210	2070	2210	2070	2191	2048	2the, 210	2070
Wald test (Prob > Chi^2)		(0.000) ***		(0.000) ***		(0.000) ***		(0.000) ***
Hansen-J test (*p*-value)		0.19		0.34		0.27		0.31

Note: Table 11 reports the regression results from estimating Equations (1) and (2), respectively. Variable definitions are provided in Table 2. *, **, *** signify *p*-values at 1 percent, 5 percent, and 10 percent, respectively.

6. Summary and Conclusions

Emerging markets with weak investor protection have much-execrated agency problems as compared to developed markets. The sources and types of agency cost differ in emerging economies. The purpose of this study was to investigate the effect of corporate governance quality and ownership concentration on the relationship between agency cost and firm performance. A-share listed firms in China were taken as a sample. Both the fixed-effect model and dynamic panel generalized method of moment estimation were employed in order to cater for the unobserved endogeneity problem. The results show that agency cost is negatively related to firm performance, while corporate governance and ownership concentration enhance firm performance. When corporate governance and ownership concentration were taken as moderating variables, we found a positive impact on the agency–performance relationship.

We also studied the effect of ownership type on the association between agency cost and firm performance. Non-state ownership positively moderated the relationship between agency cost and firm performance, while the agency cost kept its negative sign when the state ownership was taken as a moderating variable. Alternative measures of independent variables were also considered for the robustness of our results, such as the absolute value of discretionary accruals, denoted as (EM), research and development expenditures (R&D-AC), and first principle component (PCA-AC) generated through the principal component analysis of agency cost.

This study adds to the literature on corporate governance, specifically with respect to emerging economies. China is one of the largest emerging economies, and possesses a unique corporate governance system. Most of the companies are state owned, and are characterized by political influence and corporate expropriation. By incorporating effective corporate governance mechanisms, Chinese listed firms can enhance their financial performance. The theoretical evidence on ownership structures postulates that concentrated ownership can help firms to reduce agency problems. The results of this study show that concentrated ownership aligns the interests of managers and shareholders, hence increasing the overall performance of firms. Our study divides the ownership structure of Chinese listed firms into state and non-state. Studies on emerging economies have shown that non-state firms can effectively curtail agency costs (Ding et al. 2007). The results of this study show that the performance of Chinese listed firms is enhanced when they are owned by non-state entities. State ownership has a negative impact on the agency–performance relationship.

This study supports the literature in concluding that agency cost and firm performance are negatively related in Chinese listed firms. Investors should keep in mind the proxies of agency cost when choosing a specific stock. Secondly, the abuse of managerial appropriation is higher in state-held firms compared to non-state firms. Policymakers can use these results to devise the investor protection rules so that managerial appropriation can be minimized.

In summary, our results support all of our hypotheses, indicating a positive moderating effect of corporate governance quality (H1) and ownership concentration (H2) on the relationship between agency cost and firm performance. Additionally, non-state (state) ownership of companies positively (negatively) moderates the agency–performance relationship (H3).

Our study does have certain limitations. First, in constructing the corporate governance index, we tried to take account of all of the agency-mitigating governance variables. However, due to data unavailability, we dropped several governance variables, such as CEO compensation (instead, we used top three compensation), stock options, independent director dissent report (although this data is present on CSMAR, it lacks the data of financial statements), and audit committee (CSMAR contains the total committee data, but does not further elaborate), to name several.

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Appendix A

Table A1. Correlation between agency cost, corporate governance and the firm performance.

Authors	Sample	Time Period	Performance Measures	CG Measure	Agency Cost Measure	Findings
Xu & Wang (1999)	Chinese Firms listed on Shanghai and Shenzhen stock exchange	1993–1995	1. The market-to-book value ratio (MBR) 2. Return on equity (ROE), 3. Return on asset (ROA)	1. Ownership concentration ratios measured by proportion of shares held by the top 10 shareholders 2. Ownership Mix		The mix and concentration of stock ownership do indeed significantly affect a company's performance. First, there is a positive and significant correlation between ownership concentration and profitability. Second, the firm's profitability is positively correlated with the fraction of legal person shares, but it is either negatively correlated or uncorrelated with the fractions of state shares and tradable A-shares held mostly by individuals. Third, labor productivity tends to decline as the proportion of state shares increases
Shen & Chih (2007)	The CLSA report includes corporate governance (CG) rankings on 495 companies in 25 emerging countries in April 2001 and February 2002.	1991–2000		1. Amount of external financing 2. Governance index	1. Earnings smoothing 2. Earnings discretion	Firms with good corporate governance tend to conduct less earnings management. Firms with higher growth (lower earnings yield) are prone to engage in earnings smoothing and earnings aggressiveness, but good corporate governance can mitigate the effect.
Florackis, Chrisostomos (2008)	1672 UK listed firms	1999–2003		1. Managerial ownership 2. Managerial compensation 3. Ownership concentration	1. Sales to total assets 2. Selling, general and administrative expenses to total sales	The results reveal that the capital structure characteristics of firms, namely bank debt and debt maturity, constitute important corporate governance devices for UK companies. Also, managerial ownership, managerial compensation and ownership concentration are strongly associated with agency costs. Finally, the results suggest that the impact exerted by specific internal governance mechanisms on agency costs varies with firms' growth opportunities.
Bartram, Brown, How, & Verhoeven, (2009)	29,610 firms in 43 countries	2001–2006		1. corporate governance index constructed from ISS data	1. Dividend/Earnings 2. Dividend/Cash Flow 3. Dividend/Sales	In high protection countries, investors are able to use their legal powers to extract cash from firms but their ability to do so can be substantially hindered when agency costs at the firm level are high. In poor protection countries, investors can seek refuge in firm level governance mechanisms to curb agency conflicts, suggesting a substitution between country and firm level investor protection.
Wang (2010)	505 companies publicly listed companies on Taiwan Stock Exchange.	2002 to 2007	1. ROA 2. ROE 3. Tobin's Q		1. Free Cash Flows 2. Assets Turnover 3. Operating expense ratio 4. Advertising and R & D expense ratio	The study finds evidence to support the agency theory, meaning AC has a significantly negative impact on firm performance and stock return. In contrast, the study finds a significantly positive relation between FCF and firm performance measures, indicating lack of evidence supporting the free cash flow hypothesis.

Table A1. *Cont.*

Authors	Sample	Time Period	Performance Measures	CG Measure	Agency Cost Measure	Findings
Ibrahim (2011)	474 companies listed on the main board of the Bursa Malaysia.	1999–2005	1. Tobin's Q 2. ROA	1. Board size 2. Independent director 3. Duality	1. Asset utilization ratio 2. Expense ratio	On average firm value is lower in family firms than non-family firms, while board size, independent director and duality have a significant impact on firm performance in family firms as compared to non-family firms. We also find that these governance mechanisms have significant impact on agency costs for both family and non-family firms.
Jurkus, Park, & Woodard (2011)	Fortune 500 firm 668 firms and 3172 firm-year observations.	1995–2005		1. Number of female officers 2. Gender-diversity dummy 3. Product Market Competition	1. FCFs with poor growth 2. Dividend payout ratio	The study finds that firms with a greater percentage of female officer's present lower agency costs but that the negative relation is not robust when considering the endogeneity of diversity. The study also finds that external governance influences the relationship. Although increasing diversity does not reduce agency costs for all firms, the evidence shows that diversity is significantly negatively related to agency costs in firms in less competitive markets
Rashid (2015)	118 non-financial firms listed on the Dhaka Stock Exchange	2006–2011		1. Board Independence 2. Board Size 3. Frequency of Board Meeting 4. CEO Duality	1. Expense ratio' 2. The 'Q-free cash flow interaction' 3. The 'asset utilization ratio'	The finding of the study is that board independence can reduce the firm agency cost only under 'asset utilization ratio' measure of agency cost. Furthermore, the non-linearity tests suggest that the benefit of outside independent directors is generally plausible as a factor controlling agency costs in the case of a medium level of board independence. Overall, these findings do not reject the validity of agency theory, supporting the Anglo-American orthodoxy promoting outside independent directors as good monitors.
Achim, Borlea, & Mare (2016)	1600 companies listed on major stock exchanges around the world	2001–2011	1. Market capitalization 2. Price to book ratio (ratio between market value and book value) 3. Tobin's Q		1. Corporate governance index 2. Corporate social responsibility activities adopted by the company (CSR).	The results document a positive correlation between corporate governance quality and market value of companies, such it is reflected by Tobin's Q.

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Transition to the Revised OHADA Law on Accounting and Financial Reporting: Corporate Perceptions of Costs and Benefits

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Abstract: This paper examines the ongoing transition to the revised Organisation for the Harmonisation of Business Law in Africa Act on Accounting and Financial Reporting for companies in general and to the International Financial Reporting Standards for listed and group companies with a particular focus on recent institutional developments and corporate concerns. The study used 80 professional accountants, most of whom were members of the Institute of Chartered Accountants of Cameroon and academics. Using the descriptive statistics, the study shows that the transition to the revised OHADA brings about a high level of comparability and transparency of the financial statements, that the International Financial Reporting Standards can be implemented in Cameroon (but not fully), and that the benefit of the transition exceeds the cost.

Keywords: perception; OHADA accounting; transition; IFRS; comparability

XIX ENCUENTRO INTERNACIONAL AECA

THEMATIC AREAS
A) Financial Information and Accounting Standardisation

1. Introduction

The global wind of economic integration is at the doorstep of the accounting profession with intense pressure on nations and states to apply unified accounting standards. This effort could be seen as a century reform to the profession. The reform agenda was perceived as the way forward towards harmonising the accounting practice within the Organisation for the Harmonisation of Business Law in Africa (OHADA) Generally Accepted Accounting Principles with that of the rest of the world (The International Financial Reporting Standards), which for a long time experts had been advocating on the belief that financial accounting practises should be harmonised for ease of comparison (Dicko and Fortin 2014; Fossung 2016; Mayegle 2014; OHADA Uniform Acts 2016; AICPA 2019).

The effects of globalisation have posed the need for comparable, consistent and quality financial statements. The general expectations and advantages of the International Financial Reporting Standards

(IFRS) are widely known, but due to the scarcity in the various economic resources, there is always a primary issue of implementation of the law, and then there is the question of whether the country would also benefit from the proclaimed advantages of the IFRS while considering the cost involved. It is therefore important to examine the perception of accounting practitioners on the transition to the revised OHADA Uniform Acts on Accounting and Financial Reporting, and particularly of the transition of both listed companies and group companies to IFRS as inscribed in the revised OHADA Uniform Acts. Hence, the study sets out to investigate the perceptions of Accountants in Cameroon on the transition to the International Financial Reporting Standards, since the clients who fall within this group were required to implement IFRS as of January 2019 (OHADA Uniform Acts 2016; AICPA 2019).

Therefore, the main research question is: what is the perception of Cameroon accounting practitioners on the transition to the Revised OHADA Act on Accounting and Financial Reporting? The following specific research questions will be answered:

1. Would the implementation of the IFRS enhance comparability and transparency of financial statements produced by the concerned companies?
2. To what extent can IFRS be fully implemented in Cameroon?
3. Does the cost involved in transitioning to International Financial Reporting Standards supersede the benefits?

The recent transition to IFRS has been welcomed by many, while others still have lukewarm feelings on the decision to transit to the IFRS. As such, this study is aimed at investigating the perception of Cameroon accounting practitioners on the transition to the International Financial Reporting Standards. The specific objectives of the study are: (1) to investigate the extent to which the transition to IFRS would improve the transparency and comparability of financial statements; (2) to understand the extent to which the International Financial Reporting Standards can be completely implemented in Cameroon; (3) to assess the costs and benefits involved in transitioning from the previous (OHADA) Accounting System to IFRS.

Studies like Barth et al. (2012) analysed the difference between IFRS and US GAAP-based accounting. Exploring information from US companies with IFRS-based accounting and US-based accounting from 1995 and 2006 showed that IFRS firms' accounting amounts had greater comparability with those of US firms when IFRS firms applied IFRS than when they applied non-domestic standards. They add that there was greater comparability for firms that adopted IFRS mandatory, common law firms and firms in countries with high enforcement. Furthermore, Armstrong et al. (2010) reported 16 events associated with the IFRS as a result of the European stock market reactions. Their study showed that there existed an incremental positive reaction for European firms with higher pre-adoption information quality and lower pre-adoption information asymmetry. Meanwhile, the study of Jeanjean and Stolowy (2008) revealed that the European Commission, the International Accounting Standard Board and the Security and Exchange Commission (SEC) should put more effort to promote institutional factors and incentives rather than harmonising accounting standards.

2. Literature Review

2.1. Background

In the early 60s, antecedent to the acquisition of independence by most African countries, accounting practices where still those inherited from colonial masters. The companies in the areas of the Economic and Monetary Union of West Africa (WAEMU) and the Customs and Economic Union of Central Africa (CACEU) continued to use the French accounting systems in 1947 and 1957 (Dicko and Fortin 2014; Fossung 2016; Mayegle 2014; AICPA 2019). It was only until the Africans conceived their unity in 1963 and decided to create the Common African and Mauritian Organisation (OCAM) accounting plan in 1965. This was before the convergence of the WAEMU and CACEU. OCAM lived for 15 years, but during those years there still existed many accounting standards;

the legal framework was confused and as such it resulted in a very unfavourable business climate and sub-standard financial reporting. The effects of this on some sectors were inconsistent financial records and the mismatch of some accounting works. This led the African States and certain groups to develop new accounting information systems and specific accounting plans for the credit institutions (Central Africa Banking Commission (COBAC) chart of accounts and the insurance companies (Dicko and Fortin 2014; Riasi 2015; Riasi and Aghdaie 2013; Fossung 2016)).

In response to these challenges, the Organisation for the Harmonisation of Business Laws in Africa (OHADA) was established in Port Louis, Mauritius, on 17 October 1993. The fledgling entity was launched under the treaty for the Harmonisation of Business Law in Africa, a document signed by 16 African countries (and later became 17). The objective of OHADA was to develop modern business laws relevant to conditions in Africa, promote better economic integration across the continent and encourage its harmonious development. Before the adoption of OHADA, investors had to deal with different and sometimes confusing laws in each country (Fossung 2016; Dicko and Fortin 2014). Although OHADA was initially designed for countries in the Franc zone, it now welcomes any African state, irrespective of whether it is a Francophone African countries. OHADA's primary goal is to improve the investment climate. Its Uniform Acts, including the Act on about accounting, are directly applied in all member states and supersede any existing legislation with conflicting provisions (Paillusseau 2004). Amongst the different OHADA Uniform Acts was the UNIFORM ACT of 24 MARCH 2000 on the harmonisation of the accounts of enterprises. After being in use for more than seventeen years, this Act was revised to converge with the IFRS in response to the global pressure of international accounting harmonisation.

2.2. Conceptual Framework

The concept of perception (generally referred to as social perception by most scholars) like many others in the social science disciplines has been defined in a variety of ways since it was first used. A lay man can see perception as "a particular way of viewing things that depends on one's experience and personality." Perception (from the Latin perception) is the organisation, identification, and interpretation of sensory information in order to represent and understand the presented information, or the environment (Schacter 2012). The perceived quality construct developed with its service quality instruments, is defined as the difference between perceptions and expectations. Perception is the "process by which an individual receives, selects and interprets stimuli to form a meaningful and coherent picture of the world". In customer satisfaction and service quality dimensions, perceptions are defined as the consumer's judgement of the services and an organisation's performance. Many social psychologists have tended to develop the concept around one of its most essential characteristics: that the world around us is not psychologically uniform to all individuals. This is the fact, in all probability, that accounts for the difference in the opinions and actions of individuals/groups that are exposed to the same social phenomenon.

According to Jandt (1995), perception is unique to each person; it begins with a three-step process of selection, organisation and interpretation. It has also been found that perceptions differ with respect to the physical environment of the service settings, cultural background and differences in gender (Ndhlovu and Senguder 2002). These indicate that a clear understanding of how perceptions are formed is critical to any service business as it facilitates the formulation of strategies to manage customer perceptions of service performance. Rao and Narayana (1998) define perception as "the process whereby people select, organise, and interpret sensory stimulations into meaningful information about their work environment." To Rao and Narayana, perception is the most critical determinant of human behaviour, which leads them to imply further that there can be no behaviour without perception. Though focusing on managers in work settings, they draw attention to the fact that since there are no specific strategies for understanding the perception of others, everyone appears to be "left with his inventiveness, innovative ability, sensitiveness and introspective skills to deal with perception." Rao and Narayana (1998) share the main characteristics of the above definition. However,

they emphasise that perception ranks among the "important cognitive factors of human behaviour" or psychological mechanisms that enable people to understand their environment. The details of the mental and environmental nature of perception are not of primordial important to this study. However, these literary definitions help to shed more light on the variances in perception and what may cause them.

2.3. Theoretical Framework

An objective of perception is to gauge genuine properties of the world. An objective of categorisation is to characterise its structure. Ages of development have formed our faculties to this end. These three presumptions inspire much work on human discernment. The interface theory of perception offers a system, roused by advancements, to control inquiries about in question order. The perceptions of an organism are like a user interface between that organism and the objective world. This theory addresses the natural question that if our perceptions are not accurate, then what good are they? The answer becomes evident for user interfaces. The colour, for instance, of an icon on a computer screen does not estimate or reconstruct the exact colour of the file that it represents in the computer. The conventionalist theory that our perceptions are reconstructions is, in precisely the same manner, equally naive. Colour is, of course, just one example among many: the shape of an icon does not reconstruct the exact shape of the file; the position of an icon does not reconstruct the exact position of the file in the computer. A user interface reconstructs nothing. Its predicates and the predicates required for reconstruction can be entirely disjointed. Files, for instance, have no colour, and yet a user interface is useful even though despite the fact that it is not a reconstruction. The conventional theory of perception gets evolution fundamentally wrong by conflating fitness and accuracy. This leads the conventional theory to the false claim that a primary goal of perception is a faithful depiction of the world. The idea of understanding the perceptions of accountants on the transition to IFRS was based on the understanding that the perception of accountants can depict the reality of the events that are altered by the transition.

2.3.1. Hypotheses

The hypotheses below would give various users of financial information insight into the costs involved in transitioning from the previous to the revised OHADA Accounting System (SYSCOHADA) and to IFRS by taking into consideration the views of fifty accountants in Cameroon. The findings are anticipated to provide useful and timely information to the Council of Ministers under the OHADA, to assist them in making decisions affecting accounting practices which, in turn, will support social and economic development in Cameroon and the other 16 African member countries. The evidence provided by this study is likely to be of interest to other countries or firms considering the adoption of the revised SYSCOHADA and the International Financial Reporting Standards.

Hypothesis 1 (H1). *Comparability and transparency of financial statements are enhanced under the revised SYSCOHADA.*

Hypothesis 2 (H2). *IFRS can be fully implemented in Cameroon, given the available resources and time and within the stated time.*

Hypothesis 3 (H3). *The cost involved in transitioning to International Financial Reporting Standards (IFRSs) does not supersede the benefits.*

2.3.2. J.J Gibson's Theory of Direct Perception

James Jerome Gibson (1979) believed that our cognitive apparatus was created and formed by a long evolutionary influence of the external environment, which is apparent in its structure and abilities. We learned to extract precisely the information which is necessary for our survival. By Darwin's

assumption, the pressures of the environment caused our receptors to be created and formed so that they became sensitive to relevant stimulus from the environment and they adapted to the environment. Such interpretation of perception is called the ecological one because it attributes the determinative role to the environment and to its influence on the whole process of perception. The basis of Gibson's theory is the conviction that our perception is determined by optical flows—optic arrays—which Gibson regarded as some sort of structure or pattern of light in the environment. The visual terminology he was using is not crucial since, analogically, it can be used for auditory or tactile components of perception. J.J Gibson's theory is quite relevant to this study because we believe that every individual perceives information depending on several different factors, as discussed in the theory, which gives us a reason to capture the opinion of a number of accountants on the recent decision to transit to the revised OHADA law on accounting and financial reporting (revised SYSCOHADA).

2.4. Empirical Literature

Several studies have been carried out in different parts of the world on the benefits of IFRS and on the perception of accounting practitioners on the transition and convergence to the IFRS (Mohamed et al. 2019; Dabbicco and Mattei 2020; Albu et al. 2020; Ntoung et al. 2020; Muraina 2020; Sharairi 2020; Joshi et al. 2008; Ionascu et al. 2014).

A study by Mohamed, Yasseen and Omarjee (Mohamed et al. 2019) on the perception of South African accounting practitioners on the post-implementation of the IFRS for SMEs in institutionalised environment suggests that the approval of the IFRSs was accepted by all SMEs, and significant advantages were uniformly associated with the IFRS for SMEs. Pallavi Gupta et al. (2015) add that accounting experts are optimistic towards the benefits associated with the implementation of the IFRS, while at the same time they are concerned about the significant costs and challenges such as inadequate training of staff, changes required to process, changes in information technology infrastructure and other costs that are associated with the implementation of the IFRS. This conclusion was arrived at using a closed-ended questionnaire to collect responses from 200 accounting experts. The objectives of the study were to identify the perception of accounting experts regarding the benefits and challenges of IFRS based the Kruskal–Wallis Test, and descriptive statistical tools were also used for data analysis.

Meanwhile, Dabbicco and Mattei (2020) carried out a comparative study of Italy and the UK. These authors claim that uniformity and aliment of practices in public finance reporting systems aids in the understanding of the relationship between financial reporting and budgeting processes. Albu et al. (2020) examined the impact of the IFRSs in the institutional context of the Central and Eastern European (CEE) with national or multinational regional insights both at the firm-level financial reporting benefits and country-level benefits, together with the cost-benefits relationship involved. Their study suggests that the accounting and auditing profession was the most valuable resource in the IFRS adoption process in CEE. A serious adoption process at the micro-level, signalled by high levels of perceived difficulties and regulatory impediments, along with resources available at the country-level and enforcement initiatives, is associated with financial reporting benefits. Country-level benefits are perceived to have materialised to a greater extent in countries with a lower quality of institutions, but with more organisational enablers available at the micro-institutional level. Benefits are perceived to exceed costs to a lesser extent in larger countries and those with more influential institutions.

A similar study was carried out by Muraina (2020) who examined the effects of the implementation of the International Public Sector Accounting Standards (IPSAS) on Nigeria's financial reporting quality. The study employed a survey research design to determine the effects of the implementation of the IPSAS on Nigeria's financial reporting quality. Partial Least Square 3 (SmartPLS 3) technique of analysis was applied to achieve the research objective. The study found that accountability positively and significantly affects the quality of financial reporting in Nigeria. Specifically, IPSAS has improved the level of accountability, which in turn improved Nigeria's financial reporting quality. Sharairi (2020) investigated the factors that influenced the current adoption of the International Financial Reporting Standards (IFRS) by Islamic banks in the UAE. This paper examined the relationship between the

theoretical aspects and practical components. This paper revealed that factors such as religion, culture and local investors might have limited influence on the current adoption of accounting standards in the Islamic banks. Furthermore, this paper uncovered a concern among respondents of issues that developed when Islamic banks commenced the adoption of IFRS.

P.L Joshi et al. (2008) studied the perception of accounting professionals on the adoption and implementation of a single set of global accounting standards in Bahrain. The data for the study were collected using a pre-tested survey plan containing demographic information and professional qualifications—the study aimed at examining the perceptions of accounting professionals on adopting a single set of global standards. The results of the study proved that the accountants were optimistic about the harmonisation of accounting standards, and they felt that it is worth the while. Despite the conclusion drawn, the study was limited in its number of respondents. This conclusion may have been altered if more accountants responded.

There has been much discussion on the relationship that exists between the accounting standards and accounting quality. A study by Barth et al. (2008) sought to examine whether the application of International Accounting Standards is associated with higher accounting quality. The study used accounting quality metrics for a broad sample of firms across 21 countries that adopted IAS from 1994 to 2003. The accounting quality was compared with that of the non-US firms that do not apply the IAS. The study used inferential statistical tools and arrived at the conclusions that the firms of 21 countries which were applying IAS showed evidence of less earnings management, more timely loss recognition and more value relevance of accounting amounts. The author also compared the accounting quality for IAS firms before and after they adopted the IAS and concluded that accounting quality improved between the pre- and post-adoption periods. The period before and after they adopted IAS found that accounting quality was enhanced between the pre- and post-adoption periods.

The perception of accountants on the implementation of IFRS is quite essential in the implementation of the IFRS. A study by (Ionascu et al. 2014) was carried out on the adoption of IFRS by developing countries in the case of Romania. The paper attempted to research the fundamental proof with respect to the advantages and costs of adopting IFRS in Romania. The outcomes acquired demonstrate that, regardless of consistency issues, the Romanian economic environment was open to IFRS and idealistic about their potential to an extent.

3. Methodology

3.1. Research Design

In order to realise the objectives of this paper, a survey research design was chosen given the nature of the population considered for the research as in prior studies (such as Dabbicco and Mattei 2020; Albu et al. 2020; Muraina 2020; Sharairi 2020). It is also likely to be beneficial to accounting standard-setting bodies like the IFRS Foundation, the International Federation of Accountants (IFAC) OHADA, professional accounting associations and public accounting firms in their efforts to promote the worldwide adoption of international standards. Finally, this research would be of importance to academicians as they try to understand the strengths and limitations of the implementation of revised SYSCOHADA and specifically the IFRS in the OHADA zone. Lastly, this study would help educate the stakeholders of listed companies and group companies operating within the OHADA zone.

3.2. Population and Sampling

The study population consisted of the all-professional accountants across the national territory of Cameroon. The reason for selecting Cameroon was because Cameroon is the 'melting pot' and a member of the OHADA zone where all economic and financial transactions are represented.

This population comprised of males and females from different cultural, geographical and social origins. As of 2018, there were two hundred and eight (208) chattered accountants in Cameroon. Our total sample was eighty (80) participants drawn mostly from the Institute of Chartered Accountants

of Cameroon (ONECCA) list of chartered accountants in Cameroon. A random sampling technique was used. The specific reason for selecting 80 accountants, most of whom were members of ONECCA was due to the willingness and availability of participants and to provide us with specific explanation and clarification through open extended questions when the need arose during the survey. This involved the selection of respondents who were available and willing to participate in the study. The data for the research were all primary data collected on the field.

Consequently, we resorted to using a structured close-ended questionnaire. The questionnaires were made up of close-ended questions with the first part relating to demographics and the second part relating to the variables of the study. All questionnaires were administered by mail to the respondents. The question of the cost and benefits arising from the transition from the revised OHADA accounting system may have shown the culture and way of life which can be echoed by the differences between international, regional and national laws and how this affected the reporting decision of players with the confines of these conflicting laws. For example, there is conflict between the OHADA Uniform Acts and General Tax code regarding the deadline for filing company accounts and tax returns, and as such, companies need to extract cost in order to be compliant to both standards. Following the institution of the new accounting law in Cameroon, there was a need to investigate if transitioning from the revised OHADA was beneficiary to companies.

The data obtained were reported using descriptive statistical analysis represented by tables, graphs, charts and other tools to enable adequate interpretation for the required, resulting output. The statistical package for social sciences (SPSS) software version 20.0 was used to facilitate the analysis. The main portion of the questionnaire used a Likert scale where respondents were expected to respond, ranging from strongly disagree to agree strongly.

4. Data Analysis

4.1. Background Information of the Respondents

It was essential to find out the background information of the respondents as this allows the researcher to know the kind of respondents in terms of occupation and years of experience. This typically has implications in terms of how different people perceive different things. For example, the way auditors may recognise a certain IFRS element may be different from the way an accounting professional in a company, as well as an academician, may view the same.

Percentages and frequencies were used to present data on tables classified under four respond options: agree and strongly agree as Agree (A), Neutral (N) and Disagree and strongly disagree as Disagree (D). A cut off 2.5 on a scale of 5 was adopted for the analysis of close-ended items. This stipulates that items with a mean lower than 2.5 exclusively were considered to imply a negative perception on the transition to IFRS as per the SPSS analysis on the main objective. However, to achieve this aim, the information presented was guided by the study objectives. The first section covered the background information such as demographic characteristics of the respondents (that is, the occupation of the respondent and number of years of experience). The second part covered perceptions about the comparability and transparency of the financial statements, the effect of full IFRS implementation in Cameroon, the extent to which the transition to IFRS would improve the transparency and comparability of the reported financial statements, relationship between the dependent variable (transition to IFRS) and independent variables of the study and testing of the hypotheses. The last part focused on determining the best predictor variable for influencing the implementation of IFRS. The data is presented using tables, charts and graphs. Descriptive statistics analysis was used to analyse, interpret and discuss the results from the data collected in line with the study objectives so as to enable the researcher to report the results in detail.

4.2. Occupation of the Respondents

The study sought to find out the various position of responsibility or occupation of the respondents who responded to the questionnaires. Our goal here was to look at those professionals who performed other duties than public practice. The results are presented in Figure 1 below.

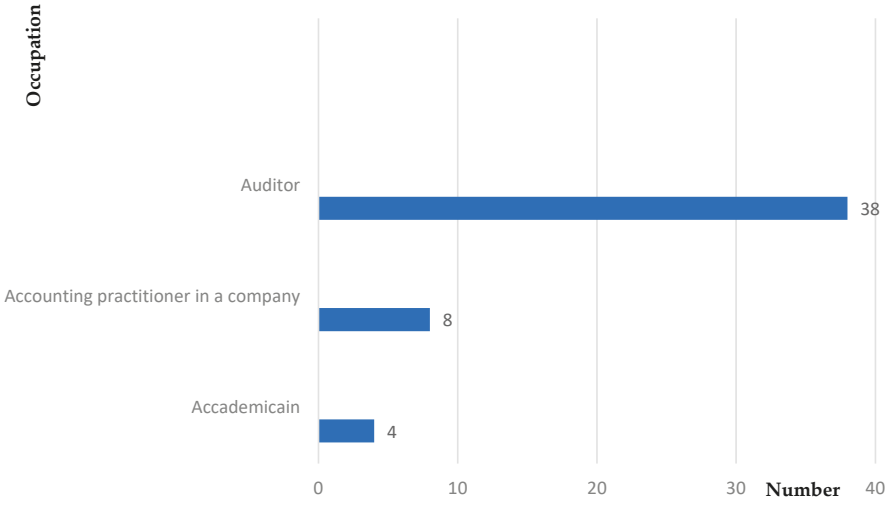

Figure 1. Occupation of the respondents (Source: developed purposely for this research).

The results presented in Figure 1 above show a total of fifty respondents. According to the data collected, 38 (76%) of the respondents were auditors, 16% (8) of the respondents were accounting practitioners in companies, and 8% (4) were academicians. The percentages imply that for the most part the respondents were auditors who audit clients and understand the difficulties or ease involved in their clients' transition. Even though 80 respondents were anticipated, only 50 thoroughly completed the questionnaires. Those 30 respondents who did not complete the questionnaire correctly were eliminated.

4.3. Distribution of Respondents by Number of Years of Experience

The results in Table 1 indicate that the majority of the respondents (22 respondents) worked for 11–20 years which is 44.0%, and 17 respondents worked for 6–10 years, which comprises 34% of the total number, while seven worked 0–5 years (14%). The groups working from 21–30 years and 30 years and above had the same percentage (2%), respectively. This shows that most of the respondents were well experienced in financial reporting and have witnessed the transition and implementation of other financial reporting standards before the IFRS.

Table 1. Distribution of respondents by number of years of experience.

	Frequency	Percent %
11–20 years	22	44.0
6–10 years	17	34.0
0–5 years	7	14.0
21–30 years	2	4.0
30 years and above	2	4.0
Total	50	100.0

Source: Developed purposely for this research.

4.4. Comparability and Transparency of Finance Statement

The first objective of this study was geared towards examining comparability and transparency of the financial statements. To effectively examine this, respondents were requested to indicate their opinion about the comparability and transparency of the financial statements concerning the IFRS. To reduce ambiguity, the results were collapsed from a five-point Likert scale to three-point Likert scale options and their mean values were stipulated.

Table 2 shows the respondents' views on comparability and transparency of the financial statements. Of the respondents, 48 (96%) agreed that there was a higher quality of disclosure in financial statements presented under IFRS than under the former OHADA Uniform Accounting Act. There were no neutral views on this, while a minority of two respondents (4%) disagreed. However, the mean value of 4.61 on a scale of 5 showed there was a strong positive correlation as stipulated by the statement. Thus, we can conclude that there was a higher quality of disclosure in financial statements presented in accordance with IFRS than with the former OHADA Uniform Accounting Act. In terms of comparability, a significant percentage of respondents, 46 persons (92%), agreed that the financial statements were directly comparable to national and international companies. There was one neutral view (2%) and three persons (6.0%) who disagreed with the statement that the financial statements were directly comparable to national and international companies. This can be seen from the mean value of 4.35 on a scale of 5 which shows that there was a strong positive correlation.

Table 2. Respondents' views on comparability and transparency of financial statements.

ITEMS	Agree		Neutral		Disagree		Mean
	F	%	F	%	F	%	
There is a higher quality of disclosure in financial statements presented in accordance with IFRS than under former OHADA Uniform Accounting Act	48	96	0	00	2	4	4.61
The financial statements are directly comparable to national and international companies	46	92.0	1	2.0	3	6.0	4.35
IFRS are appropriate for achieving a true and fair view of the financial statements	49	98	0	0.0	1	2	4.84
The financial statements prepared in accordance to the IFRS are more transparent than those prepared under former OHADA Uniform Accounting Act	47	94	1	2.0	2	4	4.39
Implementing IFRS would increase the understand ability of financial statements	49	98%	1	2.0%	0	0.0%	4.58

Source: Developed purposely for this research.

Similarly, out of the 50 respondents sampled, 49 of them (98%) agreed that IFRS were appropriate for achieving a true and fair view of the financial statements. There was just one person (2%) who disagreed to the fact that the IFRS were appropriate for achieving a true and fair view of the financial statements. There was, therefore, a very strong indication that the IFRS were appropriate for achieving a true and fair view of the financial statements as stipulated by the mean value of 4.84 on a scale of 5, which shows the statement was in line. Furthermore, concerning the statement indicating that the financial statements prepared under the IFRS were more transparent than those prepared under the former OHADA Uniform Accounting Act, a vast majority of the respondents (47 persons) confirmed the assertion to be true. However, three persons differed with the claim. Going from the majority, it can be noted that the financial statements prepared following the IFRS were more transparent than those prepared under the former OHADA Uniform Accounting Act. Furthermore, the mean value of 4.39 on a scale of 5 tells us that there was a strong positive correlation in the statement.

Furthermore, 49 respondents agreed that the implementing of IFRS would increase the ability to understand financial statements. As well, 48 respondents (96%) strongly agreed that there was a higher quality of disclosure in financial statements presented in accordance with IFRS than under the former OHADA Unfirom Accounting Act. Forty-six people (92.0%) agreed that the financial statements were directly comparable to national and international companies, while 4 (8%) disagreed with this. In a nutshell, the mean value of 4.58 on a scale of 5 shows there was a strong positive correlation with the statement with the Cronbach alpha of 0.842 as shown in Table 3 below.

Table 3. Reliability Statistics.

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
0.842	0.810	5

Source: Results obtained from SPSS.

4.5. Examining the Possibility of Fully Implementing the International Financial Reporting Standards in Cameroon

Another aspect of the study was to examine the extent of the application of IFRS in the Cameroon accounting system.

As seen in Table 4, more than three quarters (84.0%) of the respondents strongly agreed that were aware of the International financial reporting standards; eight (16.0%) agreed, and none of the participants disagreed with this. This was closely supported by an understanding of the differences between the IFRS and SYSCOHADA. It was revealed that most of the respondents clearly knew the differences between the accounting reporting systems, as 39 (78.0%) strongly agreed to this, 10 (20.0%) agreed, while one person (2.0%) expressed a neutral view. However, their computed mean was greater than 2.5 and above, which shows that both statements were positively correlated.

Table 4. Respondents' view on the extent of the implementation of International Financial Reporting Standards (IFRS) in Cameroon.

Survey Statement	Agree		Neutral		Disagree		Mean
	F	%	F	%	F	%	
I am well aware of the IFRS	50	100	0	0.0	0	0.0	4.98
I understand the key differences that exist between the IFRS and SYSCOHADA	49	98.0	1	2.0	0	0.0	4.71
Cameroon has the structures needed to carry out a revaluation of fixed assets	20	40.0	4	8.0	26	52.0	2.35
The nature of fixed assets in most companies are such that they can be decomposed and recorded separately	38	76.0	2	4.0	10	20.0	3.94
The clients fully understand the IFRS and can prepare their statements for the 2018 Financial year in accordance with the IFRS	26	52.0	3	6.0	21	42.0	3.39
Accountants understand the distinguishing factors in the IFRS for SME's	30	60.0	5	10.0	15	30.0	4.00
Accountants of SME's who report internationally have been well trained to prepare their statements in accordance to the revised standards	39	78	4	8	7	14	3.61
Companies have understood the changes in the statistics and tax return filing	11	22.0	3	6.0	36	72.0	2.77
My clients would be able to prepare their tax returns in accordance with the revised laws for the 2018 financial year	19	38.0	11	22.0	4	8.0	3.97

Source: Developed purposely for this research.

From Table 4 above, the study also found that a majority of the respondents (52%) disagreed with the assertion that Cameroon has the structures needed to carry out a revaluation of fixed assets. Four neutral respondents comprised 8%, and as the mean value of 2.35 on a scale of 5 shows, there was a weak positive correlation. Furthermore, 40% of the respondents felt that Cameroon has the structures needed to carry out the revaluation of fixed assets. This depicts clearly that many of the respondents think that Cameroon does not have the necessary structures and infrastructures to implement the IFRS, as well as the revaluation of fixed assets.

50 respondents agreed with the assertion that the natures of fixed assets in most companies are such that they can be decomposed and recorded separately. Of the total respondents, 34% strongly agreed with that assertion, 42% agreed (giving a total of 76% for those who agreed), two respondents could not tell whether companies have fixed assets that can be decomposed and recorded separately, and 20% disagreed that companies have fixed assets that can be decomposed. This shows that most of the respondents hold the view that the natures of fixed assets in most companies are such that they can be decomposed and recorded separately. The computed mean value of 3.39 shows that the statement was in line.

Furthermore, 60% agreed that accountants understand the distinguishing factors in the IFRS for SME's, and only 10% and 30% were neutral and strongly disagreed, respectively. The computed mean value of 4.00 shows there was a strong positive relationship. However, 78% agreed that accountants of SME's who report internationally had been well trained to prepare their statements in accordance to the revised standards. In comparison only 8% and 14% were neutral and disagreed, respectively. In a nutshell, the mean value of 3.61 on a scale of 5 shows that the statement was positively correlated.

In addition to that, 11 respondents (22%) strongly agreed that the clients fully understand the IFRS and can prepare their statements for the 2018 financial year under the IFRS; 15 respondents (30%) supported this, while 6% of the respondents were indifferent. However, 10% of the total respondents disagreed with the assertion that their clients fully understand the IFRS and can prepare their statements for the 2018 financial year per the IFRS. Accountants understand the distinguishing factors in the IFRS for SMEs, and the mean value of 2.77 shows the statement was strongly correlated.

Equally, from those sampled in the study, less than half accepted that companies have understood the changes in the statistics and tax return filling, while few were indifferent. This was opposed to about 72% who disagreed that companies' accountants understand the changes in tax return filing with the introduction of IFRS. The last aspect indicates that most of the respondents disagreed that their clients would be able to prepare their tax returns in accordance with the revised laws for the 2018 financial year. This was opposed to a few whom the study found could, and the mean value of 3.9 on a scale of 5 shows there was a strong positive correlation with the Cronbach's alpha of 0.818 as shown in Table 5 below.

Table 5. Reliability Statistic.

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
0.818	0.770	9

Source: Results obtained from SPSS.

4.6. Perception on the Costs and Benefits Involved in Transitioning from the Former OHADA to IFRS

The last objective of this study sought an understanding of respondents' perception on the costs and benefits involved in transitioning from the OHADA GAAP to IFRS as shown in the Table 6 below.

Table 6. Respondents' perceptions of the costs and benefits involved in transitioning from the Organisation for the Harmonisation of Business Laws in Africa (OHADA) GAAP to IFRS.

Survey Statement	Agreed		Neutral		Disagree		Mean
	F	%	F	%	F	%	
Implementing IFRS would increase the relevance of accounting information for decision making	50	100	0	0.0	0	0.0	4.71
Preparing financial statements in accordance with the IFRS would increase the opportunities of Cameroon companies for assessing global markets	50	100	0	0.0	0	0.0	4.65
Presenting Financial statements in accordance with the IFRS would assure greater accessibility of funds for Cameroonian companies	46	92.0	0	0.0	4	8.0	4.65
Transitioning to IFRS would lower the cost of capital	44	88.0	3	6.0	3	6.0	4.39
Transitioning to IFRS would provide professional opportunities to Cameroonian professionals across the globe	49	98.0	1	2.0	0	0.0	4.55
Transitioning to IFRS would make the business climate more welcoming to investors	48	96.0	1	2.0	1	2.0	4.72
IFRS is complicated in comparison to OHADA	40	80.0	1	2.0	9	18.0	4.64
Transitioning to IFRS requires the training of staff which would be costly to organisations	11	22.0	3	6.0	36	72.0	2.05
Transitioning to the IFRS would require a change in the accounting processes	35	70.0	2	4.0	13	26.0	3.94
Implementing IFRS would require significant changes in the Information Technology Infrastructure of several organisations	31	62.0	2	4.0	17	34.0	3.57
The IFRS requires too much disclosure of financial information which is troublesome	25	50.0	0	00	25	50.0	2.50
Implementation of IFRS would require significant changes in various existing laws	21	42.0	1	2.0	28	56.0	2.46

Source: Developed purposely for this research.

As seen in the Table 6 above, an evaluation of respondents' opinions on the cost-benefit analysis of the implementation of IFRS found a strong confirmation by all respondents that implementing IFRS would increase the relevance of accounting information for decision making. About three-quarters of the respondents agreed that preparing financial statements under the IFRS would increase the opportunities of Cameroon companies for assessing global markets. This was supported by the remaining one quarter 13 (26%) of respondents. However, the mean values greater than 2.5 on a scale of 5 shows that there was a strong positive relationship in the stipulated statement.

Likewise, it was confirmed by 38 (76%) of the respondents that presenting financial statements per the IFRS would assure greater accessibility of funds for Cameroonian companies. While eight (16%) of the respondents supported this assertion, four (8%) significantly differed and four (5%) were indecisive.

In terms of cost of capital, the results proved that 34 (68%) of the respondents strongly agreed that transitioning to IFRS would lower the cost of capital; this was decided upon by 10 respondents (20%) of the respondents, while three respondents (6%) stayed neutral and three respondents (6%) disagreed. Conversely, 11 (22%) of the respondents held that transitioning to IFRS required the training of staff, which would be costly to organisations. Nevertheless, the majority of the respondents (72%) disagreed with the minority. This was confirmed by the mean value of 2.05 which was less than 2.5, showing there was a weak positive correlation.

On another dimension, 49 respondents (98%) held that transitioning to IFRS would provide professional opportunities to accounting professionals in Cameroon across the globe. Transitioning to IFRS would make the business climate more welcoming to investors according to 48 (96%) of the respondents. Likewise, transitioning to the IFRS would require a change in the accounting processes

according to 35 (70%) of the respondents, although 13 (26%) of them opposed. In a nutshell, the mean value of 3.94 shows the statement was strongly in line.

In terms of technological change, the results recorded a significant confirmation by 31 (62%) respondents that implementing IFRS would require substantial information technology infrastructure of several organisations. This was opposed by 17 (34%) of the respondents, while two (4%) of them were uncertain. This was in accordance with the mean value of 3.57 which was greater than 2.5 on a scale of 5. This shows there was a strong positive correlation with and the Cronbach alpha of 0.825 as shown in Table 7 below.

Table 7. Reliability Statistics.

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
0.825	0.802	11

Source: Results obtained from SPSS.

Moreover, the IFRS requires too much disclosure of financial information, which was troublesome according to 25 (50%) respondents, besides the fact that implementation of IFRS would require significant changes in various existing laws. The mean value of 2.5 on a scale of 5 shows there was a positive correlation stipulated by the statement. IFRS recommends the application of the fair value concept, which is generally difficult to apply.

In terms of the effect on earnings, the study found that 30 (60%) of the respondents admitted that implementing IFRS would increase volatility in the company's earnings. This is because financial statements presented under the IFRS are prone to manipulation since businesses can use the methods they wish. This was according to 13 respondents (23%), while the majority disdained. However, the result shows a weak positive correlation of 2.46 on a scale of 5 as stipulated by the statement.

4.7. Verification of Research Hypothesis

The first goal in analysing the results was to test if the findings were robust. In particular, this examines if individuals gave broadly similar answers to roughly similar questions (an essential test of reliability). Furthermore, the results using a 1% level of significance as our tested hypotheses under one sample test are computed on the Table 8 below:

Table 8. Hypothesis testing results.

	One-Sample Test					
	Test Value = 2					
	T	df	Sig. (2-Tailed)	Mean Difference	99% Confidence Interval of the Difference	
					Lower	Upper
The implementation of the IFRS would improve the comparability and transparency of financial statements	31.976	50	0.000	4.613	4.22	5.01
IFRS can be fully implemented in Cameroon given the available resources and within the stated time.	72.058	50	0.011	2.839	4.65	5.02
The benefits involved in transitioning to IFRS supersedes the cost of the transition	66.635	50	0.000	3.806	4.61	5.00

Source: Developed purposely for this research.

As analysed above from the presentation of results for the test of hypothesis on Table 8, it was noticed that the *p*-value for comparability and transparency was 0.000, which is less than 0.01 at 1% level of significance. We therefore reject the null hypothesis which says that the implementation of the IFRS would not improve the comparability and transparency of financial statements and accept the alternative hypothesis which says that the implementation of the IFRS would improve the

comparability and transparency of financial statements. Therefore, we conclude that the International Financial Reporting Standards would have a significant effect on the comparability and transparency of financial statements.

Furthermore, the *p*-Value for Cameroon's resources was greater than 1% level of significance (*p*-Value > 0.01) therefore, our study was insignificant. That is, we do not have enough evidence to reject the null hypothesis which says IFRS cannot be fully implemented given Cameroon's resources and within the stated time, and conclude that the test was statistically insignificant at 1% level of significance. Lastly, the *p*-Value for transitioning to IFRS was less than 1% level of significance (*p*-Value < 0.01) therefore, our study was significant. That is, we then reject the null hypothesis which says that the costs involved in transitioning to IFRS supersedes the benefits and accept the alternative which says that the benefits involved in transitioning to IFRS supersede the cost of the transition. Therefore, we conclude that there is likely an overall effect of benefits and costs by transitioning to IFRS.

4.7.1. Discussion of Results on the Comparability and Transparency of the Financial Statements under the IFRS

The first objective of this study was geared towards examining comparability and transparency of the financial statements under the IFRS. Aspects of perception examined showed that majority of the respondents agreed that with the introduction of IFRS in the Cameroon accounting reporting system, there is a higher quality of disclosure in financial statements presented as per the IFRS than under OHADA. This means that the respondents perceive that IFRS enables greater transparency, as such disclosure in financial statements filed in accordance with IFRS can reveal more information about the financial situation of the business, which makes analysis easier. Furthermore, a significant percentage of respondents also agreed that the financial statements prepared in accordance with the IFRS would be more comparable to national and international companies than those prepared following the OHADA GAAP. Greater comparability lowers the cost of acquiring information and increases the overall quantity and quality of information available to analysts about the firm. In addition to that, the respondents were positive about the idea that reporting in accordance with the IFRS would result in financial statements that reflect a true and fair view of the financial situation of the company. According to some proponents of International Financial Reporting Standards (IFRS), IFRS increase financial comparability and usefulness of accounting information (Tweedie 2010).

The last aspect identified under this objective recorded great confirmation that there was more transparency of financial statements prepared in line with IFRS than those prepared in accordance with the OHADA GAAP. These findings align to an extent with those of Rachel Byers (2017), who found that a transition to IFRS would have significant effects on those accounting information sources, as this has been already adopted by over 100 countries because of its levels of transparency and comparability in international business environments spur by globalisation. Furthermore, P.L. Joshi et al. (2008), on the perception of accounting professionals on the adoption and implementation of a single set of global accounting standards in Bahrain, proved that the accountants were optimistic about the harmonisation of accounting standards and they feel that it is worth the while.

4.7.2. Discussion on the Findings of the Full Implementation of IFRS in Cameroon

The findings with respect to Cameroon's ability to implement the IFRS revealed that accounting practitioners are actually positive about the IFRS implementation irrespective of the limited time for the law to take effect. However, the results were insignificant, indicating that most of those interviewed believe that Cameroon does not have the necessary infrastructure as well as proper accounting knowledge of IFRS to implement IIFSR in the system fully. This is unlike Barth et al. (2008), who found that the application of International Accounting standards was associated with higher accounting quality in 21 countries that adopted IAS from 1994 to 2003. The author also compared the accounting quality for IAS firms before and after they adopted the IAS and concluded that accounting quality has

improved between the pre- and post-adoption periods. The period before and after they adopted IAS showed that accounting quality was enhanced between the pre- and post-adoption periods.

4.7.3. Discussion of Cost/Benefits of the Transition to IFRS

In line with Gupta et al. (2015), the conclusion generated from the descriptive and empirical analysis was that accounting experts are optimistic towards the benefits associated with the implementation of the IFRS, while at the same time they are concerned about the significant costs and challenges, such as inadequate training of staff, changes required in the process, changes in information technology infrastructure and other costs that are associated with the implementation of the IFRS. The low response rate below 50% makes the study limited. The number of responses used to arrive at the conclusion was quite small with respect to their target population. Perhaps if the response rate was higher, the results would have been different.

This, however, contradicted the works of others in the Swiss accounting system who found that a high percentage of firms voluntarily chose IAS in the 1990s, and switching to IAS was likely to be more costly for Swiss firms than for firms from countries with higher reporting standards; as such, voluntary adopters in Swiss firms should expect more advantages from IAS adoption (Dumontier and Raffournier 1998; Murphy 1999). While proponents of IFRS claim that IFRS increases financial comparability and usefulness of accounting information concord with the findings of this study, others believe worldwide adoption of IFRS by all firms is costly, complex and does not necessarily improve the quality of accounting reports. These study findings did not agree as there was significant evidence that the benefits of the transition to IFRS supersede cost.

5. Conclusions

This study aimed at investigating the perception of accounting practitioners on the transition from the former OHADA Uniform Accounting Act to the revised (now) OHADA Act on Accounting and Financial Reporting and to IFRS, taking into account their opinion on the extent to which the transition to IFRS would improve the transparency and comparability of the reported financial statements. Also, it looked at the extent to which the International Financial Reporting Standards can be completely implemented fully in the economy of Cameroon as a whole given its level of resources and within the stated time. Lastly an understanding of the costs and benefits involved in transitioning from SYCOHADA to IFRS was explored. The findings of this study are summarised as follows: with respect to the transparency and comparability of the financial statement, the results indicated that there would be a higher quality of disclosure in financial statements prepared following the International Financial Reporting Standards than under the previous OHADA Accounting Act. This is supported by the fact that the respondents believe that when reporting following the IFRS, financial statements of a company can be directly comparable with a similar company in the same industry both within and out of the country.

The study proved that financial statements prepared in accordance with the IFRS are more appropriate in presenting a true and fair view. This implies that the Cameroon accountants perceive IFRS to be a better reporting standard than the previous OHADA Uniform Accounting Act because financial statements are expected to present a true and fair picture of the company's financial situation and be free from material misstatements. In addition to that, the study also proved that the understandability of the financial statements would be greatly improved when reporting under IFRS because a greater majority understands these standards as they are used in several countries already and they present a higher quality of disclosures than OHADA. All these prove that the accountants have a positive perception about the comparability, transparency and understandability of the financial statements. The investigation on the perception of practitioners regarding the complete implementation of International Financial Reporting Standards in the economy of Cameroon proved that Cameroon does not have the structures required to carry out the revaluation of fixed assets. Hence there is a need

for an independent valuation body in Cameroon. However, the respondents attested to the fact that the nature of fixed assets in some companies is such that it can be decomposed and recorded separately.

The study also found out that the accountants in Cameroon understand the distinguishing factors in the IFRS for small and medium-size enterprises, and they would be able to prepare their financial statements for the year ending in December 2018 in accordance with the IFRS. However, though the accountants believe that they can prepare the financial reports in accordance with the International Financial Reporting Standards, there is still insufficient evidence to attest to the fact that companies in Cameroon have understood the changes in the statistics and tax return filling and that many clients would be able to prepare their tax returns in accordance with the laws for the 2018 financial year. It should be dully noted that Cameroon implemented just part of the IFRS, which is the reporting standards for publicly listed companies and group companies that report internationally. The IFRS for SME's is still under review. The advantages and disadvantages of implementing IFRS are peculiar to respective countries based on the availability of resources. Cost and complex nature have been a cause of concern for implementing and adopting IFRS. There are of course positive gains regarding the implementation of IFRS. However, there are serious concerns about the cost and benefits associated with IFRS. All the respondents agreed that implementing IFRS would increase the relevance of accounting information for decision making and it would increase the opportunities of Cameroon companies for assessing global markets.

They also attested to the fact that presenting financial statements in accordance with the IFRS would assure greater accessibility of funds for Cameroonian companies, lower the cost of capital, provide professional opportunities to Cameroonian professionals and of course make the business climate more welcoming to investors. However, there are major concerns attributed to the transition, as the respondents supported the fact that the IFRS is a more complicated statute to adhere to than the OHADA. The transition does not come with previous knowledge, and as such, every company would have to train its staff on the new standards and these trainings and workshops are usually very costly and time-consuming. The transition would also require a change in the accounting process which may be attributed to the higher quality of disclosures when reporting under IFRS. It was also uncovered in the course of the study that the increase in the disclosure may tend to be troublesome because when too much information is made available, deciphering may become difficult for shareholders. In addition to that, the findings of the study also included the fact that implementing IFRS would require significant changes in the information technology infrastructure of several organisations and would also require significant changes in various existing laws.

In sum, this study on the perception of accounting practitioners on the transition from OHADA General Accepted Accounting Principles to IFRS in Cameroon sought specifically the respondents' views pertaining to transparency and comparability of IFRS, the extent to which the IFRS can be implemented in the economy of Cameroon and the costs and benefits involved in transitioning from OHADA to IFRS. Data were collected using questionnaires administered to a sample of 50 respondents constituting accountants in Cameroon businesses. Accounting practitioners have a positive perception of the cost/benefits of IFRS transition in Cameroon. It was concluded that full IFRS could not be completely implemented in Cameroon given Cameroon's resources, especially within the slated time. However, there is need for further research to be done in this area. Further studies should focus on investigating whether the perception of accountants is independent of their individual attributes like age, education, experience and qualification to bring about uniformity in the reporting structures. It is necessary to investigate the extent to which the IFRS was actually implemented in Cameroon and understand the challenges and opportunities that actually arose after the implementation of the new reporting standards. One of the limitations is that it is specific to Cameroon. We had as one of our principal objectives to widen the scope, but due to limited information we were restricted only to Cameroon. Further research will include other African countries that had adopted the OHADA Accounting System. Consistently, Tawiah and Boolaky (2019) shows that in most African Countries there is a very slow implementation process of the IFRS. His study suggests that amongst the

African countries examined, 18 African nations required their companies to report financial statements according to IFRS, meanwhile, 23 did not permit their companies to report according to the IFRS. Thus, the above discussion shows that Cameroon needs the local institutional capacity and professional training to smoothen the path towards the transition of IFRS.

6. Recommendations of the Study

The first priority of the International Accounting Standards Board (IASB) is to improve financial reporting for the benefit of investors and other users of financial information. It is done by striving to set the highest-quality standards, which collectively are known as Generally Accepted Accounting Principles (GAAP). The IASB is a key participant in the development of the IFRS. The benefits of having internationally comparable financial statements are abound. However, the results from the study reveal that the respondents were not aware of whether the financial statements prepared in accordance with IFRS were comparable or not. This shows that their knowledge on IFRS was limited, hence seminars and focus group discussions should be organised to educate the experts on all the benefits of this transition.

It is necessary to revalue fixed assets to bring them to their proper fair value when reporting under the IFRS. However, the results from the study reveal that there are no proper structures in Cameroon to carry out the revaluation of fixed assets. Hence the ministry of finance and the government at large should ensure that such structures are put in place in order to reduce the level of material misstatement in fixed assets.

More so, results showed that clients do not fully understand the IFRS and were not certain if their clients would be able to prepare their financial statements in accordance with the IFRS. It is worth noting that the IFRS provides momentous changes to the manner of reporting financial transactions. Hence, there is an inexorable need to train the auditors and accountants on these changes. In view of this, it is worth proposing that the accounting body in Cameroon (ONECCA) should strive to ensure that all accountants have a proper understanding of the IFRS that guides the preparation of their financial statements in their sector of business. In line with the cost-benefit analysis of IFRS implementation, the findings showed that transitioning to IFRS requires the training of staff which is costly to organisations, and it also requires too much disclosure of financial information which is troublesome to businesses. Likewise, implementation of IFRS would require significant changes in various existing laws. To address these issues, it was recommended that businesses should evaluate the overwhelming benefits that IFRS have on their businesses such that the accompanying cost can be undermined. Considering that the trainings would have a ripple effect on several parties, the organisers should see into it that these trainings are very affordable for all and the both languages should be represented. The fundamental reason for utilising this research method was due to the fact that a qualitative survey is holistic, and it allowed us to develop an initial understanding of how people think and feel. It equally permitted a primary study of a large and diversified population with the possibility of adequately studying a sample while still maintaining the validity and reliability.

7. Limitation of Study

Our study is limited to the sociability of the respondents. This might be bias. However, this is because we were more concerned with examining the perceptions of professional accountants which might impose some incomplete information to the study.

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What Drives the Declining Wealth Effect of Subsequent Share Repurchase Announcements?

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Abstract: Recent academic studies document that open market share repurchase announcements in the United States generate significantly lower returns than those reported in earlier studies. We find that the lower announcement return is associated with an increasing number of subsequent announcements in the more recent periods. Although the announcement period return from the initial announcement is positive, subsequent announcement returns are significantly decreasing. Further, we find that the decreasing returns of subsequent announcements are attributed to firms with negative past repurchase announcement returns. Our multivariate regression test results are consistent with the notion that the decreasing subsequent repurchase announcement returns are driven by hubris-endowed managers.

Keywords: open market share repurchase; hubris; cumulative announcement returns; endowed

1. Introduction

SEC Rule 10b-18 of the United States' Securities and Exchange Commission, introduced in 1982, allows a company to announce its intention to repurchase its shares at the going market price. Market reactions to open market share repurchase announcements in the 1980s were very positive with average cumulative announcement returns recorded of more than 3 percent (see, for example, (Vermaelen 1981; Ikenberry et al. 1995)).[1] Since then, however, the cumulative abnormal announcement returns are reported to decline over the years with average cumulative announcement returns of around 1% in 2004 (Bonaimé 2012; Yook and Gangopadhyay 2011). The goal of this paper is to explain why some firms, in light of the evidence of declining average announcement period returns, continue to repeat their open market share repurchases.

What has caused the depletion of open market repurchase announcement returns? One possible explanation is that it could be related to the increasing number of frequent repurchase announcements.[2]

[1] The main motive for open market share repurchases is mainly either to buy back undervalued stocks (Lakonishok and Vermaelen 1990; Peyer and Vermaelen 2009), or to distribute temporary free cash flows, in lieu of dividends, to shareholders (Stephens and Weisbach 1998; Dittmar 2000; Skinner 2008). Other theories used to explain repurchases are: (1) to improve their leverage ratios (Bagwell and Shoven 1988); (2) to discourage takeover attempts (Bagwell 1991); and (3) to counter the dilution effect of stock option plans (Fenn and Liang 2001; Kahle 2002).

[2] Another possible explanation could be due to lower past repurchase completion rates. (Bonaimé 2012; Mishra et al. 2011; Chang et al. 2010) argue that when a firm launches an open market share repurchase program but does not follow it through

Jagannathan and Stephens (2003) find that the market reacts less positively to announcements made by frequent repurchasers than to those made by non-frequent repurchasers. The number of frequent repurchase announcements in their sample, during the period from 1986 to 1996, accounts for about half of their total sample. Since 2003, however, the frequency of announcing subsequent open market repurchase programs is reported to have been increased substantially (Fu and Huang 2016).[3]

Busch and Obernberger (2017) document that share repurchases help to maintain accurate stock prices by providing price support at fundamental values. They find no evidence of managers using share repurchases to manipulate stock prices when selling their equity holdings or exercising stock options. Similarly, Liu and Swanson (2016) provide evidence that a key motive for increasing share repurchases is to provide price support.

If the market reacts less favorably to subsequent repurchase program announcements, why would some firms keep repeating such a program? Ben-David et al. (2007) argue that hubristic managers are not only responsive to excess cash flows, but also prone to believe that their firms' stock prices are less than what they should be and are likely to communicate their (biased) belief to the market by launching open market repurchase programs.[4] Ben-David et al. (2007) argument is consistent with Jagannathan and Stephens (2003) findings that repeat repurchasing firms have large excess cash flows and high growth opportunities. As empirical evidence in the literature suggests that hubristic bias is pervasive among managers,[5] this paper examines whether managerial hubris bias can explain the decreasing magnitude of open market repurchase announcement period returns. The empirical results are consistent with this conjecture.

It should be pointed out that the term *hubris* has been used in the context of takeovers by Roll (1986) to describe the managerial motive behind takeovers. *Managerial hubris* refers to overconfident managers who attribute their success to their individual superior abilities. There is no direct instrument available to measure CEO/managerial hubris. Prior work has used the following indicators to infer managerial hubris: recent organizational success (Meindl et al. 1985; Hayward and Hambrick 1997), recent media praise (Chen and Meindl 1991; Salancik and Meindl 1984), CEO's self-importance (Manfred et al. 1984; Miller and Droge 1986; Finkelstein 1992), and the moneyness of CEO's option (Kim et al. 2016). Following these works, particularly Hayward and Hambrick (1997), we infer about managerial hubris based on a firm's prior performance.

This paper finds that, during the sample period from 1996 to 2014, the number of repeat or subsequent open market repurchase announcements has been increasing over the years. On average, the number of repeat announcements in a year accounts for about 68% of total open market repurchase

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or repurchase less than the number of shares announced in the program, the market considers the firm as having a bad reputation. Consequently, the market will react less favourably when the firm announces a subsequent open market share repurchase program. Low past completion rates, however, cannot explain why some firms keep repeating open market repurchase programs. If the motivation to repurchase is related to stock undervaluation, which is one of the most common motives to launch an open market repurchase program, a positive market reaction to the repurchase announcement may be sufficient for the announcing firm to not fully follow through on its announced repurchase plan, and therefore may explain its lower repurchase completion rate. Similarly, if a firm's subsequent open market repurchase program is motivated by distributing excess cash flows or stock options, it should not have a low repurchase completion rate.

3 A similar pattern has also been observed in the Swedish stock market. De Ridder and Rasbrandt (2014) find that repeat repurchasers make two out of three Swedish share repurchase announcements.

4 For the purposes of the current research work, we refer to hubris as an individual's personal attribute of self- or over-confidence. We define the term managerial hubris as the over-confident behavior of corporate managers.

5 The finance literature documents that some managers are prone to self-attribution bias, which leads them to be hubristic. Ben-David et al. (2007) find that among other corporate actions, these managers are more likely to be associated with less efficient investments. Hayward and Hambrick (1997) find that CEO's hubris (or exaggerated self-confidence) is strongly positively associated with the size of premiums paid for acquisitions. Malmendier and Tate (2008) find evidence consistent with the view that hubristic CEOs overestimate their ability to generate returns. Hence, they overpay for target companies and undertake value-destroying mergers. Another managerial trait—CEO narcissism—has also been shown to be positively related to the number and size of acquisitions. (Chatterjee and Hambrick 2007; Billett and Qian 2008; Karolyi et al. 2015) find evidence consistent with hubristic managers explaining the declining returns of serial acquirers. Recent work by Aktas et al. (2016) show that both acquirer and target CEO narcissism affect the characteristics of the takeover process. No prior studies have studied stock repurchases using the lens of managerial hubris.

announcements.[6] Consistent with prior studies, compared with firms that do not repeat share repurchase announcements, firms that repeat their share repurchase programs have higher growth opportunities, have more free cash flows, are more profitable, less undervalued, larger, and have significantly lower cumulative abnormal announcement period returns (3.56% vs. 1.83%, respectively). It is, therefore, an empirical question why such firms, having high growth opportunities and large cash flows, would keep investing in their own stocks rather than investing in the real sector.

This paper documents firms that repeat open market share repurchase programs experience an average cumulative announcement period abnormal return of 2.51% from their initial announcement. However, when these firms repeat their repurchase programs, the market reacts less favorably to the second announcement, that the cumulative announcement period return drops significantly to 1.77%. The cumulative announcement period return continues to drop further to only 0.89% when firms make five or more open market repurchase announcements. In a further analysis, this study finds that firms with negative past announcement returns experience decreasing subsequent announcement returns, which is consistent with the notion that managers endowed with hubris are associated with decreasing subsequent announcement returns.

This study sheds light in explaining the declining open market share repurchase announcement returns and attempts to contribute to the literature in several aspects. First, this study employs a more recent sample period (from 1996 to 2014) and documents that the number of repeat open market share repurchase announcements has significantly increased over the years, suggesting that there is a systematic change in repurchasing behavior during the sample period. Second, the present study is the first to document that, not only the announcement returns of repeat announcements are lower than those of non-repeat announcements, but also that the magnitude of subsequent announcement returns is decreasing significantly. Third, this paper proposes a managerial motivation bias to explain the increasing number of repeat open market share repurchase programs. The empirical results are consistent with the hubris bias hypothesis that firms with managers endowed with hubris bias and equipped with excessive cash flows, are more likely to repeat their open market share repurchase programs even though their decisions generate lower subsequent announcement returns.

The rest of the paper is organized as follows. Section 2 develops and discusses the hypotheses. Section 3 describes the sample and data collection processes. The empirical results are reported in Sections 4 and 5 concludes.

2. Hypothesis Development

The literature documents that firms that repeat their repurchase programs have higher growth opportunities, have more free cash flows, are less undervalued and are larger than those with infrequent repurchases (Jagannathan and Stephens 2003). Firms with such characteristics provide an ideal research setting for examining the *managerial hubris hypothesis* in subsequent share repurchase programs as hubristic managers are significantly more responsive to the generation of excess cash flows by their firms and tend to over-invest by repurchasing their firms' shares (Ben-David et al. 2007; Malmendier and Tate 2005; Campbell et al. 2011).[7] Supported with large amounts of free cash flows, managers may feel confident in their ability to meet the firm's obligations and may also be over-confident in using the excess free cash flows on a subsequent open market repurchase program when they believe their firms' equity value is underpriced, regardless of firms' high growth opportunities and could have

[6] Drops only in 1998 and 1999 to less than half of the total announcements in a year (48% and 45%, respectively).

[7] Lehn and Poulsen (1989) find that firms with undistributed free cash flows tend to pay a significant premium for stock repurchases related to going private transactions. Howe et al. (1992) investigate whether Jensen (1986) free cash flow theory explains the market reaction to tender offer share repurchases and specially designated dividends where the cash distribution is not expected to be repeated. They find that free cash flows do not explain the announcement returns very well and conclude that their results are inconsistent with Jensen's free cash flow hypothesis but consistent with the information-signaling hypothesis. They offer the entrenchment hypothesis as a possible explanation for their conflicting findings with those of Jensen's.

invested in real capital projects instead. If a repeat repurchase program is not in the best interest of shareholders, the market will react less favorably to a firm's subsequent announcement. As such, we test the following hypothesis:

Hypotheses 1 (H1). *Subsequent open market repurchase announcements by hubristic managers will experience lower announcement period returns due to their overpayment for the shares.*

Managers may develop a hubris bias when their previous open market repurchase program is successful (learning hubris) and, therefore, may overestimate their ability to repeat their previous success by launching a subsequent repurchase program. On the other hand, managers can also be hubristic if they are already endowed with it. Prior studies in the psychology literature document that people endowed with hubris are likely to ignore negative feedback of their behavior (Snyder et al. 1977; Swann and Read 1981; Taylor and Gollwitzer 1995). Thus, managers endowed with hubris are likely to ignore negative feedback from the market (Roll 1986; Billett and Qian 2008). Because they are biasedly optimistic about their ability to succeed, even though their firm's past announcement return from the previous program is negative, if they believe that their current stock price is undervalued, they would likely attempt to correct the stock price by repeating a repurchase program. Therefore, we expect that the subsequent announcement returns of such firms to be lower, or even negative. Thus, the second hypothesis is:

Hypotheses 2 (H2). *If repeat repurchase announcements are attributed to endowed hubris, then firms with negative past announcement period returns will experience even lower subsequent announcement returns.*

Managers with endowed hubris bias may likely repeat a subsequent share repurchase announcement within a shorter period, as they would like to repeat their previous success. The shorter the number of days between a previous and a current announcement, the lower is the expected current announcement period return. Consequently, the third hypothesis is:

Hypotheses 3 (H3). *The time between two subsequent announcements is positively related to the announcement period return.*

3. Sample

This study collects open market share repurchase announcement dates of non-financial and non-utility firms in the U.S. from January 1996 to September 2014 from Thomson Reuters SDC Platinum. Price and accounting variable data of these firms were obtained from Thomson Reuters Datastream. Market-adjusted announcement period abnormal returns were computed with market value-weighted returns obtained from Kenneth French's website[8] as the benchmark. This study does not use the market model to estimate abnormal announcement returns as several firms in the sample repeat their announcements in less than a year period, and thus would bias the measurement of normal period return.[9] Merging the data obtained from SDC Platinum and Thomson Reuters Datastream reduces the sample size to 3122 announcement-year observations. To mitigate the effects of outliers, these variables are winsorized at the 1% and 99% levels.

Table 1 shows the number of non-repeat and repeat announcements from 1996 to 2014, their corresponding announcement period returns, and the associated size programs during the sample period. In Panel A of Table 1, the total number of open market share repurchase announcements increases from 227 in 1996 to 405 in 2008 and then declines to 82 in 2014. The lowest (highest) total number of announcements is in 2012 (1998) with 36 (405) announcements. The percentage of announcements made by repeat repurchasers decreases from 59% in 1996 to less than half in 1999. Since then, it has increased to, on average, around three-fourths of all repurchase announcements

[8] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#HistBenchmarks.
[9] This methodology is also used in studies on repeat acquisitions, such as (Karolyi et al. 2015; Billett and Qian 2008).

every year in the sample period. Panel B shows that the lowest (highest) 2-day cumulative abnormal returns or CARs (days 0, +1) is 0.4% (4.7%) in year 2006 (1999). The average 2-day CARs since year 2000 is 1.78% per year, which is much lower than those reported in earlier studies in the open market repurchase literature. The average cumulative announcement abnormal return for the whole sample period is 2.4%. We observe that the size of repurchase programs increases over time with the average smallest (largest) program launched in 2004 (2012). On average, repurchasing firms plan to buy back around 7.56% of their outstanding stocks. The (untabulated) correlation coefficient between the percentage of repeat announcements and announcement returns is negative. These statistics clearly show that open market share repurchase announcements in more recent periods are dominated by repeat repurchase announcements with significantly lower announcement period returns.

Table 1. Sample distribution and market adjusted returns.

Panel A. Number of Repurchases				
YEAR	**ONLY ONE**	**REPEAT**	**TOTAL**	**% REPEAT**
1996	94	133	227	59%
1997	122	128	250	51%
1998	211	194	405	48%
1999	147	122	269	45%
2000	96	112	208	54%
2001	43	82	125	66%
2002	57	109	166	66%
2003	23	79	102	77%
2004	25	132	157	84%
2005	47	156	203	77%
2006	47	1474	194	76%
2007	41	142	183	78%
2008	32	92	124	74%
2009	12	59	71	83%
2010	30	97	127	76%
2011	28	106	134	79%
2012	12	24	36	67%
2013	16	43	59	73%
2014	36	46	82	56%

Panel B. Cumulative Abnormal Announcement Returns		
YEAR	**2-day Cumulative Abnormal Returns [CAR (0, +1)]**	**SIZE OF PROGRAM (%) (SIZEPROG)**
1996	0.024	6.656
1997	0.020	6.538
1998	0.030	7.358
1999	0.047	7.917
2000	0.045	7.631
2001	0.023	7.413
2002	0.040	6.617
2003	0.016	6.826
2004	0.013	6.465
2005	0.019	7.010
2006	0.004	7.459
2007	0.022	8.649
2008	0.025	8.025

Table 1. *Cont.*

YEAR	2-day Cumulative Abnormal Returns [CAR (0, +1)]	SIZE OF PROGRAM (%) (SIZEPROG)
2009	0.020	7.441
2010	0.015	8.753
2011	0.010	8.201
2012	0.020	9.407
2013	0.008	8.177
2014	0.014	7.055

ONLY ONE refers to firms that announce only one repurchase during the sample period. REPEAT is firms that announce to repurchase the first time and will repeat during the sample period. SIZEPROG is percent of shares authorized at initial authorization date.

4. Methods and Results

Fu and Huang (2016) report the disappearance of long run abnormal returns following stock repurchase programs from 2003 to 2012. They argue that the U.S. stock markets have become more efficient since 2003 due to several regulatory changes, such as the decimalization of stock prices and the enactment of the Sarbanes–Oxley Act of 2002 (SOX). These are expected to affect not only market and regulatory environments, but also reduce managers' incentives to manipulate earnings. Thus, to examine whether the lower cumulative announcement period return is attributed to increased efficiency of the U.S. stock market since 2003, this study splits per year announcement period returns based on whether they are the first or subsequent announcements made by the repurchasing firms.

The results, as reported in Table 2, show that, on average, subsequent announcement returns are significantly lower than those of initial announcements at the 95% confidence level. These results remain consistent when the sample is sorted based on pre- and post-2003 periods. Hence, the findings suggest that the increased efficiency of the U.S. stock market alone cannot explain the decline in open market repurchase announcement period returns, but that subsequent announcements may also explain the lower repurchase announcement period returns. We also find that the average announcement returns in the 2003–2014 period (post-SOX) are significantly lower than those in the 1996–2002 period for both the first and subsequent repurchase announcements.

Table 2. First and subsequent market-adjusted announcement returns.

PERIOD	First Announcement	Subsequent Announcements	Difference
Average Total period	0.026 ***	0.016 ***	0.010 **
Average 1996–2002	0.037 ***	0.022 ***	0.015 **
Average 2003–2014	0.020 ***	0.013 ***	0.007 **
Difference	0.017 ***	0.009 **	

This table displays the cumulative market-adjusted returns (0, +1) from first and subsequent open market share repurchase announcements and the difference between the two. It also shows the difference of the average announcement returns between the two sub-periods. *** and ** denote statistical significance at the 1% and 5% respectively.

Panel A of Table 3 shows the differences of announcement returns sorted by firms that announce only one repurchase during the sample period versus firms that repeat their repurchase announcements. The cumulative abnormal return of open market repurchase programs announced by firms that do not repeat their open market repurchase programs is 3.56% and significantly higher than that of firms that repeat their announcements (1.83%), which is consistent with the findings of Jagannathan and Stephens (2003). In Panel B, announcement returns are sorted based on the order of repeat announcements. On average, repeat repurchasers earn 2.51% from their initial announcements. The average cumulative abnormal return in the second announcements, however, drops significantly to 1.77%. Third announcements experience a further decline in cumulative announcement return to

1.25%. The cumulative announcement return continues to decline when firms announce more open market repurchase programs (0.89%).

Table 3. Cumulative abnormal announcement returns (0, +1).

Panel A. Only One Repurchase vs. Repeat Repurchases		
ONLY ONE	**REPEAT**	**Difference**
3.56% ***	1.83% ***	−1.73% ***
Panel B. Cumulative announcement abnormal returns of repeat repurchasers		
Initial announcement	**Second announcement**	**Difference**
2.51% ***	1.77% ***	−0.73% **
Second announcement	Third announcement	Difference
1.77% ***	1.25% ***	−0.53% *
Third announcement	≥5 announcements	Difference
1.25% ***	0.89% ***	−0.36%

Abnormal returns are measured as market-adjusted returns. ONLY ONE is firms that announce one repurchase during the sample period. REPEAT is firms that announce to repurchase the first time and will repeat during the sample period. Initial announcement is the first announcement made by repeat repurchasers. Second announcement is the second announcement made by repeat repurchasers. Third announcement is the third announcement made by repeat repurchasers. *, **, *** denote statistical significance at the 10%, 5% and 1%, respectively.

To examine if the declining subsequent announcement returns are attributed to hubristic bias, this study sorts the announcement returns based on the sign of past announcement returns. Panel A of Table 4 shows that the mean (median) return of the second repurchase announcements of firms that experience a negative announcement return from their initial announcements is 1.59% (1.29%) during the two-day announcement window period. When firms make subsequent announcements, their mean (median) announcement return drops significantly to 0.16% (−0.16%) during the two-day window period. However, there is no evidence of decreasing subsequent announcement returns for firms with positive past announcement returns (Panel B). These results suggest that the decreasing subsequent announcement returns can be attributed to firms experiencing negative past announcement returns that keep repeating their repurchase programs.

Table 4. Announcement returns sorted by past announcement returns.

Panel A. Negative Past Announcement Returns			
	CAR (0, +1)		
	2nd Announcement	**>2 Announcements**	**Difference**
Mean	1.59%	0.16%	−1.43% ***
Median	1.29%	−0.16%	−1.45% †
Panel B. Positive past announcement returns			
	CAR (0, +1)		
	2nd announcement	**>2 announcements**	**Difference**
Mean	1.39%	2.12%	0.74% **
Median	0.90%	1.50%	0.60% †

*** and ** denote statistical significance at the 1% and 5% levels, respectively. † denotes significance at the 1% level, based on Wilcoxon *p*-values for the median.

Table 5 shows the descriptive statistics of the sample sorted by the frequency of announcements made by repurchasing firms. Consistent with prior studies, repeat repurchasing firms are bigger, more profitable, have more free cash flows, have higher growth opportunities, and are less underpriced than those of non-repeat repurchasing firms (the mean of RUNUP is −7.3% vs. −9.2%, respectively).

The less underpricing of repeat repurchasing firms suggests that the motivation of firms that frequently announce open market share repurchase programs may be less attributable to undervaluation but seems to be more consistent with the distribution of excess cash flows. According to the free cash flows hypothesis, when there are no growth opportunities available, managers distribute excess cash to the firm's shareholders to maximize their firm value. These firms, however, have higher and increasing growth opportunities than non-repeat repurchasing firms as indicated by their book-to-market ratios. Thus, instead of investing in the real sectors, these firms choose to invest in the firms' stocks by announcing subsequent repurchase programs, which is inconsistent with the free cash flow hypothesis but is more consistent with the hubris bias hypothesis.

Table 5. Descriptive statistics.

			Repeat Repurchasers		
Mean Values	**Total**	**ONLY ONE**	**Initial Announcement**	**≥2 Announcements**	**≥3 Announcements**
CASHFLOW	0.120	0.092	0.133	0.137	0.140
B/M	0.561	0.671	0.519	0.492	0.436
DIVYIELD	0.008	0.005	0.007	0.009	0.011
LEVERAGE	0.178	0.180	0.172	0.179	0.183
SIZE ($000)	741,760	273,773	770,361	1,654,712	2,770,892
ΔSALES	0.022	0.018	0.035	0.019	0.023
ROA	0.049	0.016	0.064	0.068	0.079
ROA+1	0.048	0.009	0.068	0.069	0.076
RUNUP	−0.063	−0.092	−0.073	−0.035	−0.024
STDEV	0.028	0.034	0.028	0.023	0.020
SIZEPROG	7.420	7.702	6.780	7.496	7.689

ONLY ONE refers to firms that announce only one repurchase during the sample period. Initial announcement is the first announcement made by repeat repurchasers. Second announcement is the second announcement made by repeat repurchasers. Third announcement is the third announcement made by repeat repurchasers. CASHFLOW is measured as cashflows/total assets. B/M is book-to-market ratio. DIVYIELD is dividend/market value of equity at time t − 1. LEVERAGE is total debt/total assets. SIZE is the natural logarithm of market value of equity in the quarter prior to announcement quarter. ΔSALES is change in sales/total assets. ROA is return on assets. All accounting variables are measured in the quarter prior to the announcement quarter. RUNUP is cumulative market-adjusted return measured from −46 to −6. STDEV is the standard deviation of market-adjusted return measured from day −100 to −46. SIZEPROG is the size of the repurchase program, measured as percentage of shares authorized at announcement.

Table 5 also shows that the stock performance of repeat repurchasers prior to subsequent announcements (RUNUP) is negative. The hubris bias hypothesis predicts that when hubristic managers believe their firms' shares are undervalued, they are likely to repurchase shares by repeating their repurchase program. Furthermore, due to their illusory belief that they can repeat their past success of announcing such programs, these managers may also increase the size of their repurchase programs in subsequent announcements. The size of the repurchase program (SIZEPROG) reported in Table 5 is consistent with this conjecture. The size of the programs announced by repeat repurchasers from the initial announcement to subsequent announcements increases from 6.78% of the total outstanding shares to 7.50% in subsequent announcements, and further up to 7.69% for more than three subsequent announcements.

The results displayed in Table 5 suggest that firm characteristics of repeat repurchasers are different from those of non-repeat repurchasers and that they have the propensity to repeat open market share repurchase programs. Hence, this study conducts a logit analysis to examine the determinants or the likelihood of these firms to announce a share repurchase program:

$$REPEAT\ REPURCHASE = \alpha + \beta_1 RUNUP + \beta_2 SIZE + \beta_3 B/M + \beta_4 SIZEPROG + \beta_5 LEVERAGE + \beta_6 STDEV + \beta_7 ROA + \beta_8 OPTION + Industry\ and\ Year\ Control + \varepsilon \quad (1)$$

where *REPEAT REPURCHASE* is a dummy of 1 for announcements made by repeat repurchasers.

The results reported in Table 6 are consistent with the firm characteristics reported in Table 5. RUNUP is positively related to the likelihood to a repeat repurchase, suggesting that repeat repurchasers are not motivated by under-performance. Large firms with large cash flows are more likely to repeat share repurchase programs. Firms repeating repurchase announcements are also likely to increase their program size.

Table 6. The determinants of repeat repurchases.

	Coeff.	(***p*-Values**)
RUNUP	0.600 ***	(0.001)
CASHFLOW	3.629 ***	(0.000)
SIZE	0.287 ***	(0.000)
B/M	0.226 *	(0.061)
ΔSIZEPROG	0.038 ***	(0.006)
LEVERAGE	−0.123	(0.670)
STDEV	−7.744 **	(0.026)
ROA	−0.014	(0.959)
OPTION	0.492	(0.614)
INTERCEPT	−3.168 **	(0.029)
Year effect	Y	
Industry effect	Y	
LR chi2	616.11	
Pseudo R2	0.1599	
Number of obs.	2981	

Logit analysis of the determinants of repurchasing made by repeat repurchasers. The dependent variable is one for repurchases made by repeat repurchasers. RUNUP is cumulative market-adjusted return measured from −46 to −6. CASHFLOW is measured as cashflows/total assets. SIZE is the natural logarithm of market value of equity in the quarter prior to announcement quarter. B/M is book-to-market ratio. ΔSIZEPROG is the change in program size. LEVERAGE is total debt/total assets. STDEV is the standard deviation of market-adjusted return measured from day −100 to −46. ROA is return on assets. OPTION is a dummy variable of one if the motivation to conduct a share repurchase program is related to stock options. *p*-values are in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10%, respectively.

To examine whether hubris explains the lower subsequent repurchase announcement returns, this study controls for the probability of repeating a repurchase program measured by the fitted value from the logistic regression reported in Table 6. If the market is able to anticipate that a subsequent repurchase program would be launched by a repeat repurchaser, then the coefficient of this variable should be significantly related to the announcement period return and that the market should not react significantly to subsequent or repeat share repurchase announcements.

The results of cross-sectional regressions of share repurchasers' announcement abnormal returns on hubris and control variables are reported in Table 7. Consistent with the second hypothesis, the results show that the decreasing subsequent announcement period returns are attributed to hubris-endowed managers. The coefficients of the probability of repeating a repurchase are not statistically significant, suggesting that the market may fail to anticipate subsequent repurchase announcements. The last column in Table 7 shows that firms that repeat their repurchase announcements within a shorter period experience significantly lower returns, which is consistent with the third hypothesis.

Table 7. Regressions of repeat repurchasers' abnormal returns.

	(1)	(*p*-Values)	(3)	(*p*-Values)
ENDWHUBRIS	−0.008 **	(0.037)		
TBD (×10,000)			0.0288 *	(0.083)
RUNUP	−0.031 ***	(0.000)	−0.01768	(0.125)
SIZE	−0.002	(0.306)	−0.00173	(0.393)
B/M	0.003	(0.394)	0.002276	(0.672)
LEVERAGE	−0.018	(0.042)	−0.00916	(0.399)
STDEV	0.627 ***	(0.000)	0.485303 ***	(0.003)
ΔSIZEPROG	0.001 *	(0.055)	0.000679 *	(0.066)
OPTION	−0.026	(0.421)	−0.08596	(0.111)
CASHFLOW	0.029	(0.280)	0.054924 *	(0.091)
Pr(Repeat repurchase)	−0.026	(0.420)	0.002167	(0.954)
INTERCEPT	0.033	(0.462)	−0.13531 **	(0.022)
Year effect	Y		Y	
Industry effect	Y		Y	
Adj. R2	0.0679		0.0214	
Number of obs.	2972		1311	

The dependent variable is cumulative abnormal return (0, +1). ENDWHUBRIS is one if a past repurchase announcement return is negative. TBD is the number of days between two announcements. RUNUP is cumulative market-adjusted return measured from −46 to −6. SIZE is the natural logarithm of market value of equity in the quarter prior to announcement quarter. B/M is book-to-market ratio. LEVERAGE is total debt/total assets. STDEV is the standard deviation of market-adjusted return measured from day −100 to −46. ΔSIZEPROG is the change in program size. OPTION is a dummy variable of one if the motivation to conduct a share repurchase program is related to stock options. CASHFLOW is measured as cashflows/total assets. Pr (repeat repurchase) is the estimated probability of a repeat repurchase based on the logit results presented in Table 6. *, **, *** denote statistical significance at 10%, 5%, and 1%, respectively.

Robustness Tests

The sample period starts from the beginning of 1996. However, there could be a concern that this might not be representative of the start of an initial open market repurchase program. For added robustness, this study follows (Song and Walkling 2000; Cai et al. 2011; Aktas et al. 2013) by imposing an initial time lag of two years (1996 and 1997) during which time the repurchasing firms are not active. Only those firms that have not undertaken any transactions during the initial dormant period (1996 and 1997) are included in the sample. The results are similar to those reported in the main analysis.

Additionally, this study redefines the measure for repeat repurchasers as firms that announce subsequent open market share repurchase programs within five years of their initial issue. Although this alternative measure may suffer from a sample selection bias due to the restriction, this study finds that the results are also similar to those already reported. This study also considers the average abnormal returns on the announcement day (day 0) and three (−1, +1), four (−2, +2), and ten (−5, +5) days of return window periods in the analysis and finds that the results remain the same.

The present study examines managerial hubris at the firm level for several reasons. First, the most popular proxy for hubris at the CEO level is the option-related measure developed by Malmendier and Tate (2005). However, according to Malmendier and Tate (2015), Execucomp data prior to 2006 cannot be used to calculate this measure, while noting that our sample period runs from 1996 to 2014. Second, a recent study by Bayat et al. (2016) suggests that this option-based measure does not accurately measure hubris at the CEO level; rather, it measures firm characteristics. They find that CEOs who are considered hubristic according to the option-based measure are not considered as hubristic when they change their affiliation.

As prior studies suggest that hubristic managers with large cash flows tend to over-invest, therefore, we consider hubristic managers as those in firms that have the highest investments. Following Campbell et al. (2011), we measure a firm's industry-adjusted investments as the difference between the firm's capital expenditures scaled by its beginning of year gross property, plant, and equipment (PPE), and the average industry investment based on 2-digit Standard Industrial

Classification (SIC) codes. These variables were downloaded from the Research Insight database and matched the variables to the final sample. This study then creates quintiles based on the industry-adjusted investments and examine only those firms that belong to the highest quintile (the largest investments) as they are considered to have hubris bias. The matching procedure and examining only the highest quintile, however, reduce the number of observations quite significantly. After re-running the regression models, we find similar results. The endowed hubris variable is significantly and negatively associated with the announcement period cumulative returns.

The other two proxies are a dummy variable of 1 for subsequent announcements as hubristic managers are expected to repeat a repurchase program and the number of previous repurchase announcements. A manager who has experience in launching more than one share repurchase program can develop hubris bias and feel more confident in repeating a program but result in negative announcement returns. The results are like those reported earlier. Both proxy variables are negatively related to the announcement period returns; however, only the coefficient of the dummy variable is statistically significant.

For added robustness, we include a time trend (TREND) in place of year effects in Table 7. The results shown in Table 8 are consistent with the earlier findings, albeit with a slight reduction of significance (p-value of 0.053) for ENDWHUBRIS.

Table 8. Regressions of repeat repurchasers' abnormal returns with time trend.

	Coeff.	***p*-Value**	**Coeff.**	***p*-Value**
ENDWHUBRIS	−0.007 *	(0.053)		
TBD (×10,000)			0.031 *	(0.061)
RUNUP	−0.033 ***	(0.000)	−0.018 *	(0.099)
SIZE	−0.002	(0.080)	−0.001	(0.504)
B/M	0.004	(0.281)	0.005	(0.291)
LEVERAGE	−0.016 *	(0.065)	−0.008	(0.429)
STDEV	0.700 ***	(0.000)	0.530 ***	(0.000)
ΔSIZEPROG	0.001 **	(0.045)	0.001 **	(0.012)
OPTION	−0.028	(0.384)	−0.091 *	(0.087)
CASHFLOW	0.028	(0.133)	0.072 ***	(0.004)
Pr(Repeat repurchase)	−0.020	(0.181)	−0.012	(0.489)
TREND	0.000	(0.298)	0.000	(0.445)
INTERCEPT	0.020	(0.648)	−0.155 ***	(0.006)
Industry effect	Y		Y	
Adj. R2	0.0681		0.0279	
Number of obs.	2972		1311	

*, **, *** denote statistical significance at 10%, 5%, and 1%, respectively.

5. Conclusions

This paper examines open market share repurchase announcements from January 1996 to September 2014. This paper documents that repeat announcements, which generate decreasing announcement returns, dominate the number of open market share repurchase announcements in the later period. Large firms with large cash flows are more likely to repeat share repurchase programs. Firms repeating repurchase announcements are also likely to increase their program size. This paper also finds that the decreasing announcement returns are attributable to subsequent announcements made by firms experiencing negative past repurchase announcement returns.

Our results are robust to alternative definitions of repeat purchases and are consistent with the notion that managers endowed with hubris or self-confidence drive the declining wealth of repeat repurchasing firms' shareholders. A word of caution is in order. Corporate board members should be more mindful of the adverse impact of repeat share repurchases made by their over-confident managers to shareholders before approving such offers.

We acknowledge the limitation in the sampling period of our study and recommended future research to include data from more recent years. It would also be interesting to compare the results of this study to those in other countries that may have a similar regulatory framework to see if the conclusions are similar.

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Innovation in SMEs and Financing Mix

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Abstract: This study addresses the types of innovation activity of SMEs (Small and medium-sized enterprises) in the European Union and its association with financing decisions. The main objective is to capture the cross-country differences in the types of innovation in SMEs and then investigate the relationship between the types of innovations and relevance of a given type of funding. In the empirical examinations, we use the non-parametric methods, due to the nature of the data. We have found out that there are differences in the types of innovation activity of SMEs in the cross-country dimension. We have also confirmed the contingencies between the types of innovations undertaken by SMEs in each cluster of the European countries, which suggests that various types of innovations co-exist. However, we have not found any unified pattern of correlations between the relevance of a given source of financing and a given type of innovation. Our study contributes to the ongoing debate on the different intensity of innovation activity of SMEs, as linked to the problem of the SMEs financing gap as one of the fundamental drivers of innovation.

Keywords: SMEs financing; financing gap; innovative activity; innovation; capital structure decisions

1. Introduction

Small and medium-sized enterprises (SMEs) are regarded as the dominant vector of economic progress, as their successful activity determines regional and country development, creates new jobs, supports market competition, and enhances innovation (Beck et al. 2005; Kersten et al. 2017; Savlovschi and Robu 2011). High flexibility and entrepreneurial spirit are the key attributes of SMEs (Thurik and Wennekers 2004). Thus, SMEs remain the crucial players in the knowledge-based economy, as they can respond flexibly to new opportunities, diversify their activities, and create new products, processes, and organization forms. Innovative activity of SMEs results in multiple applications, and their gains may be shared through knowledge and information spill-overs with other firms (Organisation for Economic Co-operation and Development, OECD 2013). In this respect, SMEs are regarded as the main driving force of innovation.

However, SMEs are quite heterogeneous (e.g., sector, size, age, profitability) and they operate in different business environments (e.g., macroeconomic factors, institutional system, financial market, banking sector). Thus, the level of their innovative activity may vary across countries, which was confirmed in prior research (e.g., Pełka 2018).

It is empirically confirmed that innovation activity of SMEs is limited by the accessibility of sufficient funds (Goujard and Guérin 2018; Hall 2010). In this respect, this study contributes to the ongoing debate on SMEs financing decisions and the existence of financing (capital) gap (Angilella and Mazzù 2015; De Moor et al. 2016; Hottenrott and Peters 2012). However, the existing body of the literature in this field remains focused on the public support for innovative SMEs, as it has been confirmed that firms may face difficulties in finding external market-based finance for intangible (knowledge-based) assets (Lee et al. 2015; Vasilescu 2014). Numerous studies have also examined the relevance of venture capital funding and recently—crowdfunding, in the context of innovative SMEs

(Anwar 2018; Baldock and Mason 2015; Kijkasiwat and Phuensane 2020; Schenk 2015). The relevance of debt finance and internal funding (determined by the efficient performance) in enhancing innovation in SMEs remains relatively less explored (Kerr and Nanda 2015; Sau 2007).

Facing this research gap, the main objective of this study is to capture the cross-country differences in the innovation activity of European SMEs and then to investigate the relationship between the types of innovation and relevance of a given type of funding. In this respect, there are two main contributions of our study to the existing body of the literature. First, it contributes to the debate on the cross-country differences in SMEs innovation activity. Second, it contributes to the debate on the SMEs' financing gap as one of the fundamental drivers of their innovative activity.

In the empirical examinations, this study relies on the data provided in the Survey of Access to Finance of Enterprises (SAFE) reports (SAFE 2018). SAFE regularly analyzes numerous aspects of the European SMEs performance and thus enables to study the differences and similarities in the firms' behaviors. In this study, we use the data that reflect the types of SMEs innovation (within product, market, process, and sales) and the relevance of various types of financing to detect the similarities and the differences of SMEs performing in different European countries.

The remainder of the paper is structured as follows. In the second section, we briefly review the related literature to highlight the conceptual framework of the study. In the third section, we explain the research design and methodology. The fourth section presents and discusses the results of empirical investigations. In the final section, we conclude.

2. Literature Review

In the conceptual dimension, this study is merging two streams of literature: innovation activity of SMEs and financial management. The first part derives from the premises of the innovation theory formulated originally by J. Schumpeter, developed further by numerous researchers in the field. Within the second part, the study refers primarily to the discussion on SMEs financing decisions and the persistence of the phenomenon known as financing (capital) gap.

2.1. SMEs and Innovations

In the 1930s, J. Schumpeter defined innovation as the introduction of new or qualitative change in existing products, processes, markets, sources of supply of inputs, and organizations. Innovation encompasses a creative activity, the element of novelty, as well as the disruptive change and is often described as a complex, multi-actor process, determined by numerous factors (Assink 2006; Boer and During 2001).

In economic literature, various classifications of innovation have been applied. However, the most common approach is based on the OECD methodology and distinguishes between product, process, organization, and market innovation (Oslo 2018).

Product innovation is defined as any goods, service, or idea that is perceived by its users as new. Process innovation includes the adaptation of existing production lines and the installation of entirely new infrastructure and the implementation of new technologies. Any changes in marketing, purchases and sales, administration, management, and staff policy are classified as organization innovation. In addition, market innovation encompasses the exploitation of new territorial markets or the penetration of new market segments in the existing markets. This approach is widely applied e.g., in the studies by: (Baregheh et al. 2012; Boer and During 2001; Tavassoli and Karlsson 2015 or Varis and Littunen 2010).

J. Schumpeter discussed the importance of SMEs in the context of the innovation process in one of his pioneer works (Schumpeter Mark 1 presented in Schumpeter 1934). He insisted that new, small, entrepreneurial firms are likely to be the source of most innovations, searching creatively for the new market opportunities. However, later, he focused on capital market imperfections and claimed that large, mature firms have better access to finance and extensive resources required for R&D projects. Thus, he proposed subsequently that small firms tend rather to imitate than to innovate themselves due to high costs of R&D activity (Schumpeter Mark 2 presented in Schumpeter 1942). Both hypotheses

formulated by Schumpeter were tested in numerous studies, for various sectors and economies with contradictory results (Freel 2007; Santarelli and Sterlacchini 1990; Van Dijk et al. 1997; Vaona and Pianta 2008). Recent studies, however, point out that small firms are quite heterogeneous, ranging from highly innovative firms to traditional ones for which the innovation process is irrelevant. As a consequence, the main determinants of innovation in SMEs are proposed to be: sector belonging, the particular nature of innovation and the characteristics of the firm itself, such as size and age (Avermaete et al. 2003; Bhattacharya and Bloch 2004; Ortega-Argilés et al. 2009). Another stream of studies examined the effects of innovation on firm performance (Anwar 2018; Kijkasiwat and Phuensane 2020; Wolff and Pett 2006). Most of the works focus on innovative activity in particular countries (e.g., Hall et al. 2009; Lecerf and Omrani 2019 in Germany; Oke et al. 2007 in the UK; Varis and Littunen 2010 in Finland). However, in this stream of literature, the cross-country studies are relatively rare. Skuras et al. (2008) analyzed product innovation in SMEs from six European countries, while Anwar (2018) identified four clusters of European countries based on the level of intensity of innovative activity. Facing this gap, this study remains focused on the cross-country analysis, by referring to four types of innovation: product, process, management, and sales (organization). In this context, the study aims at answering the first research question:

> **RQ1:** Are there any contingencies between the types of innovations undertaken by SMEs in the cross-country dimension?

2.2. SMEs and Financing Gap

Another stream of studies focused on the barriers to innovation, which may be analyzed with regard to: the stages of the innovation process (such as: knowledge, invention, implementation, diffusion, and adaptation), the levels of innovation (microeconomic and macroeconomic barriers), and the nature of factors (financial, personal and organizational, socio-cultural, and legal factors). The variety of barriers to innovation were recently discussed in (Assink 2006; Hueske and Guenther 2015; Madeira et al. 2017). In particular, the access to external financing and the existence of capital constraints that may negatively affect the firms' innovative activity was underlined by Angilella and Mazzù (2015); Colombo and Grilli (2007). Accordingly, the existing empirical evidence shows that the key determinant of the SMEs development is access to sufficient funds. As proved by Kersten et al. (2017), SMEs finance has a positive significant impact on firm performance, capital investment, and employment. However, SMEs often face various problems while searching for new sources of funds. Kumar and Rao (2015) identified the main problems of insufficient funds for SMEs: (1) demand gap, due to the effect of various capital structure determinants, (2) supply gap (limited availability of funds for SMEs), (3) knowledge gap (lack of knowledge on the accessibility of funds, and (4) benevolence gap (unwillingness of financial institutions to provide funds to SMEs). Various financing patterns of SMEs addressing the problem of financing gap were identified and analyzed by Moritz et al. (2016); Ou and Haynes (2006); Whittam and Wyper (2007). Some studies refered exclusively to the debt financing gap (Colombo and Grilli 2007; De Moor et al. 2016; Neely and Auken 2012), while others focused on the equity financing gap (Deffains-Crapsky and Sudolska 2014; Durvy 2007; Papadimitriou and Mourdoukoutas 2002).

Capital structure decisions have been the focus of research attention since the seminal works of Modigliani and Miller (1958). The main theoretical explanation for the capital structure determinants was provided by the pecking order theory (POT). As suggested by Donaldson (1961) and further developed by Myers and Majluf (1984), the observed capital structures reflect the relationship between internally available funds and investment requirements. The POT suggests that companies have a hierarchy of preferences concerning sources of funds. That is the consequence of asymmetric information between management and potential capital providers. This issue may cause firms to avoid raising external equity by issuing new shares. At the same time, while the access to debt may be limited, firms may be forced to postpone or to cancel valuable investment opportunities, including innovative ones. In these circumstances, firms prefer internal finance; they try to avoid new equity

issues, and their borrowings are a residual between desired investment and the supply of retained earnings. Colombo and Grilli (2007) explained the modified pecking order financing for innovative firms, including private equity financing (from Angel investors and Private Equity/Venture Capital funds) before debt capital. The importance of venture capital for innovative firms is widely discussed in the literature (Da Rin and Penas 2007; Wadhwa et al. 2016; Wu et al. 2019).

Our study, however, addresses the relevance of internal finance, external equity, and debt financing for SMEs, which is consistent with the modified or 'bridged pecking order theory' (BPOT). The BPOT assumes that SMEs move directly from self-funding (internal equity) to external equity (provided by private equity investors) in preference to, or instead of bank finance, as suggested by Whittam and Wyper (2007). The importance of internal finance as the primary source of funds for smaller firms is discussed by Ou and Haynes (2006), who declared that the significance of external equity for SMEs seems to be overstated. Therefore, based on the BPOT findings and the financing gap facing by SMEs, we may assume that the SMEs' innovative activity is financed first with the internal finance. As a result, the types of innovations undertaken by SMEs may be limited due to the external capital constraints (both in terms of debt and external equity). In this respect, the second question addressed in this study is as follows:

> **RQ2:** Is there any association between the type of innovations in SMEs and the relevance of a given type of financing?

3. Materials and Methods

Driven by the relevance of innovation activity of SMEs and the literature evidence on the existence of SMEs financing gap, this study is designed to shed some light on types of innovations of SMEs that perform in the European Union and its relationship with the relevance of a given type of fund. The differences in the implementation of given types of innovation are captured on the cross-country level (**RQ1**). Further, we investigate the relationships between the types of innovation and the relevance of internal funds, external equity, and debt finance (**RQ2**).

In the empirical investigations, we rely on the data provided on a regular basis as SAFE (Survey of Access to Finance of Enterprises) reports by the European Commission and European Central Bank. The SAFE dataset consists of aggregated survey results obtained for each of the European Union (EU) member states. In this study, we have focused on SAFE results obtained for five consecutive years in a 5-year time span (2014–2018). Since 2013, the results of the SAFE survey are published annually, but since 2014 in a unified format that allows time comparisons. At the moment of the research investigation, the latest results were available for 2018. The SAFE survey sample includes randomly selected SMEs from each EU member state, from various sectors and of various size (micro, small, and medium-sized enterprises). In 2018, there were over 17,000 survey respondents (SAFE 2018).

For this study, we cluster the EU members states to construct the research sample. First, we grouped the countries following the prevailing classification scheme by distinguishing between the "old" and "new" EU members states, as explained in Table 1. This distinction is guided by the fact that "old" EU member states have a long history of performance as a union and are regarded as better developed, in comparison to the new member states. On the other hand, the "new" member states (in this, the SMEs sector in these countries) have benefited from numerous programs that were aimed at enhancing the removal of disparities (before and shortly after the EU accession).

Table 1. The clusters of the examined European Union (EU) member states.

Clusters 1st Demarcation	Sub-Clusters 2nd Demarcation	Countries	Reasoning
OLD_EU	INNER_C *(inner core)*	Belgium France Germany Italy Luxembourg The Netherlands UK	Founders of the EU and UK as the largest net contributor
	OUTER_C *(outer core)*	Austria Denmark Finland Greece Ireland Portugal Spain Sweden	The remainder 'old' EU member states
NEW_EU	INNER_P *(inner peripheral)*	Cyprus Estonia Latvia Lithuania Malta Slovakia Slovenia	'New' EU member states (since 2004 or later), in the Eurozone
	OUTER_P *(outer peripheral)*	Bulgaria Croatia Czech Republic Hungary Poland Romania	'New' EU member states (since 2004 or later), outside the Eurozone

Secondly, guided by the studies of Bartlett and Prica (2017) and Bruha and Kocenda (2018), we clustered the EU countries into four groups that consider the existence of core and peripheral EU member states. In particular, consistently with Bartlett and Prica (2017), in the cluster of "old" and "new" EU countries, we further distinguished between the inner core, outer core, inner peripheral, and outer peripheral countries. In the cluster of the "old" EU member states, we identified 7 "inner core" countries: the founders of the EU and the UK, as one of the largest net contributors to the EU budget (Kovacevic 2019). In the cluster of the "new" EU countries, we identified 7 "inner peripheral" countries: the members of Eurozone (see the reasoning explained in Table 1). The adopted scheme of clustering the EU countries is justified by the results of prior works related to innovation activity and capital-structure related issues. The Anwar (2018) study confirmed that the majority of the old EU countries are typically innovation leaders, whereas the post-communist countries (that are a majority in outer and inner peripheral EU countries) are low-moderate innovators. Anwar (2018) also addressed the types of innovations (product and process), including SMEs. The Kędzior (2012) study confirmed that there are significant differences in capital structure-related issues between the old and new EU member states.

The list of the examined variables is provided in Table 2. However, it is substantial to explain the methodology behind the SAFE survey and the presentation of its results, as it remains relevant for the design of the empirical investigations performed in this study. The SAFE database presents the percentage structure of SMEs (the respondents) answers for a given question. Moreover, the percentage structure of answers remains aggregated on country level (in other words—it is provided separately for each of the EU member states). In our empirical investigations, we merge two aspects (problems) that were subject to the SAFE study: innovation and sources of funds in SMEs. Within

the first aspect (innovation), the survey incorporates the set of questions that refer to four areas of improvements implemented by firms in the past year. In this respect, we are able to identify the percentage of companies which declared the implementation of product, process, management, and sales innovations, as explained in Table 2. The second aspect (financing mix) refers to the relevance of a given source of funds. The SAFE survey provides information on the percentage of respondents (SMEs) who declared that a given source of funds was relevant in their activity in the past six months. In this respect, in statistical examinations, we refer to the percentage of firms (SMEs) which declared the relevance of internal funding, external equity, and debt financing, as explained in Table 2.

In the empirical investigations, we use the non-parametric methods, due to the nature of the available data. In particular, to examine the differences on country-level (in accordance with the defined clusters), the non-parametric ANOVA is used (Kruskal–Wallis test). The relationships of SMEs innovation and the use of particular sources of funds are captured by the Rho–Spearman correlations.

Table 2. The definitions of the examined variables.

Variable	Definition
Types of SMEs innovation	
Product	The percentage of companies which declared that they introduced significant improvements in products or services within the past year.
Process	The percentage of companies which declared that they introduced significant improvements of production process or methods within the past year.
Management	The percentage of companies which declared that they introduced a new organization of management within the past year.
Sales	The percentage of companies which declared that they introduced a new way of selling goods or services.
Relevance of SMEs financing	
INTERNAL FINANCING	The percentage of surveyed companies which declared the relevance of internal sources of financing (retained earnings and sales of assets were used over the past 6 months or are considered to be used in the future).
EXTERNAL EQUITY	The percentage of surveyed companies which declared the relevance of external sources of equity (equity capital was used over the past 6 months or is considered to be used in the future).
DEBT	The percentage of surveyed companies which declared the relevance of debt (debt was used over the past 6 months or is considered to be used in the future).

4. Results and Discussion

4.1. SMEs Innovations across the EU

In Appendix A, we present the figures with data on the percentage share of SMEs, which declared the implementation of a given type of innovation between 2014 and 2018 (product, process, management, or sales), in accordance with the assumed clusters of the EU member states. The data indicate that in the case of the implementation of product, process, and sales innovations, the situation could be judged as comparable. The percentage of SMEs which declared the implementation of product, process, and sales innovations was slightly lower in inner core EU countries, in comparison to the remaining core countries. In the group of the old EU countries, Finland is clearly in the leading position. Moreover, in the cluster of the old EU countries in the majority of the countries, peak levels of product and process innovations were observable until 2017, with a visible drop in 2018. A similar pattern of changes was observable in the cluster of new EU countries (2014–2017), however with a slight improvement in 2018. In the inner peripheral countries, the lowest percentage of SMEs that declared

the implementation of the product, or process innovations was in Estonia, whereas in the cluster of outer peripheral countries—in Hungary. In the remaining new EU countries, the percentage of SMEs that declared the implementation of product or process innovations could be judged as comparable, with the most dynamic changes in Cyprus, Latvia, and Malta (only for process innovations). Similar conclusions could be drawn concerning sales innovations, with a leading position in Cyprus and Romania. Cyprus and Romania are also leading in the implementation of management innovations (Figure A3). However, in the case of old EU countries, the situation is different as compared to product, process, and sales innovations. First, a slightly higher percentage of innovative SMEs operating in the cluster of inner core EU countries is observable, as compared to the outer core ones. In the old EU countries, Greece was in a leading position in the implementation of management innovations, as declared by SMEs. The data also indicate that in the majority of countries, the declared level of management innovations remained unchanged between 2017 and 2018.

The initial observations on the overall trends and differences between the declared level of the implementation of innovation in European SMEs (Appendix A) justify the examination of the statistical relevance of these differences, within the defined clusters of countries and consistently with the first research question (RQ1). In Table 3, we present the results of non-parametric tests that have confirmed that there are statistically significant differences between the defined clusters of countries, concerning the percentage of SMEs that declared the implementation of the product, management, and sales innovation, but not the process innovations. Within the comparisons between new and old EU countries, the mean ranks of the U Mann–Whitney test (Figure 1) indicate that in the cluster of new EU countries, a higher percentage of SMEs declared the implementation of product innovations, as compared to the old EU countries. However, we observe a contrary situation in the case of management and sales innovations. The percentage of SMEs, which declared the implementation of management and sales innovations was significantly higher in the old EU countries, as compared to the new ones.

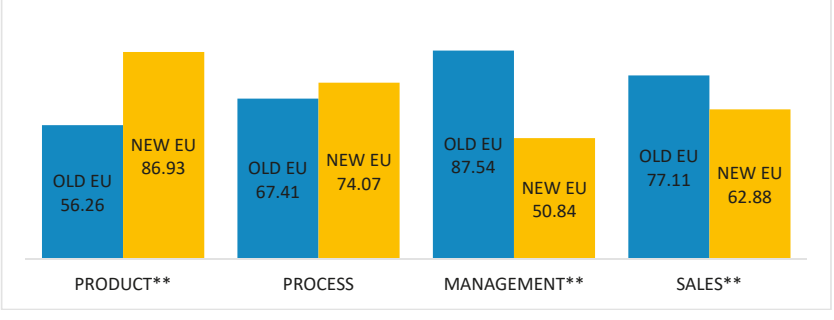

Figure 1. Mean ranks of U Mann–Whitney test for differences in the declared implementation of innovation between the clusters of old and new EU member states. Notes: statistically significant differences at ** $\alpha = 0.05$.

The Kruskal–Wallis test indicates the overall differences between the four clusters of EU countries. Thus, to detects which specific groups of countries differ significantly, the post hoc tests were performed (see Table 3). In the case of product innovations, the post hoc tests have confirmed that there are statistically significant differences between the inner core EU countries, as compared to the remainder clusters. The analysis of mean ranks of the Kruskal–Wallis test, illustrated in Figure 2 indicates that the percentage of SMEs that declared the implementation of product innovation was significantly lower in inner core countries, as compared to the remainder clusters. In the case of management innovation, statistically significant differences were observed in several dimensions. First of all, the post hoc tests and the ranks of the Kruskal–Wallis test indicate that the percentage of SMEs which declared the implementation of management innovation was significantly higher in the cluster of

outer core EU countries, in comparison to the clusters of the outer and inner peripheral. Moreover, the percentage of SMEs which declared the implementation of innovation in management was significantly higher in the cluster of inner core countries, in comparison to the clusters of inner and outer peripheral (Figure 2). Finally, in the case of sales innovation, the statistically significant differences were confirmed only between the cluster of the outer core EU countries and the cluster of outer peripheral countries (significantly higher percentage of SMEs declared the implementation of innovations in sales in the cluster of the outer core, as compared to the cluster of outer peripheral EU countries).

Table 3. The differences between the clusters of countries concerning innovation in SMEs.

Data		Type of Innovations			
		Product	**Process**	**Manag.**	**Sales**
Clusters—1st demarcation (old/new EU)					
p-value U Mann–Whitney test		0.000 **	0.332	0.000 **	0.038 **
Sub-clusters—2nd demarcation (IC/OC/IP/OP)					
p-value H Kruskal–Wallis test		0.000 **	0.186	0.000 **	0.002 **
Post-hoc tests pairwise comparisons	IC/IP	0.000 **		0.012 **	1.000
	IC/OP	0.000 **		0.001 **	1.000
	IC/OC	0.004 **		1.000	0.610
	OC/IP	0.182		0.001 **	0.475
	OC/OP	1.000		0.000 **	0.001 **
	OP/IP	1.000		1.000	0.318

Notes: statistically significant at ** $\alpha = 0.05$; symbols: IC—inner core, OC—outer core, IP—inner peripheral, OP—outer peripheral.

Figure 2. Mean ranks of the Kruskal–Wallis test for differences in the declared implementation of innovation between the sub-clusters of the EU countries. Notes: statistically significant differences at ** $\alpha = 0.05$.

We additionally examined the possible co-existence between the types of innovations most frequently undertaken by the SMEs. In Table 4, we present the Rho–Spearman correlation coefficients to capture the associations between the percentage of the European SMEs, which declared the implementation of various types of innovations, broken by the clusters of analyzed countries.

Table 4. Correlations between a percentages of the European SMEs which declared the implementation of innovations.

	Declared Types of Innovations			
	Product	**Process**	**Management**	**Sales**
Old EU				
Product	1			
Process	0.676 **	1		
Management	0.077	0.282 *	1	
Sales	0.653 **	0.714 **	0.356 **	1
New EU				
Product	1			
Process	0.675 **	1		
Management	0.460 **	0.529 **	1	
Sales	0.464 **	0.455 **	0.744 **	1
Inner Core				
Product	1			
Process	0.432 **	1		
Management	0.206	0.744 **	1	
Sales	0.395 *	0.648 **	0.425 *	1
Outer Core				
Product	1			
Process	0.839 **	1		
Management	−0.033	−0.011	1	
Sales	0.667 **	0.773 **	0.351 *	1
Inner Peripheral				
Product	1			
Process	0.616 **	1		
Management	0.363 *	0.323	1	
Sales	0.310	0.100	0.628 **	1
Outer Peripheral				
Product	1			
Process	0.761 **	1		
Management	0.579 **	0.849 **	1	
Sales	0.609 **	0.821 **	0.887 **	1

Notes: statistically significant at ** $\alpha = 0.01$; * $\alpha = 0.05$.

The data presented in Table 4 indicate that in general, in the cluster of the old EU countries, there were statistically significant correlations between all types of innovations, except for product and management. It suggests that the undertakings of various types of innovations co-existed in the surveyed SMEs that perform in the old EU member states. This pattern of interdependencies is repeated in the sub-clusters of inner and outer core countries. However, in the case of the cluster of inner core countries, the correlation coefficients between product innovation and process and sales innovations are visibly lower, as compared to the cluster of outer core countries. In the cluster of new EU countries, there are statistically significant correlations between the implementation of all types of innovations, and this pattern is also observable in the sub-cluster of outer peripheral countries, with visibly higher correlation coefficients. In the case of inner peripheral countries, the statistically significant correlations are observable only between the following pairs of innovations: process and product, management and sales, as well as management and product. These observations clearly indicate that the co-existence of the implementation of various innovations was higher in the cluster of outer peripheral countries (for statistically significant correlation coefficients). That can be explained by the 'spiral of innovation' phenomenon, which describes the relationship between different types of innovations: one successful innovation (e.g., product innovation) begets the other (e.g., process

innovation). One type of innovation generates demand on the other, as well as it provides solutions that can be used to create new developments.

4.2. Types of SMEs Innovations and Sources of Funds

The second aspect of the empirical investigations was concerned with the analysis of the associations between the percentage of SMEs that declared the implementation of a given type of innovation and the percentage of SMEs that declared the relevance of a given source of financing **(RQ2)**. In this respect, we may track the possible relevance of a given type of financing to the implementation of innovations. In Table 5, we present the Rho–Spearman correlation matrix, broken by the analyzed clusters of the EU countries.

Table 5. Correlations between declared type of innovation and relevance of a given source of funds.

	Product	Process	Management	Sales
Old EU				
Internal	0.252 *	0.112	−0.277 *	0.019
External Equity	0.042	−0.072	−0.220	−0.055
Debt	0.200	0.451 **	0.328 **	0.464 **
New EU				
Internal	0.194	0.255 *	0.216	0.184
External Equity	0.218	0.482 **	0.261 *	0.241
Debt	0.396 **	0.431 **	0.458 **	0.363 **
Inner Core				
Internal	0.321	0.220	0.185	0.139
External Equity	−0.148	−0.016	−0.080	0.081
Debt	−0.145	0.364 *	0.373 *	0.290
Outer Core				
Internal	0.205	0.046	−0.591 **	0.205
External Equity	−0.023	−0.120	−0.314 *	−0.023
Debt	0.462 **	0.511 **	0.304	0.462 **
Inner Peripheral				
Internal	0.257	0.156	0.097	0.238
External Equity	0.150	0.366 *	0.078	0.027
Debt	0.331	0.326	0.551 **	0.526 **
Outer Peripheral				
Internal	0.057	0.338	0.339	0.100
External Equity	0.219	0.573 **	0.534 **	0.417 *
Debt	0.465 **	0.518 **	0.212	0.152

Notes: statistically significant at ** $\alpha = 0.01$; * $\alpha = 0.05$.

In the cluster of the old EU countries, there are statistically significant correlations between the percentage of SMEs that declared the implementation of process, management, and sales innovations and the relevance of debt financing. It suggests that debt finance remains a prime source of funds for these types of innovations in the SMEs performing in the old EU countries. However, if we consider the sub-clusters of the old EU countries (inner and outer core countries), the statistically significant correlations were observed only in the case of debt financing and management and process innovation (inner core), as well as between debt financing and the product, process, and sales innovation (outer core).

In the cluster of new EU countries, the statistically significant correlations are observable between debt financing and the implementation of all types of innovations. In addition, the declaration on the relevance of external equity financing was correlated with the declarations on the implementation of process and management innovations, while internal financing was correlated with the process innovations.

In general, if we consider the correlations in the sub-clusters of new EU countries (inner and outer peripheral), the statistically significant correlations were obtained only for debt financing and management and sales innovations (inner peripheral), as well as for debt financing and product and process innovations (outer peripheral). Interestingly, the relevance of equity financing was correlated with the declaration on the implementation of process innovations (both in inner and outer peripheral) as well as management and sales innovations (outer peripheral).

The obtained results clearly indicate that on the level of sub-clusters of the EU countries, there is no unified pattern of correlations between the relevance of a given source of financing and a given type of innovation. Nevertheless, debt financing seems to be a primary source of financing innovation in all clusters of countries, and external equity remains relevant only in the case of new EU countries. This may lead to the conclusion that different financing mechanisms were developed in different countries. In some countries, the main source of finance for innovative SMEs comes from the banking sector, in others—from the private equity capital providers. Possibly, our observations are related to the financial support and arrangements offered within the equity-related programs directed to SMEs operating in the new European member states.

5. Conclusions

This study was designed to capture the cross-country differences in the types of innovations undertaken by European SMEs (**RQ1)** and the relationship between the types of innovations and relevance of given types of funding (**RQ2**). The empirical investigation has found out that there are significant differences in SMEs innovations if we consider the product, management, and sales innovations. However, the directions of these differences are heterogeneous. The larger scale of product innovations was observed in the new EU member states, while the larger scale of management and sales innovations was identified in the old EU member states. If we consider the sub-clusters of EU countries (inner/outer core and inner/outer peripheral), a similar pattern was confirmed. The SMEs from the inner core of the old EU member states are significantly least involved in the product innovations, at the same time, the SMEs form the inner core and outer core EU countries are the leaders in the management innovations. Simultaneously, the SMEs from outer and inner peripheral countries are less involved in management innovations.

This evidence suggests that the types of innovations undertaken by the SMEs may be linked to the general level of economic development and innovative activity in particular countries. The SMEs from the new member states try to catch up with SMEs from countries with a higher level of development, focusing on product innovations. On the other hand, more developed economies create a favorable environment for further improvements beyond product innovations. The importance of the regional factors in the innovation process was underlined by Varis and Littunen (2010). In addition, the different scale of innovative activity in different European countries was noticed by Anwar (2018). In this respect, further inquiries should be placed to detect the drivers of SMEs innovativeness, on the cross-country level. In particular, the relevance of dynamic development of IT technology shall be addressed, in this, the open access to knowledge and the increasing popularity of the open innovation concept.

This study has also confirmed the contingencies between the types of innovations undertaken by SMEs in each cluster of the European countries. These contingencies are most visible in the case of the cluster of the old EU countries, as well as in the outer peripheral cluster. It was found that various types of investment are accompanying undertaken innovations, thus various types of innovations co-exist, although they require different inputs and strategies as suggested by Vaona and Pianta (2008) and are characterized by different degrees of persistency as noticed by Tavassoli and Karlsson (2015). That relationship is explained by 'the spiral of innovation' phenomenon, according to which, one successful innovation provides the opportunity to create another one.

The second aspect subject to this study and addressed in the second research question (**RQ2**—the analysis of the associations between the type of innovation and a given type of financing) provided mixed results. Although debt capital was identified as the prime source of financing innovations in

several sub-clusters of countries, there is no unified pattern of correlations between the relevance of a given source of financing and given type of innovation. These results are inconsistent with our earlier assumption about the importance of internal finance, as suggested by the BPOT. They are also in contrast to the earlier findings that innovative firms are more likely to be financed by equity than debt (Hall 2010). On the other hand, Kerr and Nanda (2015) noticed the growing importance of debt financing related to innovation. It suggests that different financing mechanisms were developed in different countries to facilitate SMEs access to finance for innovative activity, which was addressed by Moritz et al. (2016). However, further studies are needed to confirm this supposition. In particular, further studies shall revise the relevance of debt financing, with reference to the domination of banking sector in the financial system, which is typical in numerous European countries. On the other hand, in the case of SMEs, the external equity comes mostly from the private equity market, of which development is one of the priorities of the European Union strategy, focusing on the sustainable growth and innovation.

The results of this study contribute to the ongoing debate on the SMEs financing gap, as linked to their innovative activities (Hottenrott and Peters 2012; Lee et al. 2015; Vasilescu 2014). From an applicative point of view, these results may support the design of system intervention mechanisms that are implemented to reduce the existence of the SME financing gap. As the SMEs operating in various countries remain focused on various types of innovations, the country settings seem to be relevant for the directions of innovations undertaken by the SMEs. In finance-oriented contexts, the system intervention mechanisms should be multivariate and allow flexible design of SMEs financing mix. Moreover, it seems that the system interventions mechanisms should not pursue a defined financing mix for the implementation of a given type of innovation. The core element of these mechanisms should be based on the alternative market-based financing instruments, which are crucial for access to the long-term sources of funds, as noted by Goujard and Guérin (2018).

The main limitation of this study is the nature of the SAFE survey data. Surveys data are always exposed to the risk of bias. In this case, the conclusions are finally driven concerning the SMEs' self-reported (and thus subjective) information. However, as the SAFE survey is repeated continuously (the EU initiative), the risk of bias seems limited. Nevertheless, this study signals a need to perform further investigations that could potentially enrich the evidence on innovative activity of SMEs and financing (capital structure) considerations. In particular, by referring to other possible proxies of innovation in SMEs, the direct associations with the existing SMEs capital structures could be addressed. Such an approach, however, needs a detailed study related to balance sheet entries and annual reports. Further inquiries shall also be placed to better explain the possible reasons behind the differences in types of undertaken innovation in the country-oriented contexts.

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Appendix A

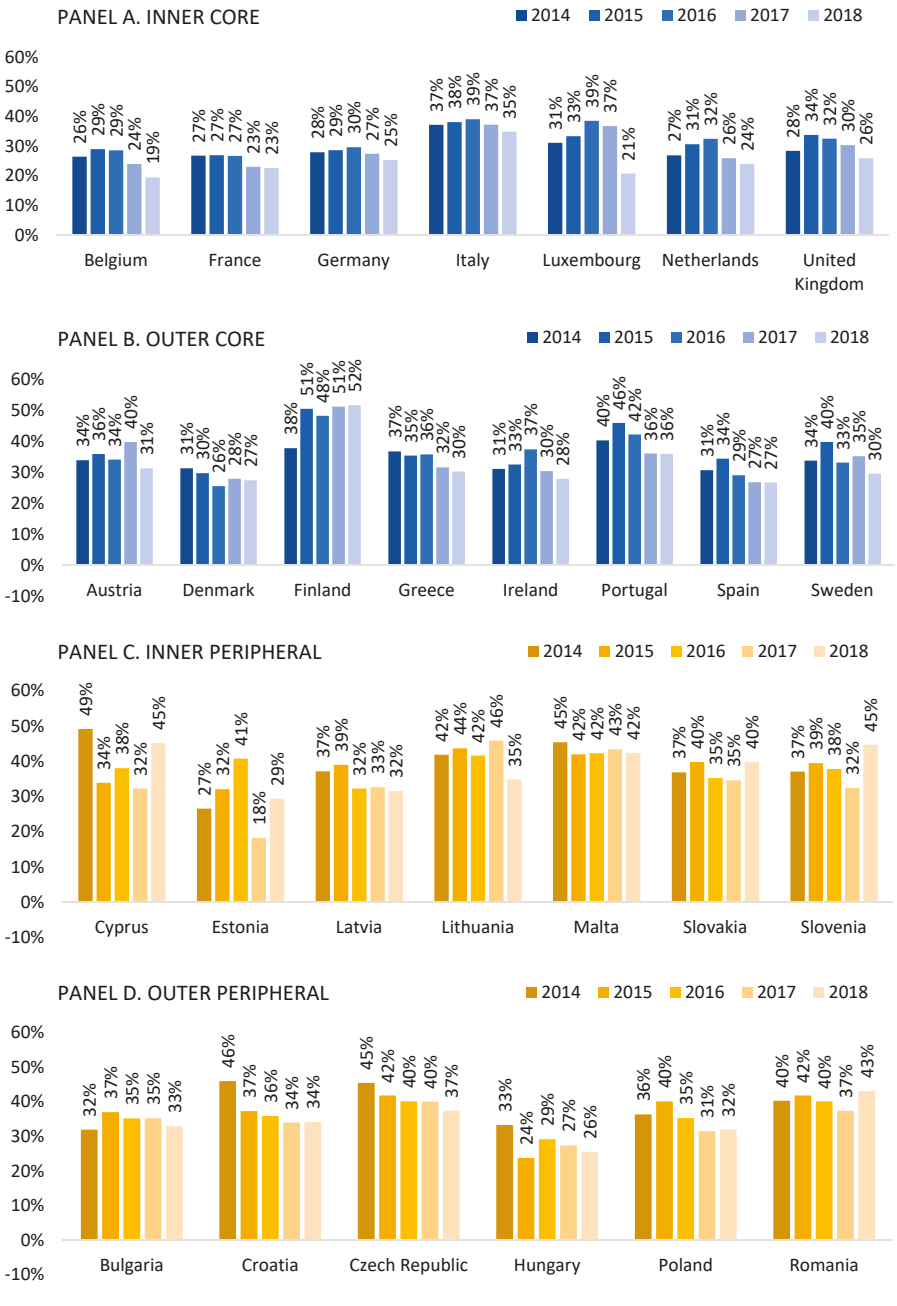

Figure A1. Percentage share of SMEs which declared the implementation of product innovations by country. Source: Own study.

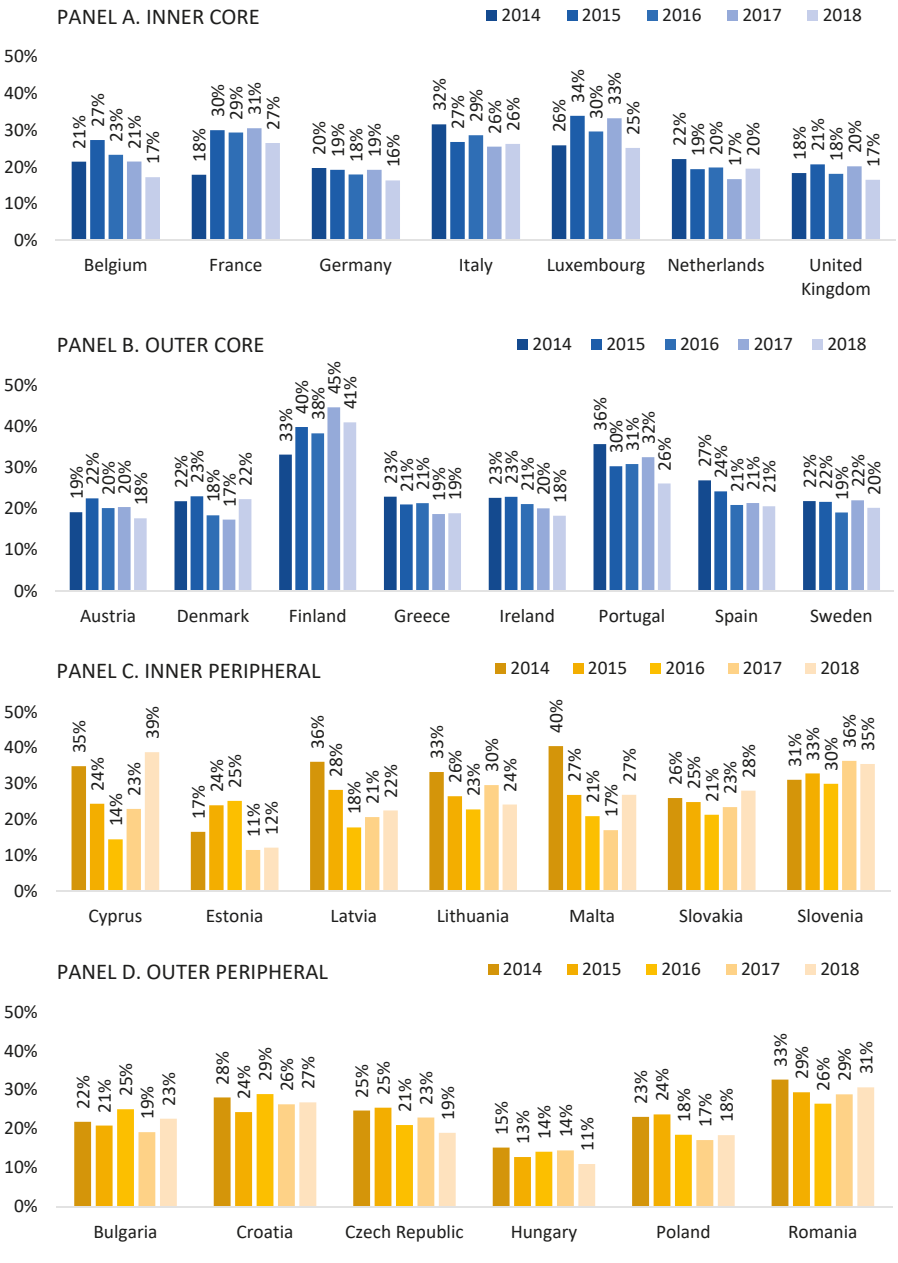

Figure A2. Percentage share of SMEs which declared the implementation of process innovations by country. Source: Own study.

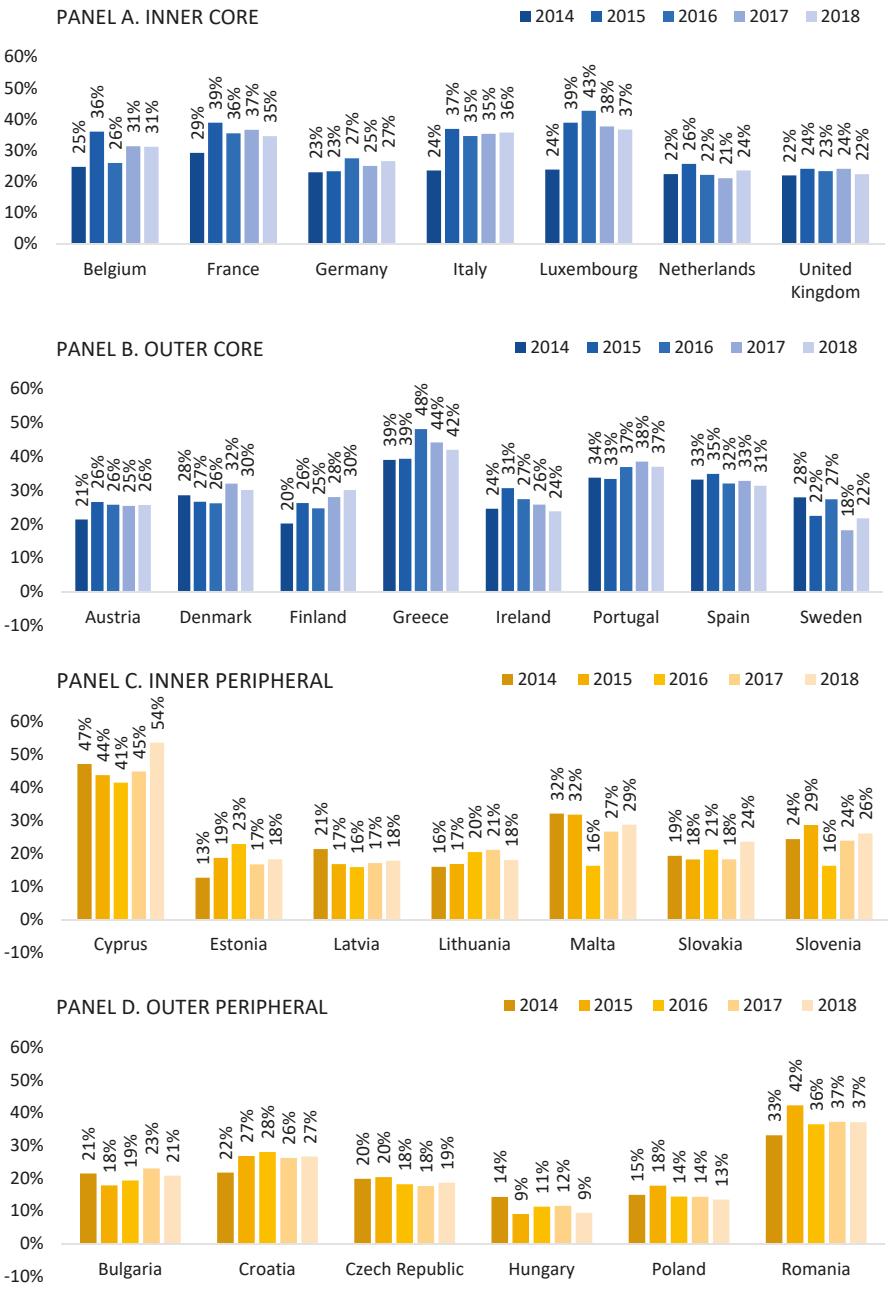

Figure A3. Percentage share of SMEs which declared the implementation of management innovations by country. Source: Own study.

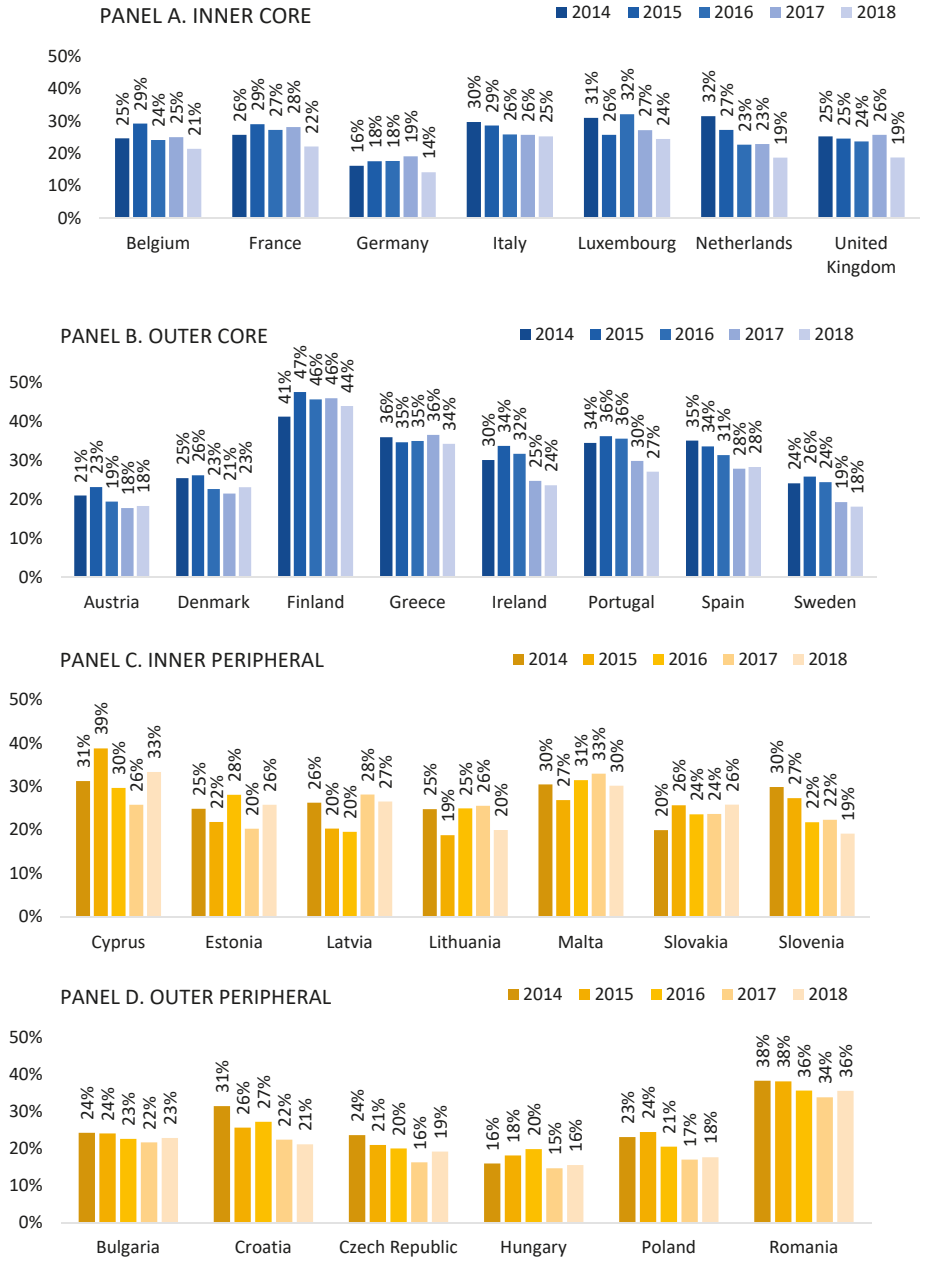

Figure A4. Percentage share of SMEs which declared the implementation of sales innovations by country. Source: Own study.

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Bankruptcy Prediction with the Use of Data Envelopment Analysis: An Empirical Study of Slovak Businesses

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Abstract: The paper deals with methods of predicting bankruptcy of a business with the aim of choosing a prediction method which will have exact results. Existing bankruptcy prediction models are a suitable tool for predicting the financial difficulties of businesses. However, such tools are based on strictly defined financial indicators. Therefore, the Data Envelopment Analysis (DEA) method has been applied, as it allows for the free choice of financial indicators. The research sample consisted of 343 businesses active in the heating industry in Slovakia. Analysed businesses have a significant relatively stable position in the given industry. The research was based on several studies which also used the DEA method to predict future financial difficulties and bankruptcies of studied businesses. The estimation accuracy of the Additive DEA model (ADD model) was compared with the Logit model to determine the reliability of the DEA method. Also, an optimal cut-off point for the ADD model and Logit model was determined. The main conclusion is that the DEA method is a suitable alternative for predicting the failure of the analysed sample of businesses. In contrast to the Logit model, its results are independent of any assumptions. The paper identified the key indicators of the future success of businesses in the analysed sample. These results can help businesses to improve their financial health and competitiveness.

Keywords: bankruptcy; data envelopment analysis; logit; model

1. Introduction

Determining the probability of bankruptcy is becoming one of the most important risk management tasks. We pay close attention to predictions of bankruptcy due to the fact that it is important from the point of view of creditors, employees, and other entities around the affected company that would feel the effect the bankruptcy brings (Štefko et al. 2012). Bankruptcy prediction methods can, with a certain degree of probability, alert a company to a negative situation. By taking early remedy measures, businesses can prevent future bankruptcy events (Gundová 2015). To date, empirical studies have found that inefficiency, high corporate indebtedness, and solvency problems are a prerequisite for bankruptcy (Altman 1968). According to Achim et al. (2012) the risk of bankruptcy of an enterprise is closely linked to economic and financial risks. The financial risk is determined by the level of indebtedness, while the economic risk depends on the ratio of fixed and variable costs. In general, knowing these risks allows us to quantify the risk of bankruptcy. Although there is no uniform definition of the concept of bankruptcy, it is advisable to follow the definition of Dimitras et al. (1996), according to whom bankruptcy is a situation where an enterprise is unable to repay its creditors' obligations and meet obligations towards shareholders or suppliers, or where bankruptcy proceedings were commenced under applicable law. Ding et al. (2008) described bankruptcy in a similar way: Bankruptcy is a situation where a firm could not pay lenders, preferred stock shareholders, suppliers, etc., or a bill was overdrawn,

or a firm was bankrupt. Trahms et al. (2013) have contributed the most to the current research on finding the causes of bankruptcy. They state that more complex indicators of business performance decline should be identified in any research on bankruptcy. Scarlat and Delcea (2011) introduced a new concept, a bankruptcy syndrome, which they define as a summary of related symptoms that characterise a particular situation that can lead to bankruptcy. Many authors devote their attention to financial symptoms of bankruptcy, which are expressed by financial indicators. These authors include, among others, Beaver (1966), Altman (1968), Altman et al. (1977), Geng et al. (2014), and Ding et al. (2008) who attributed the risk of bankruptcy to reduced company profitability. One of the most common aspects involved in assessing the cause of bankruptcy is either financial or non-financial causes. Chen et al. (2009) determined that non-financial causes of corporate bankruptcy include: customer relationship levels, IT infrastructure, innovation potential, employee professionalism, and other factors. Martin et al. (2012) referred to other parameters of bankruptcy such as operational risk, competitiveness, credibility analysis, training of employees, quality, etc. The loss of competitiveness as a cause of bankruptcy was also examined by Suhányi and Suhányiová (2017). In addition to the previous classifications, research studies often classify the causes of bankruptcy based on the environment they come from through external and internal causes (Blazy et al. 2008). Despite the existence of various other causes of bankruptcy, our empirical study prioritises the financial causes of bankruptcy.

The next part of the text is structured as follows: The second chapter outlines the theoretical basis of the studied problem. This part of the paper lists various methods and models used for predicting the risk of bankruptcy. A special part is devoted to the summary of the theoretical knowledge about the Data Envelopment Analysis (DEA) method. At the end of the theoretical part, a research problem and goal are formulated. The aim of the paper is to find out whether businesses from the analysed sample have been faced the threat of bankruptcy due to financial difficulties. The third chapter describes the data, the analysed sample of companies, and the processing methods. When addressing the research problem, we made use of selected financial indicators, a correlation matrix, the Additive DEA model (ADD model) model, and the Logit model. We formulated the ADD non-oriented model with variable returns to scale that were solved with the use of Efficiency Measurement Systems (EMS) software. The fourth chapter includes results and discussion of the results achieved. This chapter lists and compares the results of bankruptcy prediction with the use of the DEA and Logit models. The final part of the paper is the conclusion in which the essential conclusions resulting from the research problem are addressed.

2. Theoretical Background

At present, we can observe several tendencies regarding the application of prediction models in predicting bankruptcy. Sun et al. (2014) specifically point to three trends: the transition from one-dimensional analysis of variables to multidimensional prediction, a shift from classical statistical methods to machine learning methods based on artificial intelligence, and more intensive involvement of hybrid and ensemble classifiers. Aziz and Dar (2006) divided prediction models into statistical prediction models, models that use artificial intelligence, and theoretical models. Individually, the use of multiple discriminant analysis (MDA) and Logit models dominates the research (Altman and Saunders 1997; In: Csikosova et al. 2019).

Fitzpatrick (1931) was the first to deal with bankruptcy prediction in his study of solvent and insolvent businesses. In the following years, research on this topic has been carried out by Merwin (1942), Chudson (1945), Jackendoff (1962), and Beaver (1966) (In: Delina and Packová 2013). Beaver (1966) demonstrated that financial ratios can be useful in the prediction of an individual firm's failure. He has proven that not all financial indicators can be used to predict business difficulties. However, the use of simple financial indicators was questioned in practice because of their possible mismanagement by managers. Univariate analysis was later followed by authors who used multivariate analysis. In the beginning of multivariate prediction models, discriminant analysis (DA) was applied. In 1968 Altman developed a multiple discriminant analysis model (MDA) called the Z-Score Model. Since Altman's

study, the number and complexity of these models has increased dramatically. DA was explored by Blum (1974), Elam (1975), Altman et al. (1977), Norton and Smith (1979), and Taffler (1983). Altman's original model required the fulfilment of multinormality, homoskedasticity, and linearity assumptions. These prerequisites for financial indicators were often not met. The main drawback of DA, however, is that although it is able to identify businesses that are likely to go bankrupt, it is not able to estimate the likelihood of this situation occurring. Based on these shortcomings, the next step in the theory of bankruptcy prediction was to develop methods and models that would be able to provide such information (Mihalovič 2015). That was the reason why logistic regression began to be preferred, as this method does not have to meet these conditions. Compared to methods based on multi-dimensional discriminant analysis, logistic regression has several advantages. It has a higher predictive ability and its application does not require compliance with assumptions that could limit its usability. The method was first used to predict the bankruptcy of banks by Martin (1977). Ohlson (1980) was the first to use it to assess companies. Ohlson, as a pioneer in the application of Logit analysis, did not agree with the application of discriminant analysis to predict bankruptcy due to its requirement for a variance-covariance matrix (Klieštik et al. 2014). However, even Logit models have their weakness—their sensitivity to remote observation.

Another method used in the area of bankruptcy prediction is DEA (Horváthová and Mokrišová 2018). Compared to statistical methods, DEA is a relatively new, non-parametric method, which represents one of the main possible approaches to assessing the financial health of a business and its risk of bankruptcy (Štefko et al. 2018). This method was first applied in Charnes et al. (1978). It is based on the idea mentioned in the article "Measuring efficiency of decision making units", published by Farrell in 1957. His work was based on the works of Debreu (1951) and Koopmans (1951). Farrell (1957) proposed a new approach to efficiency measuring based on a linear convex envelopment curve and the use of distance measurement functions between the enterprise of interest and the projected point on the efficiency frontier. In this way, he proposed a new level of efficiency based on the calculation of two components of the overall business efficiency: technical efficiency and resource allocation efficiency. Farrell's approach measures the ability of the business to transform inputs into outputs. Therefore, it is also called the input-oriented approach. Charnes et al. (1978) have applied a multiplicative input-output model to measure business efficiency. The approach of these authors represents a two-stage efficiency calculation. The first step is to identify the production frontier, while businesses that lie on this line are among the best businesses. In the second step, the efficiency score is calculated for the analysed enterprises and their distance from the production frontier is determined. From the point of view of their input, DEA models can be divided into DEA CCR (Charnes et al. 1978) and DEA BCC (Banker et al. 1984). This method was further developed by Färe et al. (1985). The DEA method was also used by the following authors: Tone (2001); Wang et al. (2007); Kao and Hwang (2008); Sadjadi and Omrani (2008); Zhu (2015); Oanh and Ngoc (2016); Ghomi et al. (2019); Dumitrescu et al. (2020); and many others.

The first idea to use the DEA method to predict bankruptcy was recorded by Simak (1997), who was the first to compare its results with the results of Altman's Z-score. Other authors dealing with the DEA bankruptcy prediction included Cielen et al. (2004). The authors used the DEA radial model to predict bankruptcy and compared the results with DA results. In the same year Paradi et al. (2004) applied an additive and radial model along with the peeling technique. The model achieved 100% success in predicting the bankruptcy of businesses. In 2009, Premachandra et al. used an ADD model and compared its results with the results of logistic regression. The result of this research was a satisfactory level of correct prediction of business bankruptcy. The prediction rate for financially sound businesses was less accurate. Sueyoshi and Goto (2009) applied an ADD model to create a line under which businesses go bankrupt. The results were then compared with the DEA-DA approach. In 2011, Premachandra et al. combined the radial and ADD model and created the DEA ranking index. Shetty et al. (2012) applied the DEA model in 2012 to determine the bankruptcy likelihood for their

analysed business sample. The result of their study was the designing of indicators that should be applied as predictors of bankruptcy.

Other methods that are suitable for the application in the field of bankruptcy prediction include neural networks. In this context, it is possible to mention the authors Odom and Sharda (1990), who developed a neural network to investigate business bankruptcy using selected financial indicators. Gherghina (2015) made a significant contribution to the application of neural networks in this area. The neural network in the field of bankruptcy prediction was also applied by Altman et al. (1994). Other methods include decision trees (Breiman et al. 1984; Frydman et al. 1985). However, in conclusion, it should be noted that the most commonly used methods today are discriminant analysis and logistic regression.

In line with the above-mentioned text, we identified the following research problem: Is the DEA method a suitable alternative in predicting failure of businesses from the analysed sample? In relation to the research problem, the aim of the paper was formulated: To predict business failure with the use of the ADD model and to compare its results with the results of the Logit model. The aim was also to analyse classification and estimation accuracy of the ADD DEA model and to compare it with the classification and estimation accuracy of the Logit model.

3. Methodology and Data

DEA models are designed to assess the technical efficiency of production units based on the size of inputs and outputs. There are two possible approaches to creating DEA models: multiplicative and dual. The dual model is an additional task to the multiplicative one. A significant problem of the DEA analysis are production externalities (negative outputs) and desirable inputs. Generally, in DEA models, the basic prerequisite is data positivity. However, situations in which negative inputs and outputs occur are not uncommon. In the case of the sample of companies analysed, negative outputs occurred in the case of profitability. The ways to deal with this problem are different. Some software programmes attach zero weight to negative inputs and outputs. Another frequently used option is to treat the negative outputs as inputs (thus minimising them) and the desired inputs as outputs (thus maximising them). However, this procedure is not universally applicable. One of the simpler options is to use an additive model in which the positive and negative inputs and outputs are evaluated separately (Premachandra et al. 2009; Mendelová and Stachová 2016).

The ADD model is one of the non-oriented models. This model was formulated by Charnes et al. (1985). A Decision Making Unit (DMU) was introduced as a unit for which efficiency was solved and which describes any entity for which the process of transforming inputs into outputs is in progress. Determining DMU efficiency with an additive model for variable returns to scale means solving the following linear programming model:

$$\begin{array}{c} \max\limits_{\lambda, s^x s^y} A_o = \left(e_m^T s^x + e_s^T s^y\right) \\ \text{s.t. } \sum_{j=1}^{n} x_j \lambda_{\ j} + s^x = x_o, \quad s^x \geq 0, \\ \sum_{j=1}^{n} y_j \lambda_{\ j} - s^y = y_o, \quad s^y \geq 0, \\ \sum_{1}^{n} \lambda_{\ j} = 1, \qquad \lambda_{\ j} \geq 0, \end{array} \tag{1}$$

where e_m, e_s, are unit vectors of appropriate length and s^x, s^y are additional variables-slacks. DMU_o o = {1, … , n}, is efficient when $s^x = 0$, $s^y = 0$, in other words, when the objective function and all slacks equal zero. Otherwise, the DMU_o is inefficient.

Since our paper does not address the efficiency of the analysed sample, but rather covers bankruptcy, the input vectors x_o, were replaced by output vectors y_o. The efficiency condition in this case served as a condition for the assumed bankruptcy of the company. In our research, we used 9 financial indicators. We selected this group of indicators in such a way that it contains indicators from all areas of financial health evaluation (liquidity, profitability, activity, indebtedness) and there is not a strong correlation between indicators. As output variables, we applied indicator

LLTA—long-term liabilities/total assets used as a leverage measure which indicates long-term financial obligation, and indicator CLTA—current liabilities/total assets which indicates a lack of cash flow to fund business operations. As input variables, we applied 7 indicators: TRTA—total revenue/total assets, CR (Current ratio)—(financial assets + short-term receivables)/current liabilities, WCTA—working capital/total assets, CATA—current assets/total assets, EBTA—earnings before interest and taxes/total assets, EBIE—earnings before interest and taxes/interest expense, and ETD—equity/total debt. For the creation of the ADD model, we used the Efficiency Measurement System (EMS) software. We divided the results of the DEA model into 6 zones (businesses in financial distress—3 zones and financially healthy businesses—3 zones) according to Mendelová and Bieliková (2017).

3.1. Logit Model

The Logit regression model was applied to compare the results obtained with the DEA model. The Logit model is a widespread model that has been used by several authors to predict the default/no default probability of a company (Premachandra et al. 2009; Kováčová and Klieštik 2017; Mendelová and Stachová 2016). This model is a type of multivariate statistical model. It captures the relationship between the dependent variable Y and the independent variable X.

Logistic regression works very similar to linear regression, but with a binomial response variable (Sperandei 2014). The dependent variable y_i can only take two values: $y_i = 1$ if the probability of bankruptcy occurs and $y_i = 0$ if the probability of bankruptcy does not occur. Therefore, we can assume that probability y_i =1 is given by P_i; probability $y_i = 0$ is given by $1 - P_i$. By using logistic transformation, we could specify the probability P_i using the following model: $P_i = f\ (\alpha + \beta x_i)$, where x_i are the chosen financial indicators while α and β are estimated parameters. P_i is then calculated using the logistic function:

$$P_i = \frac{\exp(\alpha + \beta \mathrm{xi})}{1 + \exp(\alpha + \beta \mathrm{xi})} = \frac{1}{1 + \exp(-\alpha - \beta \mathrm{xi})}. \quad (2)$$

A logistic regression models the chance of an outcome based on individual characteristics (Sperandei 2014). According to Kováčová and Klieštik (2017), the Logit can be defined as:

$$Logit = \ln(\frac{P_i}{1 - P_i}) = f\ (\alpha + \beta x_i). \quad (3)$$

The above represents the logarithm of the odds ratio of the two possible alternatives (P_i, $1 - P_i$). It is called the Logit. The goal of logistic regression is to calculate the odds ratio ($\frac{P_i}{1-P_i}$); ln in this relationship represents the Logit transformation.

For the creation of Logit model, it was necessary to divide businesses into bankrupt and non-bankrupt. When choosing the appropriate conditions for bankruptcy occurrence evaluation, we studied the papers of various authors. Some of them assume that a company goes bankrupt if it does not make a profit (Beaver 1966; Altman 1968; Altman et al. 1977; Geng et al. 2014) or reaches negative cash flow (Ding et al. 2008). Based on the bankruptcy definition stated in the Introduction, we chose the value of indebtedness as the bankruptcy condition. We then detected 50 bankrupt businesses.

When creating the Logit model, we started with the same 9 indicators which we used for the ADD model. However, there was a strong correlation between ETD and the indicator of indebtedness which we used as a bankruptcy criterion. Therefore, we did not use the indicator ETD in the Logit model. We also excluded the indicator CATA because when applying it, the Logit model did not process any coefficients. We assumed that the indicators CATA and WCTA are related indicators which evaluate the same financial area of evaluation and express the same reality. For the creation of the Logit model, we used software Statistica 13.1.

Using the results of the Logit model, it is possible to determine whether a company is about to go bankrupt or not. This classification may use a cut-off score (usually 0.5), with businesses above this value facing a probability of going bankrupt and businesses below this value facing lower (or no) probability of going bankrupt. Two types of misclassification can occur when evaluating

business failure. The type I error (false negative rate) arises when a bankrupt company is classified as non-bankrupt, and the type II error (false positive rate) arises when the non-bankrupt company is classified as bankrupt (Kováčová and Klieštik 2017).

The prediction ability of the Logit model can be verified by using the Area Under Curve (AUC) method, which measures the area under the Receiver Operating Characteristic curve (ROC curve). This analysis represents a statistical procedure for evaluating correct and false positives as well as correct and false negatives. ROC curve analysis describes the relationship of sensitivity and specificity at different discriminatory levels. AUC measures overall performance of the model. It can take on any value between 0 and 1. The closer AUC is to 1, the better is the overall performance of the model (Park et al. 2004).

One of the important tests that can be mentioned in verifying the Logit model is the Wald test, which confirms the significance of variables in the model. Based on the results of Likelihood ratio test, the model includes those variables, which increases its maximum credibility. This test is suitable not only to assess the significance of the model, but also to assess the contribution of individual predictors to the model. The higher the Chi-square test statistic, the better the model reflects the situation of a business. In addition to the above tests, the results of the Hosmer–Lemeshow test should be mentioned. This test indicates the compliance of the model with the applied data. Nagelkerke's R Square explains the percentage of variance, while we could also find out how successful the model is in explaining the "variability" of a dependent variable.

3.2. Description of the Sample of Companies

The input database of this empirical study was created from data obtained for 497 companies operating in Slovakia in the heat supply industry. The database of the data from financial statements of these companies for the year 2016 was obtained from the Slovak analytical agency CRIF—Slovak Credit Bureau, s.r.o. According to SK NACE Rev. 2, the sample of enterprises analysed falls under section D: "Supply of electricity, gas, steam and cold air". Sources and distribution of heat of these businesses were built along with the development of urban agglomerations. Their systems allow the effective use of various sources of energy generated in a city, including renewable sources, waste heat, and so on. These systems are an energy infrastructure integrator which can efficiently link production and consumption and enable the storing of energy (in the form of heat) at the time of its surplus. As part of independent heat production, today about 54% of the heat is produced in combined production (Janiš 2018). The European Commission's winter energy package sets new targets for energy efficiency. These goals and new trends in energy bring new opportunities and challenges for the heating industry. These facts are a precondition for the occurrence of risk factors which affect the performance and competitiveness of analysed businesses from outside. A more detailed analysis of this sample excluded 154 companies due to a negative value of equity or deficiencies in the database. The resulting analysed sample consisted of 343 companies. In terms of each business's legal status, 15% of the companies are joint stock companies and the remaining 85% are limited liability companies. The results of the financial analysis show that the analysed companies do not have a liquidity problem. The average value of current ratio found is 3.92. However, we also obtained a median of current ratio of 0.951. This was also reflected in the negative value of net working capital. The analysed sample of companies reported a high creditors payment period, which results in a negative value of cash conversion cycle. The assets of these companies change on average once a year. The average value of the return on assets is 5%. The capital structure of these companies is 35:65 in favour of equity. The performance of companies active in the heating industry was not found to reach the required value to avoid bankruptcy.

The Table 1 shows the descriptive statistics of indicators, which represent indicators applied in the DEA model. The values of the indicators are divided into two groups. The first group consists of bankrupt businesses and the second group consists of non-bankrupt businesses. Of these values, the negative values for WCTA, EBTA, ETD, and EBIE should be pointed out, as these negative values are one of the signs of bankruptcy. Analysed businesses also have high indebtedness.

Table 1. Descriptive statistics for bankrupt and non-bankrupt businesses.

Financial Indicators	TRTA	CR	WCTA	CATA	EBTA	EBIE	ETD	LLTA	CLTA
Bankrupt businesses (50)									
Mean	0.336	3.925	−0.239	0.185	−0.026	−1.1120	−0.217	0.499	0.424
Median	0.205	0.473	−0.067	0.138	−0.000	0.014	−0.200	0.615	0.227
Standard deviation	0.875	12.190	0.590	0.173	0.129	5.244	0.150	0.384	0.600
Skewness	6.752	4.433	−3.273	2.239	1.181	−4.877	−0.909	−0.150	3.450
Non-bankrupt businesses (293)									
Mean	0.854	3.644	−0.036	0.300	0.070	830.989	0.838	0.330	0.332
Median	0.286	0.813	−0.018	0.192	0.055	2.243	0.241	0.300	0.240
Standard deviation	1.460	12.43	0.270	0.270	0.160	11,531.54	3.5800	0.300	0.300
Skewness	3.461	6.075	−0.541	1.416	6.669	16.550	13.889	0.167	0.893

4. Results and Discussion

During the research process presented in the paper, we created two models. One was developed based on DEA as an ADD model. As the outcome of the ADD model is an extensive set of data, we present selected data as an example in Table 2. In the case of businesses that have a score of zero and all their slacks equal to zero, it can be said that they are likely to go bankrupt. From the Table 3, it can be seen that such a situation applies to e.g., company number 122 and company number 126.

Table 2. Selected results of the Additive DEA model (ADD model).

DMU	Score	TRTA	CR	WCTA	CATA	EBTA
TP121	2.48	0	0	0	0.52	0.15
TP122	0	0	0.01	−0.27	0.09	0
TP123	2.21	0	0	0	0	0.16
TP124	2.54	0.43	0	0	0	0.19
TP125	2.62	0.47	0	0	0	0.27
TP126	0	0.05	0	−0.45	0.45	0.01
TP127	1.77	0	0	0	0	−0.17
TP128	1.2	0.6	0	0	0	0
TP129	0.1	0.45	0	0	0	−0.18

Table 3. Results of a multi-zones ADD model.

DEA Zones	1	2	3	4	5	6
Number of businesses	17	15	23	56	81	151

The classification of businesses into individual DEA zones is shown in Table 3. In case of three financial distress zones, the risk of going bankrupt affects 55 companies. With regard to the first zone of the DEA model, it turned out that 17 companies face risk of bankruptcy. With regard to the second zone, 15 companies face such risk, and in case of the third zone, the risk is being faced by another 23 companies.

To determine a model's estimation accuracy, a cut-off point of 0.5 is usually used. However, this cut-off is not appropriate for every given model. Therefore, we were looking for the optimal cut off corresponding to a point in which the sum of sensitivity and specificity is the highest. The optimal cut-off was found at the level of 0.63. The results are shown in Table 4. In this case, 82% estimation accuracy for bankrupt businesses and 56% estimation accuracy for non-bankrupt businesses could be achieved. We can consider this to be an adequate estimation accuracy rate.

Table 4. Classification accuracy of the ADD model corresponding to a cut-off point of 0.63.

	Predicted: Yes	Predicted: No	% Correct	Error %
Observed: yes	41	9	82 188	18 (I)
Observed: no	131	163	56	44 (II)

We also constructed a ROC curve for the ADD model (see Figure 1), where the AUC is at the level of 0.82.

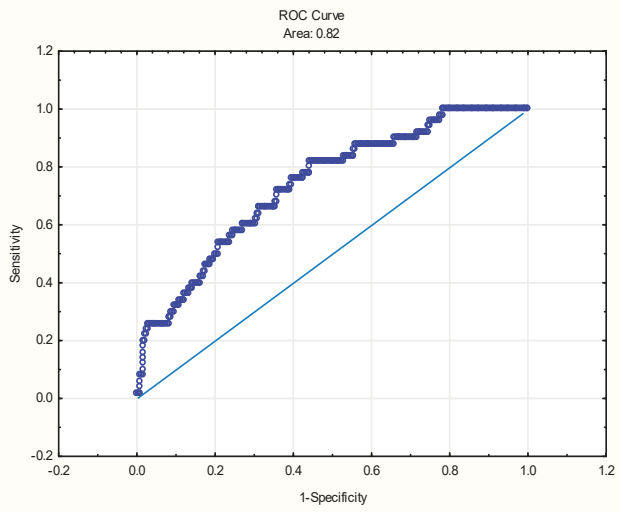

Figure 1. ROC curve for ADD model.

We then formulated Logit model to identify businesses that are likely to go bankrupt. We selected 7 financial indicators for the Logit model. They are indicators TRTA, CR, WCTA, EBTA, LLTA, EBIE and CLTA. Table 5 shows the results of Logit model.

Table 5. Logit function coefficients.

Effect	Bankrupt-Parameter Estimates						
	Column	Estimate	Standard Error	Wald Stat.	Lower CL 95.0%	Upper CL 95.0%	P
Intercept	1	−2.15434	0.443236	23.62436	−3.0231	−1.28562	0.000001
TRTA	2	−0.48536	0.415575	1.36406	−1.2999	0.32915	0.242835
CR	3	0.01264	0.011864	1.13604	−0.0106	0.03590	0.286491
WCTA	4	−1.58510	1.136295	1.94594	−3.8122	0.64200	0.163025
EBTA	5	−8.52758	1.987190	18.41503	−12.4224	−4.63276	0.000018
LLTA	6	1.31126	0.591269	4.91819	0.1524	2.47012	0.026575
EBIE	7	−0.00026	0.002247	0.01353	−0.0047	0.00414	0.907416
CLTA	8	0.19154	1.156441	0.02743	−2.0750	2.45812	0.868449
Scale		1.00000	0.000000		1.0000	1.00000	

Based on the Wald confidence intervals, it can be stated, with 95% confidence, that the coefficients of the variables EBTA, LLTA are within the specified limits of the interval and none of the intervals contains a value of 0, which would exclude the variable from the model. Since no Wald statistics

parameter is equal to zero, it can be assumed that all explanatory variables can be included in the model. It follows that the tested variables are suitable for the Logit model. At the same time, Wald statistics determines which of the independent variables is more important than the others. A statistically significant relationship determining probability of bankruptcy was confirmed for the indicators EBTA and LLTA. The above results show that the probability of bankruptcy is determined by profit and indebtedness. The resulting Logit function providing the probability of business bankruptcy is:

$$P_1 = \frac{1}{1 + e^{-(-2.150.49 \times TRTA + 0.01 \times CR - 1.59 \times WCTA8.53 \times EBTA + 1.31 \times LLTA - 0.0003 \times EBIE + 0.19 \times CLTA)}}, \quad (4)$$

To assess the estimation accuracy of the model, we constructed a Receiver Operating Characteristic (ROC) curve (see Figure 2). In our case, the AUC accounts for 79.65%, which we evaluated positively. Therefore, we can state that our model has good estimation accuracy.

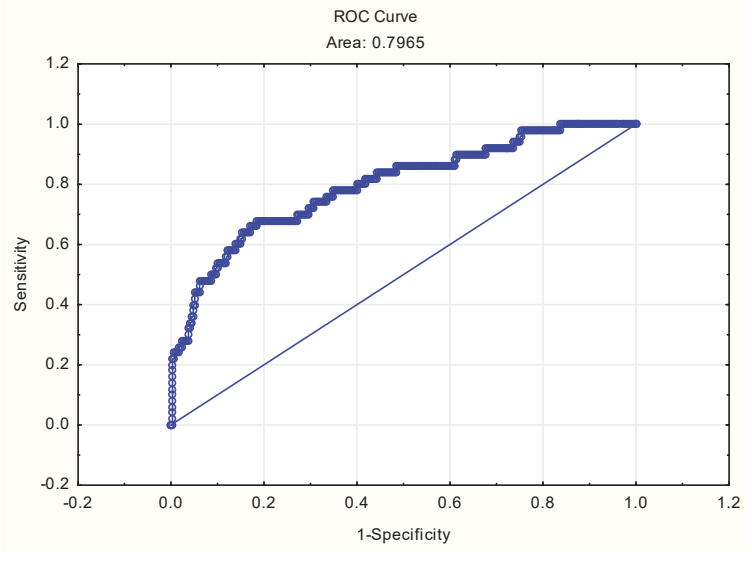

Figure 2. Receiver Operating Characteristic (ROC) curve for the Logit model.

The Hosmer–Lemeshow test signalized good conformity of the final model with given data. The *p*-value of the test was 0.71. This value is higher than the significance level, so we accepted the null hypothesis—the distribution of predicted and achieved results is the same across all groups of businesses. According to Nagelkerke's R Square, the model explains 26.73% variability of the binary dependent variable. Total estimation accuracy of the Logit model was found to be 86.6%, for non-bankrupt businesses the result was 96%, and estimation accuracy for bankrupt businesses was 30% (see Table 6). The error type I was 70% and error type II was 4%. The model was found to have higher classification accuracy for businesses that are financially sound.

Table 6. Classification accuracy of the Logit model corresponding to the same cut-off as the ADD model.

	Classification of Cases		
	Predicted: Yes	**Predicted: No**	**Percent Correct**
Observed: yes	15	35	30%
Observed: no	11	282	96%

A comparison of the classification ability of the models is given in Table 7 (corresponding to a cut-off point of 0.63). Several researchers compared the results of the ADD model and the Logit model. We already described the research of Premachandra et al. (2009) in the Introduction. The comparison of these two models was also performed by the Slovak researchers Mendelová and Stachová (2016, p. 103) who based on their research concluded that, in general, they cannot say that one method is better than the other one, because the accuracy and suitability of each method depends on the particular data used, its size, and its proportions. The results of the ADD model and Logit model were also compared by Araghi and Makvandi (2012). They found out that DEA is an effective tool for predicting business bankruptcy, but it is not as efficient as the Logit model—DEA achieved a weak performance in identifying bankrupt and non-bankrupt companies.

Table 7. Comparison of the estimation accuracy of the ADD and Logit models corresponding to optimal cut-off for the DEA model.

Model	Error Type I	Error Type II	Overall Estimation Accuracy	Sensitivity	Specificity
Logit	70%	4%	87%	30%	96%
DEA	18%	44%	59%	82%	56%

The ADD model was found to have a lower classification accuracy for non-bankrupt businesses corresponding to a cut-off of 0.63 and the Logit model has lower classification accuracy for bankrupt businesses at this cut-off (see Table 7). Therefore, it is necessary to state the optimal cut off for the Logit model, which is 0.16. At this point, the Logit model achieves a higher classification accuracy for bankrupt businesses.

Figure 3 shows the estimation accuracy for bankrupt and non-bankrupt businesses, as well as the percentage of total correct predictions for the DEA model. In the case of non-bankrupt businesses, the highest estimation accuracy was found at a cut-off of 1. Then the estimation accuracy decreases. In the case of bankrupt businesses, the estimation accuracy gradually increases up to 100% at a cut-off point of 0.5 and lower. The overall estimation accuracy decreases with a decreasing cut-off.

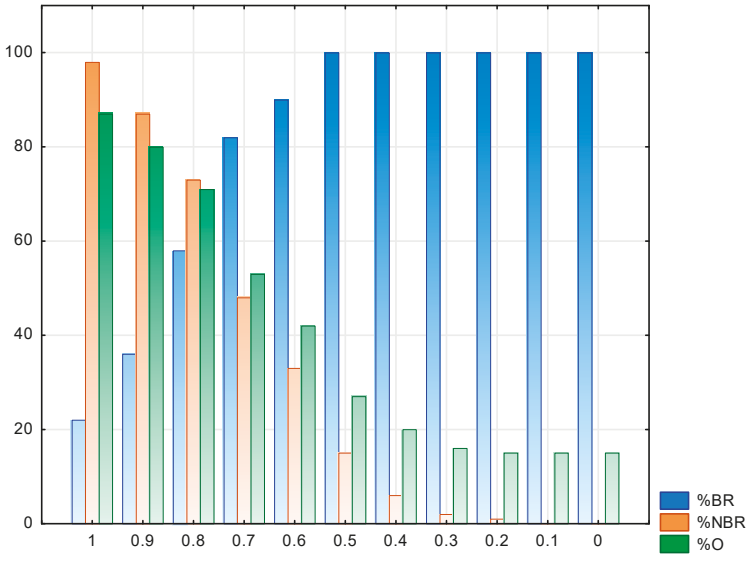

Figure 3. Percentage of correct predictions using the DEA model. Legend: BR—Estimation Accuracy for Bankrupt Businesses. NBR—Estimation Accuracy for Non-Bankrupt Businesses, O—Overall Estimation Accuracy.

Figure 4 illustrates the estimation accuracy for bankrupt and non-bankrupt businesses, as well as the percentage of total correct predictions for the Logit model.

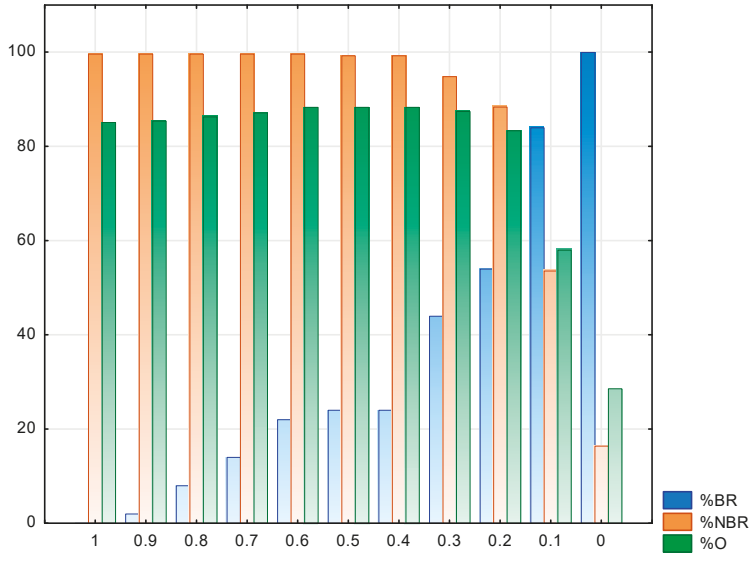

Figure 4. Percentage of correct predictions using the Logit model.

Figure 4 shows that estimation accuracy in the case of the Logit model is different in comparison with the results of the DEA model. In the case of non-bankrupt businesses, the highest estimation accuracy is from a cut-off point of 1 to cut-off point of 0.4; from a cut-off of 0.3, the estimation accuracy decreases rapidly. In the case of bankrupt businesses, the estimation accuracy gradually increases up to 100% at a cut-off point of 0. The overall estimation accuracy slightly increases up to a cut-off of 0.3 and then rapidly decreases. At the end of this discussion, it is necessary to point out the fact that each of the models has its optimal cut-off and the estimation accuracy of the models is given by the selected value of each cut-off.

5. Conclusions

In this paper, we created specific bankruptcy prediction models for the analysed sample of businesses with the use of the DEA method and Logit model. Inspired by authors who dealt with the causes of bankruptcy and based on the correlation matrix, we selected financial indicators as inputs and outputs for the constructed models. Based on the scientific literature, we also identified the bankruptcy condition of indebtedness, which was necessary to classify businesses into bankrupt and non-bankrupt businesses. This condition was applied in the case of the Logit model and together with the profit, it was verified by this model as a symptom of bankruptcy. Based on the results outlined in the Results and Discussion section, we can say that the ADD model achieved an estimation accuracy for bankrupt businesses of 82%. A similar estimation accuracy rate for businesses threatened with bankruptcy was presented in the work of Premachandra et al. (2009) of 84.89%; Mendelová and Stachová's (2016) accuracy rate was 10–42.86% and Cielen et al.'s (2004) accuracy rate was 74.4–75.7%. We obtained an estimation accuracy of the ADD model for non-bankrupt businesses of 56%, and an overall estimation accuracy of DEA model of 59%. We can compare this result with the outcomes of the above-mentioned authors: Premachandra et al. (2009) obtained 75–77%, Mendelová and Stachová (2016) obtained 88–95%, and Cielen et al. (2004) obtained 85.1–86.4%. The error type I for the ADD model was 18% and the error type II was 44%.

Several studies (Premachandra et al. 2011; Paradi et al. 2014) confirm that the traditional cut-off point of 0.5 may not be appropriate for assessing bankruptcy models' estimation accuracy. This was also confirmed in our research. The optimal cut off for DEA model was found to be 0.63, and we compared the results of the DEA model with the results of theLogit model at this cut-off. Overall estimation accuracy and estimation accuracy for non-bankrupt businesses was higher in the case of the Logit model. On the other hand, DEA has a higher estimation accuracy for bankrupt businesses. Also error type I was lower in the case of the DEA model. The optimal cut-off for Logit model was different, corresponding to 0.16. It should be noted that estimation accuracy of the models depends on their cut-off values. Both models have different optimal cut-offs, so the results cannot be clearly compared. DEA identifies fewer businesses at risk of bankruptcy, but at a higher probability of achieving bankruptcy. Logit identifies more businesses at risk of bankruptcy, but with a lower probability of the identified businesses achieving bankruptcy. This fact may also speak in favour of the application of DEA model in predicting the financial distress of businesses. In this paper, the optimal cut-off was set as the value at which the sum of sensitivity and specificity is the highest. Another way of determining an optimal cut-off is to calculate an index based on two DEA models, one representing the financial health frontier and the other representing the financial distress frontier.

Results of the constructed models can be a starting point to improve financial health, prosperity, and competitiveness of analysed businesses. Based on the achieved results, we can conclude that within our research sample, DEA identifies bankrupt businesses at a higher probability of bankruptcy than the Logit model. The DEA method does not take into account initial bankruptcy conditions but its results are based on the achieved values of financial indicators, so they are independent of any assumptions. A significant benefit of this method is that it allows us to accept the specifics of companies and industry. In contrast to the Logit model, it offers us goal values of indicators, which the Logit model does not offer. Based on the above-mentioned factors, we can conclude that the DEA method is a suitable alternative for predicting the failure of businesses from the analysed sample. In order to increase estimation accuracy of the DEA model and decrease type I and II errors for this model, in our further research we will focus on selecting explanatory variables from a wider range of financial and even non-financial indicators.

A limitation of our research is the sample of businesses used, which consisted of a limited number of companies and insufficient data; therefore, we will improve our sample and data to overcome these shortcomings in the future. However, it is important to note that the research sample consisted of real businesses and it took into account all businesses in the Slovak heat sector. Therefore, we can say that results will be beneficial for that industry.

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Corporate Governance and Firm Performance: A Comparative Analysis between Listed Family and Non-Family Firms in Japan

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Abstract: This study aims to explore the relationship between corporate governance and financial performance of publicly listed family and non-family firms in the Japanese manufacturing industry. The study obtains data from Bloomberg over the period 2014–2018 and covers 1412 firms comprising of 861 non-family and 551 family firms. Our results show that family firms outperform non-family counterparts in terms of return on assets (ROA) and Tobin's Q when a univariate analysis is invoked. On multivariate analysis, family firms show superior performance to non-family firms with Tobin's Q. However, family ownership negates firm performance when ROA is taken into account. Regarding the impact of governance elements on Tobin's Q, institutional shareholding appears to be a significant and positive factor for promoting the performance of both family and non-family firms. Furthermore, board size encourages the performance of non-family firms, while such influence is not observed for family firms. In terms of ROA, foreign ownership inspires the performance of both family and non-family firms. Moreover, government ownership stimulates the performance of family firms, while board independence significantly negates the same. Besides, we find that the performance of family firms run by the founder's descendants is superior to that of family firms run by the founder. These findings have critical policy implications for family firms in Japan.

Keywords: family firm; non-family firm; corporate governance; corporate performance; Japan

JEL Classification: G32; M13

1. Introduction

In recent times, the performance difference between family and non-family firms has received a new impetus to study because many studies claim that family firms outperform the non-family firms (Anderson and Reeb 2003; Sharma 2004; Allouche et al. 2008; Saito 2008; Chu 2011; Hansen and Block 2020; Srivastava and Bhatia 2020), while some others do not document the existence of such a relationship (Filatotchev et al. 2005; McConaughy and Phillips 1999; Miller et al. 2007; Yoshikawa and Rasheed 2010). Prior studies also note that the performance difference between family and non-family firms arises due to the governance system and corporate cultures across countries (Allouche et al. 2008; Srivastava and Bhatia 2020).

Given the above inconclusive results, we study and compare the financial performance of family and non-family firms in Japan from the governance perspective to add value. We consider Japan as a case for two reasons. First, family firms constitute over 40% of the listed firms in Japan (Saito 2008), implying the importance of such firms on stock market development and economic growth. However,

not many researchers have deep-dived to investigate the factors contributing to the performance difference between family and non-family firms in Japan. Furthermore, the limited empirical works on the performance of family firms in Japan offer mixed results. For example, Allouche et al. (2008) and Saito (2008) revealed that family firms perform better than non-family firms in Japan. Dazai et al. (2016) claimed that Japanese family firms outperform their counterparts, particularly after the economic bubble in 1991. However, Morikawa (2013) discovered that the annual productivity growth rate (one of the indicators of a firm's performance) of non-family firms in Japan was about 2% higher than that of family firms. Saito (2008) noted that the performance of founder-run firms was worse than non-family firms, but the performance of family firms owned by the founder's successors was better than the non-family firms. Moreover, Yoshikawa and Rasheed (2010) did not trace a significant relationship between family ownership and return on assets (ROA) in Japanese Over-The-Counter ("OTC") market listed firms in the manufacturing industry. Since most of the studies on family firms in Japan were conducted a fairly long time before, updated evidence on the performance difference between Japanese family and non-family firms is instrumental for policy implications.

Secondly, the Japanese governance structure is found to be somewhat different from that of US-style governance. The distinct Japanese governance system, such as the Japanese integrated monitoring system practiced by main banks, life-time employment system, and cross-shareholdings which contributed to the post-World War II economic growth rates of Japan, were substantially changed after the "big bang financial and accounting reform in 1997" in favor of the US-style governance. Even though the impact of the reform program helped the increase of independent directors, encouraged foreign shareholding, and reduced shareholding by main banks, Japanese firms are still found to be characterized by the board of directors promoted from within the firms (Arikawa et al. 2017), relatively less numbers of independent directors (two or more as per Corporate Governance Code, 2015), insider CEOs, and a higher percentage of family ownership. Thus, it is essential to know whether the current financial setup impacts the performance of family firms in Japan. Clearly, do the governance mainsprings such as board structure and ownership patterns impact on the performance difference between Japanese family and non-family firms?

We explain the above question by studying all the manufacturing firms listed in Tokyo, Nagoya, and Osaka stock markets covering the period 2014–2018. We consider manufacturing firms because this sector accounts for nearly half of the total number of corporations existing in Japan while contributing approximately 20% of Japan's GDP. The Japanese manufacturing industry is still very sizeable and significantly crucial to the Japanese economy. Furthermore, we exclude the financial and service sectors because they have a different asset structure from the manufacturing firms.

Our results show that family firms outperform the non-family counterparts on both accounting and market-based measures of firm performance, such as ROA and Tobin's Q, when univariate analysis is invoked. On multivariate analysis, family ownership reduces firm performance, indexed by ROA, but promotes the same with Tobin's Q. Among the governance elements, we find that institutional shareholding is a significant and positive factor for boosting the performance of both family and non-family firms. Moreover, board size inspires the performance of non-family firms, while such influence is not observed for family firms. In terms of ROA, foreign ownership stimulates the performance of both family and non-family firms. Furthermore, government ownership positively influences the performance of family firms, while board independence significantly negates the same. Besides, we find that the performance of family firms run by the founder's descendants are superior to that of family firms run by the founder.

The rest of the paper is structured as follows: Section 2 develops hypotheses, and Section 3 presents the research methods. Section 4 discusses regression results, while Section 5 concludes the paper.

2. Hypotheses

2.1. Family Ownership and Firm Performance

Agency theory can be put into place to discuss the performance difference between family and non-family firms. Agency theory states that executives do not have an interest in the firm's long-term performance (Jensen and Meckling 1976; Dalton et al. 1998), and they tend to make a decision based on their preferences, looking for short-term gain while ignoring shareholders' interests (Kallmuenzer 2015). Thus, from the agency theory perspective, family firms tend to perform better than non-family firms because the involvement of family members in both ownership and management can minimize this particular conflict of interest between managers and owners. Moreover, family firms are likely to have longer investment horizons, resulting in higher investment efficiency (Muttakin et al. 2014), as they want to preserve firm value for successive generations (Achleitner et al. 2014; Hasso and Duncan 2013). Moreover, empirical works by Razzaque et al. (2020) and Muttakin et al. (2014) reveal that family ownership has a positive impact on the performance of Bangladeshi manufacturing firms. Herrera-Echeverri et al. (2016) concluded that the family's involvement in the ownership and management often led to a more stable directorship for Columbian family firms. Blanco-Mazagatos et al. (2018) reported that family ownership has a positive influence on the performance of Spanish second- and later-generation firms. The more robust performance of family firms is also reported for companies in the S&P 500 (Anderson and Reeb 2003).

In the Japanese context, Chen et al. (2005) found evidence that supports the positive effect of family ownership on firm performance. Saito (2008) concluded that family control has a link to higher Tobin's Q. Similarly, Chen and Yu (2017) contend that Japanese and Taiwanese firms run by founders are traded at a higher value in the stock market.

Notably, there could be a Type II agency problem (principal–principal conflict) in family firms because the interest of family members may not necessarily be in line with the interest of minority shareholders (Muttakin et al. 2014). Besides, family firms usually hire executives from close relatives ignoring outside talents, resulting in suboptimal financial performance (Anderson and Reeb 2003). Accordingly, some empirical studies found a negative link between family ownership and firm performance (Yoshikawa and Rasheed 2010, for Japan).

Nonetheless, we argue that founders or family members who own and control the firms have stronger motivation to create wealth for successors. Thus, they tend to adopt long-run views in their investment horizons, which discourage them from taking higher risks, leading to generate stable returns for shareholders. Furthermore, higher family ownership reduces agency costs by reducing managerial myopia, moral hazards, and the agency problem. On this basis, we formulate Hypothesis 1.

Hypothesis 1 (H1). *Family ownership encourages the performance of family firms.*

2.2. Institutional Ownership and Firm Performance

Institutional ownership is considered to be a useful tool to reduce the Type II agency problem, where family firms may expropriate profits at the expense of minority shareholders. Dau et al. (2018) report that institutional ownership improves the ROA of family firms in India. A study on 134 listed firms in Kuwait reveals that institutional investors encourage firm performance, indexed by ROA and Tobin's Q (Alfaraid et al. 2012). By contrast, Ahmad et al. (2019) found a significant negative relationship between institutional investors and ROA for non-financial firms in Pakistan. Charfeddine and Elmarzougui (2011) traced that institutional ownership has a significant negative impact on Tobin's Q for French firms. However, Alnajjar (2015) found no substantial effect of institutional ownership on both ROA and Return on Equity (ROE) for firms in Jordan. Regarding the Japanese firms, Mizuno and Shimizu (2015) found that firms with a higher level of institutional ownership tended to perform better than firms having less or no institutional ownership. Moreover, Yasuhiro et al. (2016) and

Arikawa et al. (2017) found a significant positive association between institutional ownership and Tobin's Q. However, they did not see any relationship between institutional ownership and ROA.

We argue that institutional investors can mitigate much of the agency problem associated with family firms as they hold a significant equity stake in the firm (Charfeddine and Elmarzougui 2011). Institutional investors are seen to be more powerful than non-institutional investors in exercising voting rights and selling shares when management actions are not aligned with shareholders' interests (Arikawa et al. 2017). Furthermore, institutional shareholders can protect the interest of minority shareholders and reduce the Type II agency problem by monitoring the firm's management. Therefore, following previous empirical findings and agency theory, we take the following hypothesis.

Hypothesis 2 (H2). *Institutional ownership encourages the performance of family firms.*

2.3. Government Ownership and Firm Performance

Few pieces of research have studied the impact of government ownership on firm performance. Fukuda et al. (2018) argued that the government, as a shareholder, can reduce companies' financing costs. A study on Vietnamese firms from 2004–2012 provides evidence that an increase of government ownership in large firms improves firms' ROA and ROE, while for middle and small firms, it hurts the same (Ngo et al. 2014). Similarly, a study on listed firms in Shanghai and Shenzhen Stock Exchange reveals a positive relationship between government shareholdings and firm performance (Sun et al. 2002). Ahmad et al. (2008) obtained similar positive results for the link between government ownership and firm performance, measured by both Tobin's Q and ROA, in Malaysian firms.

In the case of Japan, Fukuda et al. (2018) noted that the effect of government ownership on firm performance varies depending on the state of the company, such as good, normal, or bad (performance is measured based on operating profit ratios in previous years). Their study revealed that a negative relationship runs between government ownership and Tobin's Q for good and normal Japanese firms, while a positive association exists for the same for bad performing companies. Notably, unlike the private sector, the government neither pursues aggressive growth nor puts too much pressure on the management to improve their financial performance (Fukuda et al. 2018). With that being said, the higher the government's shareholding inside the firm, the less well-performed the firm is. Thus, we take the following hypothesis.

Hypothesis 3 (H3). *Government ownership inhibits the performance of family firms.*

2.4. Foreign Ownership and Firm Performance

Many studies have been conducted to examine the relationship between foreign ownership and the firms' profitability. Firms with foreign ownerships are found to have better ROA than firms with higher domestic ownerships in Turkey (Aydin et al. 2007). A positive relationship between foreign ownership and profitability is also observed in a study of Tunisian firms (Moez et al. 2015). Likewise, a study on 663 non-financial listed firms on the Korea Stock Exchange from 2001 to 2017 revealed that foreign ownership enhances firms' long-term growth rate, thus increasing firm value, indexed by Tobin's Q (Choi and Park 2019). Moreover, foreign ownership can reduce agency costs because foreigners can use their expertise in monitoring management, thereby improving firms' profitability (Choi and Park 2019).

As for Japanese firms, Fukuda et al. (2018) found a positive relationship between foreign shareholding and Tobin's Q. Although Sueyoshi et al. (2010) found a similar result, they note that the influence of foreign shareholding on firm performance diminishes when the ratio of foreign shareholders increases to 19.49%. Yoshikawa and Rasheed (2010) considered the interaction effect of foreign ownership and ROE for the OTC market listed Japanese firms in the manufacturing industry and revealed that foreign investors influence family owners to improve firm performance. Hideaki et al. (2015) unearthed a significant positive association between foreign shareholding and Tobin's Q for Japanese firms even after controlling

the effect of various factors that may affect firm performance. By contrast, Kojima et al. (2017) found a negative relationship between foreign shareholdings and earnings quality.

We note that foreign investors can improve the performance of family firms in the following ways. First, foreign ownership does not just simply mean financial contribution but the transfer of knowledge, technology, innovations, and management expertise from foreign firms, which are essential to the growth of family firms. Second, foreign shareholders are often perceived as a catalyst for growth and change. If the domestic firm's performance goes downhill, foreign firms can layout necessary efforts to adopt various strategies to improve the firm's value. Third, foreign investors can play an essential role in disciplining managers of family firms, which are mostly recruited from family members without considering market talents.

However, foreign shareholders may easily ruin firm value if they leave firms during an economic slowdown. Another negative point is that foreigners may be biased in making investment decisions by choosing the firms based on their preferences, not by looking and carefully examining the firm's performance. In that case, the higher stock returns or more top market-based indicators do not reflect the firm's true performance. Instead, it only shows the investors' biased preferences (Hideaki et al. 2015). Nonetheless, foreign investors are generally reported to have a positive effect on firm performance in previous literature. Thus, we take the following hypothesis.

Hypothesis 4 (H4). *Foreign ownership encourages the performance of family firms.*

2.5. Board Size and Firm Performance

Extant literature shows inconclusive results for the link between board size and firm performance. Lorsch and Maclver (1989) point out that a larger board size hurts firm performance because it impedes faster decision-making. Besides, a large board size incurs higher coordination costs because of the arduous process of trying to reach a consensus amongst all board members. Empirical works also trace a significant negative relationship between large board size and firm performance in many countries (Eisenberg et al. 1998, for Finland; Mak and Kusnadi 2005, for Malaysia and Singapore; Naushad and Malik 2015, for Bangladesh; Aljifri and Moustafa 2007, for the United Arab Emirates). In the context of Japan, Hu and Izumida (2008) and Sueyoshi et al. (2010) found no significant relationship between board size and firm performance. Nonetheless, some scholars argue that a large board size can enhance board independence and diversity, thereby increasing firm performance (Ciftci et al. 2019, for Turkish firms; Jackling and Johl 2009, for Indian firms).

We argue that, for family firms, most of the board members are selected from family members who are expected to be free riders. Thus, the coordination problem arising from a larger board size would not be a severe issue for family firms. Instead, a larger board of directors could bring in more opinions from members of diverse backgrounds and enhance firm performance by improving strategic decision-making. Thus, we take the following hypothesis.

Hypothesis 5 (H5). *Board size encourages the performance of family firms.*

2.6. Board Meeting and Firm Performance

A limited number of studies have been conducted so far to examine the relationship between board meetings and firm performance. Vafeas (1999) found a negative correlation between board meetings and firm value. He concluded that frequent board meetings can play an important role in enhancing firm performance because it helps to reduce the informational gap among the board members. Furthermore, Chou et al. (2013) traced a positive link between the frequency of board meetings and firm profitability for Taiwanese firms. They further noted that outside directors are less likely to attend board meetings for companies with a higher percentage of family ownership. However, a study on Columbian firms revealed no significant relationship between the number of board meetings and ROA or ROE (Gomez et al. 2017).

In the Japanese context, the board of directors in family firms usually consists of directors selected from their relatives or employees who have been with the company under the life-time employment scheme, implying that there is little to no fresh ideas and perspectives in the board. Therefore, for family firms, the traditional group thinking may dominate the entire discussion process, while innovation and breakthrough ideas would often be given away for conservatism. Nevertheless, the board meeting is considered to be an essential factor for promoting firm performance because frequent board meetings make everyone aligned about various issues faced by companies and resolve them smoothly and timely. Huse (2007) noted that a higher number of board meetings provide effective monitoring on the board and quickly reach a consensus in resolving corporate issues. On this basis, we take the following hypothesis.

Hypothesis 6 (H6). *Frequency in board meetings encourages the performance of family firms.*

2.7. Board Independence and Firm Performance

Previous studies suggest that independent directors can improve a firm's decision making by providing effective monitoring on the board (Jensen and Meckling 1976). Huson et al. (2001) revealed a positive relationship between independent directors and firm performance. Yasuhiro et al. (2016) found that boards dominated by insiders have a significant effect on low profitability and market valuation of Japanese firms. They noted that independent directors could guarantee and promote risk-taking action, thereby creating a significant positive impact on firm performance (both ROA and Tobin's Q). Arikawa et al. (2017) unearthed that ROA and Tobin's Q increase by 0.6% and 0.26%, respectively when outside directors increase by 29%. In addition, in examining 144 companies that appointed their first outside directors, Saito (2009) reported that the stock prices of these companies responded significantly positively, rising approximately 1.2% on average, and 1% at the median.

We note that family firms can receive valuable advice if they encourage more independent directors on the board. In Japan, many independent directors are found to be life-long employees who were hired to serve on the company's board upon retirement. With such a long-term commitment, these independent directors are likely to direct the firm towards sustainable growth, not just for a short-term profit (Bauer et al. 2008). Therefore, we take the following hypothesis.

Hypothesis 7 (H7). *Board independence encourages the performance of family firms.*

3. Research Methods

3.1. Definition of Family Firms

We classified a company as a family firm if it satisfied any of the five criteria: (a) run by a founder; (b) run by family members who hold important positions inside the company (such as Chairman, Vice Chairman, Chief Executive Officer); (c) controlled by family members who are on the top 10 shareholder list; (d) controlled by family members who account for 50% of the number of board members; and (e) owned by a privately held company. We adopted these criteria following previous studies on Japanese family firms (Yoshikawa and Rasheed 2010; Saito 2008; Morikawa 2013; Arikawa et al. 2017; Hideaki et al. 2018).

3.2. Sample Description

We applied the archival research method in which data was collected from various secondary sources. General and financial data were collected from OSIRIS (software version 213, a database managed by Bureau van Dijk, BvD). The search strategy was customized to look for all of the listed companies in the manufacturing industry in Japan. First of all, companies that were in operation in Japan were selected. Then, all companies in the manufacturing industry were chosen based on the North American Industry Classification System (NAICS). After the initial search, 1601 companies

were identified as publicly listed Japanese companies in the manufacturing industry. Companies were grouped into 21 different sub-industry codes, depending on the nature of their business. These companies were then screened to see if they had sufficient data for analysis. We omitted 163 companies that lacked 5-year financial data and 26 companies that changed their industries during the study period 2014–2108. Accordingly, our sample firms reduced to 1412 publicly listed firms in the manufacturing industry, giving a sample size of $1412 \times 5 = 7060$ observations ($n \times T$). We collected corporate governance data from Bloomberg. Table 1 lists out the number and percentage of family and non-family firms in each industry grouping.

Table 1. Family and non-family manufacturing firms by North American Industry Classification System (NAICS) 2017 Code.

Industry	Non-Family Firms	Family Firms	Total	Percentage of Family Firms
311: Food manufacturing	59	39	98	39.80
312: Beverage and tobacco product manufacturing	11	3	14	21.43
313: Textile mills	22	4	26	15.38
314: Textile product mills	7	2	9	22.22
315: Apparel manufacturing	17	11	28	39.29
316: Leather and allied product manufacturing	3	0	3	0.00
321: Wood product manufacturing	9	7	16	43.75
322: Paper manufacturing	20	16	36	44.44
323: Printing and related support activities	11	14	25	56.00
324: Petroleum and coal product manufacturing	9	1	10	10.00
325: Chemical manufacturing	135	77	212	36.32
326: Plastics and rubber product manufacturing	24	20	44	45.45
327: Nonmetallic mineral product manufacturing	31	20	51	39.22
331: Primary metal manufacturing	54	16	70	22.86
332: Fabricated metal product manufacturing	57	28	85	32.94
333: Machinery manufacturing	126	82	208	39.42
334: Computer and electronic product manufacturing	138	105	243	43.21
335: Electronic equipment, appliance, and component manufacturing	33	30	63	47.62
336: Transportation equipment manufacturing	72	34	106	32.08
337: Furniture and related product manufacturing	2	10	12	83.33
339: Miscellaneous manufacturing	21	32	53	60.38
Total	861	551	1412	39.02

Note: This table shows the number and the percentage of family firms and non-family firms in the manufacturing industry in Japan. The industry classification is based on the North American Industry Classification System 2017, extracted from the OSIRIS database. The sample comprises of listed firms on the Stock Exchange of Tokyo, Osaka, and Nagoya.

Table 1 reveals that family firms account for 39% of the manufacturing firms in Japan. The distribution in the number of family firms in the top five segments, such as computer and electronics (43%), chemicals (36%), machinery (40%), transportation equipment (32%), and food manufacturing (40%), is found to be relatively closer. For other segments, the distribution between family and non-family firms is found to be skewed. For example, ten firms out of twelve firms in furniture and related product manufacturing are found to be family firms. Likewise, only 10% of firms are seen to be family firms in petroleum and coal product manufacturing. Finally, the statistical data indicates that the presence of family firms in the Japanese manufacturing industry is strong, except for some variations. This also supports previous academic research that family ownership is an essential characteristic of Japanese firms.

3.3. Description of Variables

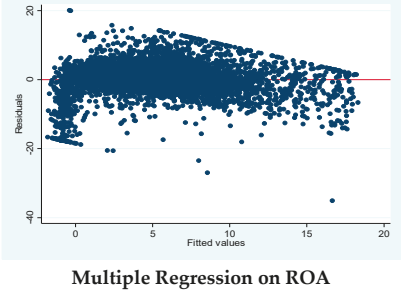
For dependent variables, we used both accounting (ROA) and market-based (Tobin's Q) methods to measure firm performance. For test variables, we considered some ownership and board structure data available on Bloomberg. Moreover, we controlled several firm-specific variables to get robust estimates. Table 2 summarizes the list of variables together with their definitions and formulas.

Table 2. List of variables.

Variables	Abbreviation	Definition	Formula
Performance Characteristics—Dependent Variables			
Return on assets	ROA	The percentage of net income after paying preferred dividends divided by average total assets for the year	(Net income/Total assets) × 100
Tobin's Q	Tobin's Q	The market value of a firm divided by its value of total assets	(Market capitalization/Total assets) × 100
Firm-Specific Characteristics—Control Variables			
Firm size	SIZE	Natural logarithm of market capitalization	Ln (Outstanding shares × share price)
Firm age	AGE	Natural logarithm of the firm's age	Ln (financial year–year of incorporation)
Cash flow over operating revenue	CFOP	The percentage of cash generated from carrying out its operating activities	Cash flow/operating revenue
Debt to equity ratio	LEV	The percentage of total liability to shareholder equity	Total liability/Shareholders' equity
Ownership Characteristics—Independent Variables			
Family ownership	FAM	The percentage of equity owned by the firm's founder and/or family members and/or privately held firms	Sum of the percentage of shares (founder, family members, privately held firms)
Institutional ownership	INS	The percentage of equity owned by different institutions	Sum of the percentage of shares (investment advisor, bank, corporation, insurance company, stock ownership plan, holding company, sovereign wealth fund, pension fund, hedge fund managers, venture capital, brokerage, hedge fund, trust, foundation, private equity fund)
Foreign ownership	FOR	The percentage of equity owned by foreigners (other than Japanese) individual/institution	The percentage of equity owned by foreigners
Government ownership	GOV	The percentage of equity owned by the Japanese government	The percentage of equity owned by the Japanese government
Board Characteristics—Independent Variables			
Board size	BO_SIZE	Number of board members	Number of board members
Board meeting frequency	BO_MEET	Number of the board of director's meetings in one year	Number of the board of director's meetings in one year
Board independence	BO_IND	Percentage of independent directors, defined as outside directors	(Independent directors on board/board size) × 100

3.4. Data Diagnosis

To ensure linearity and to avoid the outlier problem, we ran primary regression on the independent variables to obtain residuals and estimated values for dependent variables. We then plotted the residual and estimated values on the residual-versus-fitted graph to detect linearity. Then, we corrected the outlier problem by winsorizing data at 1% and 99% tails. After winsorizing, we had 7055 observations. Figure 1 confirms linearity after data winsorizing.



Multiple Regression on ROA

Multiple Regression on Tobin's Q

Figure 1. Residual-versus-fitted plot after data winsorizing. Source: authors' construction.

3.5. Econometric Model

We conducted a Hausman test to see whether the fixed effect or random effect model was suitable for regression. The test result yields a Chi-squared value of 391.42 with a 1% significance level and supports the use of the fixed-effect model. Accordingly, we ran the following fixed effect regression model.

$$\begin{aligned} \text{PERFORMANCE} = {} & \beta_0 + \beta_1\text{SIZE} + \beta_2\text{AGE} + \beta_3\text{CFOP} + \beta_4\text{LEV} + \beta_5\text{FAM} + \beta_6\text{INS} + \\ & \beta_7\text{GOV} + \beta_8\text{FOR} + \beta_9\text{BO\_SIZE} + \beta_{10}\text{BO\_MEET} + \beta_{11}\text{BO\_IND} + \beta_{12}\text{FAM*INS} + \\ & \beta_{13}\text{FAM*GOV} + \beta_{14}\text{FAM* FOR} + \beta_{15}\text{BO\_SIZESQ} + \beta_{16}\text{BO\_MEETSQ} + \varepsilon \end{aligned} \quad (1)$$

where PERFORMANCE represents the dependent variables: ROA and Tobin's Q. Variables such as SIZE, AGE, CFOP, and LEV are control variables defined in Table 2. Similarly, variables such as FAM, INS, GOV, FOR, BO-SIZE, BO_MEET, and BO_IND are the test variables defined in Table 2. We also include INS, GOV, and FOR as interaction with FAM to see their moderating effects on firm performance. Further, we square BO-SIZE and BO_MEET to see the non-linear relationship. β_0 is the unknown intercept for each firm, and ε is the between-entity error.

To ensure the consistency of our estimates, we also invoked the following random effect regression model.

$$\begin{aligned} \text{PERFORMANCE} = {} & \beta_0 + \beta_1\text{SIZE} + \beta_2\text{AGE} + \beta_3\text{CFOP} + \beta_4\text{LEV} + \beta_5\text{FAM} + \beta_6\text{INS} + \\ & \beta_7\text{GOV} + \beta_8\text{FOR} + \beta_9\text{BO\_SIZE} + \beta_{10}\text{BO\_MEET} + \beta_{11}\text{ BO\_IND} + \beta_{12}\text{FAM*INS} + \\ & \beta_{13}\text{FAM*GOV} + \beta_{14}\text{FAM* FOR} + \beta_{15}\text{BO\_SIZESQ} + \beta_{16}\text{BO\_MEETSQ} + u + \varepsilon \end{aligned} \quad (2)$$

where u is the between-entity error, and ε is the within-entity error. All other variables are the same as defined in Equation (1).

4. Results and Discussion

4.1. Descriptive Statistics

Tables 3 and 4 provide descriptive statistics and mean comparison tests of the variables used in the study, respectively. As is observed in Table 3, family firms are found to perform better than the non-family firms in terms of Tobin's Q and ROA. The mean values of family firms' ROA (net income/total assets*100) and Tobin's Q (market capitalization/total assets*100) are 5.092 and 0.774, respectively, as compared to 5.045 and 0.646 mean values of non-family firms, as shown in Table 3. Similarly, the median value of ROA (5.100) and Tobin's Q (0.503) for family firms is higher than that of non-family firms, as shown in Table 4. However, the mean and median comparison tests (t-test and z-test) yield a significant difference between family and non-family firms in terms of Tobin's Q, as shown in Table 4. The above results are consistent with previous literature, which points out that family firms tend to perform better than non-family firms (Chen et al. 2005; Saito 2008; Morikawa 2013; Dazai et al. 2016; Chen and Yu 2017).

Regarding the test variables, family firms have higher family ownership concentration than non-family firms because they are owned by founders or controlled by founding family members. On the other hand, family firms have a lower level of institution, government, and foreign ownership than non-family firms. The presence of institutional investors in family firms is around 15%, while it is about 17% in non-family firms. The government owns approximately a 1% share in family firms as opposed to nearly a 0.8% share in non-family firms. Besides, foreign owners tend to invest less in family firms with an average of a 2% equity stake compared to non-family firms with an average of a 3% share, as shown in Table 3.

Table 3. Descriptive statistics.

Variable	All Firms (n = 7055 Observations)				Non-Family Firms (n = 4305 Observations)				Family Firms (n = 2750 Observations)			
	Mean	Std. dev	Min	Max	Mean	Std. dev	Min	Max	Mean	Std. dev	Min	Max
Performance Characteristics												
ROA	5.064	5.433	−18.440	19.680	5.045	4.976	−18.440	19.680	5.092	6.080	−18.440	19.680
Tobin_Q	0.696	0.704	0.000	4.502	0.646	0.622	0.000	4.502	0.774	0.811	0.000	4.502
Firm-Specific Characteristics												
SIZE	2.986	1.508	0.000	6.992	3.118	1.491	0.000	6.992	2.779	1.512	0.000	6.992
AGE	1.745	0.254	0.778	2.117	1.782	0.247	0.778	2.117	1.688	0.255	0.778	2.117
CFOP	8.499	5.260	0.000	27.460	8.581	5.108	0.000	27.460	8.369	5.487	0.000	27.460
LEV	43.711	18.536	8.080	85.440	45.067	18.183	8.080	85.440	41.592	18.885	8.080	85.440
Ownership Characteristics												
FAM	0.625	3.029	0.000	22.370	0.000	0.000	0.000	0.000	1.602	4.685	0.000	22.370
INS	16.283	33.597	0.000	97.610	17.285	35.298	0.000	97.610	14.718	30.693	0.000	97.610
GOV	0.962	2.694	0.000	12.110	1.110	2.911	0.000	12.110	0.731	2.296	0.000	12.110
FOR	2.563	7.529	0.000	39.810	2.921	8.144	0.000	39.810	2.004	6.414	0.000	39.810
Board Characteristics												
BO_SIZE	5.761	4.713	0.000	16.000	6.523	4.556	0.000	16.000	4.570	4.707	0.000	16.000
BO_MEET	8.917	7.520	0.000	24.000	9.974	7.219	0.000	24.000	7.262	7.683	0.000	24.000
BO_IND	13.504	14.375	0.000	57.143	15.142	14.155	0.000	57.143	10.941	14.344	0.000	57.143

Table 4. Mean and median comparison between family and non-family firms.

Variable	Mean				Median			
	Non-Family (a)	Family (b)	(a)–(b)	*t*-Value	Non-Family (c)	Family (d)	(c)–(d)	*z*-Value
Performance Characteristics								
ROA	4.976	5.092	−0.047	−0.338	4.900	5.100	−0.200	−1.359
Tobin_Q	0.622	0.774	−0.128	−7.074 **	0.476	0.503	−0.027	−4.123 **
Firm-specific Characteristics								
SIZE	3.118	2.779	0.339	9.237 **	2.741	2.383	0.358	11.364 **
AGE	1.782	1.688	0.093	15.157 **	1.833	1.763	0.070	20.843 **
CFOP	8.581	8.369	0.212	1.626	7.870	7.600	0.270	2.843 **
LEV	45.067	41.592	3.475	7.651 **	44.590	40.490	4.100	7.723 **
Ownership Characteristics								
FAM	0.000	1.602	−1.602	−17.947 **	0.000	0.000	0.000	−28.217 **
INS	17.285	14.718	2.567	3.230 **	0.000	0.000	0.000	1.882
GOV	1.110	0.731	0.379	6.088 **	0.000	0.000	0.000	4.092 **
FOR	2.921	2.004	0.917	5.263 **	0.000	0.000	0.000	1.178
Board Characteristics								
BO_SIZE	6.523	4.570	1.953	17.223 **	8.000	5.000	3.000	16.992 **
BO_MEET	9.974	7.262	2.712	14.802 **	13.000	5.000	8.000	13.797 **
BO_IND	15.142	10.941	4.200	12.057 **	14.286	0.000	14.286	13.748 **

Note: ** meaning *p*-value is less than 0.01; *t*-value is the result from t-student test comparing the mean of two groups with unequal variances at confidence level of 95%; *z*-value is the result from two-samples Wilcoxon rank-sum (or Mann–Whitney U) test comparing the median of two groups. The null hypothesis is the two groups are equal versus the alternative hypothesis that the two groups are not equal.

As for board structure, family firms are found to have smaller board size, fewer board meetings, and fewer independent directors on the board than those of non-family firms. On average, board members in family firms consist of five persons, as compared to seven persons in non-family firms. For board meetings, family firms conduct about 7 sessions in a year, while it is 10 for their counterparts. For board independence, independent directors are found to be fewer in family firms with an average of 10 people against 15 people in non-family firms.

Concerning firm characteristics (control variables), non-family firms show higher market capitalization, a higher longevity level, better cash flow over operating revenue, and higher debt to equity ratio than family firms. The lower leverage ratio for family firms indicates fewer financial risks

for them as compared to non-family firms. However, lower cash flow over operating revenue ratio for family firms suggests that they may encounter financial difficulties in expanding businesses. Overall, the univariate analysis presented in Tables 3 and 4 indicates that there is a significant performance difference between Japanese family and non-family firms in terms of firm-specific characteristics, ownership structure, and board composition.

4.2. Correlation Matrix

Table 5 reports the results of the correlation between variables. The correlation coefficient between variables shows no multicollinearity problem except for BO_MEET with BO_SIZE (0.776), and GOV with FOR (0.761). While perfect multicollinearity is considered a serious problem, often signaling a logical error, imperfect multicollinearity (correlation coefficient nearly equals 1) may not be an error but just a feature or characteristic of data. Therefore, we do not drop these two variables for running the final regression.

Table 5. Correlation matrix.

Variables	ROA	Tobin_Q	SIZE	AGE	CFOP	LEV	FAM	INS	GOV	FOR	BO_SIZE	BO_MEET	BO_IND	NON_EXE
ROA	1.000													
Tobin_Q	0.279	1.000												
SIZE	0.172	0.251	1.000											
AGE	0.052	−0.239	0.109	1.000										
CFOP	0.639	0.368	0.242	0.015	1.000									
LEV	−0.267	−0.366	−0.085	0.075	−0.398	1.000								
FAM	−0.011	0.075	−0.108	−0.074	−0.016	−0.018	1.000							
INS	0.034	0.064	−0.136	0.060	0.051	−0.022	0.301	1.000						
GOV	0.071	0.078	−0.004	0.090	0.089	−0.017	0.138	0.732	1.000					
FOR	0.101	0.136	0.014	0.056	0.134	−0.053	0.163	0.705	0.761	1.000				
BO_SIZE	0.168	0.079	0.350	0.212	0.174	−0.024	−0.069	0.043	0.213	0.142	1.000			
BO_MEET	0.135	0.091	0.284	0.136	0.164	−0.027	−0.047	0.040	0.203	0.124	0.773	1.000		
BO_IND	0.134	0.159	0.356	0.128	0.197	−0.046	−0.015	0.161	0.312	0.240	0.570	0.616	1.000	

4.3. Regression Results

4.3.1. Family Ownership and Firm Performance

Table 6 reports the results of the fixed effect regression model for all firms, family firms, and non-family firms separately. In the case of all firms, Table 6 reveals that family ownership has a positive effect on Tobin's Q at the 5% significance level. However, it shows a negative relationship with ROA. For family firms, family ownership tends to have a positive impact on Tobin's Q, which is consistent with previous literature (Saito 2008, for Japan; Isakov and Weisskopf 2014, for Switzerland; Muttakin et al. 2015, for Bangladesh). However, we found that family ownership hurts ROA. Plausibly, this happens because family firms do not heavily focus on short-term profitability, which is reflected by ROA (Kapopoulos and Lazaretou 2007), to please third-party shareholders. Instead, they strive for long-term and sustainable growth, as opposed to non-family firms, to pass their wealth to future generations. It is worth noting that ROA and Tobin's Q are different measures of firm performance. ROA is an accounting-based measure reflecting short-term performance, while Tobin's Q is a market-based measure focusing on long-term growth. Thus, we may not always have consistent estimates. As for non-family firms, family ownership concentration does not exist, so no relationship is recorded. As a whole, we conclude that a significant positive connection runs between family ownership and firm performance, measured by Tobin's Q (H1). For ROA, the hypothesis H1is rejected.

Table 6. Fixed effect regression result.

Variable	All Firms		Non-Family Firms		Family Firms	
	ROA	**Tobin's Q**	**ROA**	**Tobin's Q**	**ROA**	**Tobin's Q**
Firm-Specific Characteristics						
SIZE	−0.015	0.049 **	−0.042	0.044 **	0.039	0.058 **
AGE	−9.835 ***	−0.062 *	−6.320 *	−0.990 *	−34.701 **	−0.320
CFOP	0.709 ***	0.015 **	0.597 **	0.008 **	0.918 **	0.027 **
LEV	−0.192 ***	−0.012 **	−0.162 **	−0.016 **	−0.225 **	−0.008 **
Ownership Characteristics						
FAM	−0.184 **	0.009 *	Omitted	Omitted	−0.166 **	0.009 *
INS	0.0003	0.001 **	0.000	0.001 **	0.006	0.001 **
FAM*INS	0.003 **	0.0001 *	Omitted	Omitted	0.003 **	0.000 *
GOV	0.015	−0.002	−0.018	−0.002	0.241 **	−0.006
FAM*GOV	−0.006 **	0.0002	Omitted	Omitted	−0.013 **	0.000
FOR	0.011	0.001	0.025 *	0.001	0.051 *	0.004
FAM*FOR	0.006 **	0.003	Omitted	Omitted	0.003 *	0.000 *
Board Characteristics						
BO_SIZE	0.182	0.047 **	0.006	0.052 *	0.382	0.014
BO_SIZESQ	−0.000	−0.001 *	0.000	−0.002	−0.016	−0.000
BO_MEET	0.008	0.005	−0.021	0.002	0.031	0.011
BO_MEETSQ	−0.001	−0.000	0.000	−0.000	−0.000	−0.000
BO_IND	0.007	0.0009	−0.033 **	−0.001	−0.064 *	0.000
constant	41.55 **	1.873 **	19.080 **	2.724 **	63.97 **	1.12 **
N	7055	7055	4305	4305	2750	2750
R-square	0.096	0.169	0.229	0.143	0.038	0.179

Note: *** meaning p-value is less than 0.001; ** meaning p-value is less than 0.01; * meaning p-value is less than 0.05.

4.3.2. Institutional Ownership and Firm Performance

We found a significant positive relationship between institutional ownership and firm performance, indexed by Tobin's Q, for each group such as all firms, family firms, and non-family firms. This relationship becomes stronger and significant with ROA and Tobin's Q when institutional ownership interacts with family ownership, implying that institutional shareholders can augment firm performance in family firms. There could be two possible explanations in this respect. First, family firms are likely to require more financial and technical knowledge from outside parties to manage the firms better. In that matter, institutional investors can advise and monitor family firms on various issues to foster performance in the short term (indicated by ROA). Non-family firms can take similar advantages from institutional investors to enhance profits temporarily. However, non-family firms are usually run and managed by managers coming from diverse backgrounds with strong business know-how. Thus, they are less likely to rely on advice from institutional shareholders to promote short-term profits. Instead, they seek consultation from institutional investors on strategic management, which has more impact on firms' long-term performance (Tobin's Q).

Second, institutional investors, such as banks and pension funds, demand more transparency in the board of management in disbursing funds. Unfortunately, family firms may not be perceived well by institutional investors to achieve the same level of transparency as non-family firms have. Thus, institutional investors can provide necessary advice and monitoring to the family firms to foster profits in the short term. As a whole, we found that a significant positive relationship exists between institutional ownership and firm performance, and family firms can enhance financial performance both in the short term and long term by increasing institutional ownership (H2).

4.3.3. Government Ownership and Firm Performance

We found that a significant and positive relationship runs between government ownership and performance of family firms, measured by ROA. For all firms, government ownership shows a positive impact on ROA, and a negative effect on Tobin's Q, although none of them is significant. By contrast, a negative relationship is found to run between government ownership and firm performance in both measures of firm performance for non-family firms, but the effect is not significant. Notably, government ownership turns out to be negative for family firms when it interacts with family ownership, indicating that family firms can reap the benefits of government stakes up to a certain threshold level. In this tune, Fukuda et al. (2018) concluded that the effect of government ownership on firm performance varies depending on the state of the company. Good and normal companies are likely to possess a negative relationship between government ownership on firm performance, while bad companies have a positive association between the same (Fukuda et al. 2018). As the *p*-value of government ownership is found to be significant with ROA for family firms, we accept H3. However, we note that government ownership contributes to firm performance up to a certain threshold level.

4.3.4. Foreign Ownership and Firm Performance

We found a significant and positive connection between foreign ownership and the performance of family firms with ROA. A similar substantial and positive relationship was observed between foreign ownership and Tobin's Q for non-family firms. This result is consistent with the findings of Yoshikawa and Rasheed (2010), Sueyoshi et al. (2010), and Fukuda et al. (2018), which reveal that foreign ownership improves Tobin's Q for Japanese firms. Notably, we found that foreign ownership significantly enhances the performance of family firms (both ROA and Tobin's Q) when it interacts with family ownership. This means that foreign investors, because of their expertise in overseas market operations, can monitor the company's performance closely and provide necessary advice to improve the firm's profit in the short term (ROA). Furthermore, family firms can take advantage of new knowledge, innovation, and management expertise brought by foreign shareholders to enhance profits in the long term (Tobin's Q). In conclusion, there is evidence of a significant positive relationship between foreign ownership both for family and non-family firms (H4).

4.3.5. Board Size and Firm Performance

We did not find any significant relationship between board size and firm performance for family firms, although it has been significant and positive for non-family firms. The result corresponds to previous studies by Hu and Izumida (2008) and Sueyoshi et al. (2010) for Japan. Looking at the case of all firms, we found that a non-linear negative relationship exists between board size and firm performance, indicating that the increase in board members can hurt firm performance. However, we note that it depends on the complexity of companies' structure, nature of the business, and economic goals. Finally, we do not accept H5 that a significant positive relationship exists between board size and performance of family firms (H5). However, H5 is accepted for non-family firms.

4.3.6. Board Meeting and Firm Performance

We did not find any significant relationship between board meetings and firm performance either for family or for non-family firms. This could lie in the fact that the board of directors in Japanese firms usually consists of directors selected from employees who have been with the company under the life-time employment scheme, implying that there are little to no fresh ideas and perspectives on the board. Therefore, the traditional group thinking may dominate the entire discussion process, while innovation and breakthrough ideas may be sacrificed against conservatism. Our result does not approve the findings by Huse (2007), which document that frequency of board meetings enhances firm performance by improving monitoring activities and resolving corporate issues. Moreover, we did not find that a non-linear relationship runs between the frequency of board meetings and firm

performance. In conclusion, we reject H6 that a significant positive relationship runs between the number of board meetings and Tobin's Q for family firms in Japan.

4.3.7. Board Independence and Firm Performance

As a whole, a negative relationship was traced between independent directors and firm performance. However, this negative effect was evidenced only with ROA for the case of family firms, and Tobin's Q with non-family firms. This contradicts previous studies of Yasuhiro et al. (2016) and Arikawa et al. (2017) that report a positive relationship between independent directors and firm performance for Japanese firms. In our study, the average number of independent directors is 15.142 for non-family firms, and 10.941 for family firms. Possibly, too many independent directors may have a side effect on firm performance, as they kill time for communication and making decisions. Thus, the hypothesis (H7) is not approved. We also note that the optimal size of independent directors on the board is still a complicated matter, depending on various factors and firm characteristics, and requires further study.

As for control variables, factors such as firm size and cash flows from operating activities were found to be positively and significantly associated with Tobin's Q of both family and non-family firms. By contrast, leverage tends to inhibit the performance of family and non-family firms in both the accounting-based (ROA) and market-based (Tobin's Q) measures of firm performance. Table 7 summarizes our regression results for predefined hypotheses.

Table 7. Summary of findings with hypotheses.

Variable	Expected Sign	All Firms		Non-Family Firms		Family Firms	
		ROA	Tobin's Q	ROA	Tobin's Q	ROA	Tobin's Q
Family ownership	+	− **	+ *	Omit	Omit	− **	+ *
Institution ownership	+	+	+ *	+	+ **	+	+ **
Government ownership	−	+	−	−	−	+ **	−
Foreign ownership	+	+	+	+ *	+	+ *	+
Board size	+	+	+ **	+	+ *	+	+
Board meeting	+	+	+	−	+	−	−
Board independence	+	+	+	+	−	− *	+

Note: ** meaning p-value is less than 0.01; * meaning p-value is less than 0.05. + represents a positive but insignificant relationship, while − indicates a negative and insignificant relationship.

4.4. Robustness Test

Table 8 presents regression results from the random effect model after controlling for time and industry effects. The regression results on ROA and Tobin's Q yield relatively consistent estimates with the regression results reported in the fixed-effect model. However, there are a few exceptions. For family firms, board independence that showed a significantly negative effect on ROA in the fixed-effect model disappears. Furthermore, foreign ownership appears to be a significant variable to improve the performance of all firms. In addition, institutional ownership, which showed no relationship with ROA in the fixed-effect model for family firms, turns out to be a significant and positive factor for the same.

4.5. Additional Analysis

To check the performance difference between different types of family firms, we did further analysis following the Saito (2008) approach. Accordingly, we separated the family firms into two groups: family firms run by founders and founding family members. The results are shown in Table 9. As Table 9 portrays, family firms run by the founder's family members outperform the family firms run by founders concerning Tobin's Q. This result is in line with the findings of Saito (2008). However, we found that family ownership reduces the performance of founder run family firms as far as the ROA is concerned, but Tobin's Q does not evidence the same. By contrast, family ownership significantly improves the performance of family firms run by the founder's descendants when Tobin's

Q is taken into account. However, such evidence is not pronounced with ROA. Similarly, factors such as institutional ownership and government shareholding encourage the performance of both types of family firms (founders and founders' descendants).

Table 8. Random effect regression results in controlling for time and industry effects.

Variable	All Firms		Non-Family Firms		Family Firms	
	ROA	Tobin's Q	ROA	Tobin's Q	ROA	Tobin's Q
Firm-Specific Characteristics						
SIZE	−0.084 *	0.058 **	−0.014	0.051 **	−0.162 *	0.068 **
AGE	1.454 **	−0.814 *	0.372	−0.539 *	3.027 **	−1.142 **
CFOP	0.672 *	0.020 **	0.557 **	0.016 **	0.858 **	0.028 **
LEV	−0.042 **	−0.011 **	−0.045 **	−0.012 **	−0.038 **	−0.009 **
Ownership Characteristics						
FAM	−0.187 **	0.012 **	Omitted	Omitted	−0.189 **	0.012 **
INS	0.004 *	0.001 **	−0.000	0.001 **	0.016 **	0.001 **
FAM*INS	0.003 **	0.0001 *	Omitted	Omitted	0.003 **	0.000 **
GOV	0.015	−0.004	−0.031	−0.003	0.243 **	−0.007
FAM*GOV	−0.007 **	0.000	Omitted	Omitted	−0.014 **	0.000
FOR	0.016	0.002 *	0.031 *	0.002	0.057 *	0.005 *
FAM*FOR	0.007 **	0.000 *	Omitted	Omitted	0.004 *	0.000
Board Characteristics						
BO_SIZE	0.229 **	0.002	0.211 **	0.000	0.123	0.010
BO_SIZESQ	−0.008 *	−0.000	0.007	−0.000	−0.004	0.000
BO_MEET	−0.014	0.003	−0.009	0.001	−0.000	0.007
BO_MEETSQ	0.000	−0.000	0.000	−0.000	−0.000	−0.000
BO_IND	0.006	−0.002	−0.028 **	0.000	−0.016	0.002
constant	1.51 *	2.212 **	1.22 **	1.814 **	−5.47	2.57 **
N	7055	7055	4305	4305	2750	2750
R-square	0.298	0.169	0.3241	0.1726	0.3027	0.2373

Note: ** meaning *p*-value is less than 0.01; * meaning *p*-value is less than 0.05.

Table 9. Regression results for family firms run by founder and founding family members (fixed-effect model).

Variable	Founder Run		Family Members' Run	
	ROA	Tobin's Q	ROA	Tobin's Q
Firm-Specific Characteristics				
SIZE	0.408	0.198 **	0.036	0.038 *
AGE	−38.48 **	−0.4.26 *	−11.972 **	0.829
CFOP	1.325 **	0.038 **	0.743 **	0.021 **
LEV	−0.331 **	−0.005	−0.095 **	−0.008 **
Ownership Characteristics				
FAM	−0.254 **	0.014	−0.040	0.007 *
INS	0.088 *	0.007	−0.003	0.001 **
FAM*INS	0.013 **	0.0001	0.000	0.000
GOV	1.264 *	−0.029	0.126 *	−0.005
FAM*GOV	−0.039 *	0.000	−0.008	0.000
FOR	0.077	0.017	0.005 *	0.002
FAM*FOR	0.027 *	0.000	0.003 *	0.0004 *
Board Characteristics				
BO_SIZE	0.559	0.118	0.241	−0.025
BO_SIZESQ	−0.015	−0.004	−0.002	0.00
BO_MEET	−0.040	0.003	0.025	−0.000
BO_MEETSQ	−0.000	−0.000	−0.002	−0.000 *
BO_IND	0.719	0.004	−0.025 *	−0.0003
constant	109.54 *	6.57 **	24.06 **	1.780 *
N	355	355	2045	2045
R-square	0.198	0.209	0.2954	0.1381

Note: ** meaning *p*-value is less than 0.01; * meaning *p*-value is less than 0.05.

However, as opposed to the firms run by founders' family members, foreign ownership is not found to be a significant factor for firms run by founders. This means that firms run by founders' descendants can utilize foreign shareholdings to boost firm performance following Japan's recent financial policy that encourages foreign ownership. Besides, we found that factors such as board independence and board meetings appear to be the significant factors for inhibiting the performance of firms run by founders' descendants. In contrast, such evidence is not pronounced for family firms run by founders. Moreover, we did not find any significant performance differences between these two types of family firms for the remaining cases.

Finally, we note that family firms run by founding family members tend to perform better over the family firms run by founders. Furthermore, foreign ownership encourages the performance of firms run by the founders' descendants. However, we note that further studies incorporating management strategies are required to reveal the performance difference between these two groups of family firms. Moreover, more studies with longer time and multiple angles are warranted to generalize our findings.

5. Conclusions

In this paper, we sought to compare the performance difference between family and non-family firms in the Japanese manufacturing industry from the perspective of corporate governance utilizing data of 1412 companies over the period 2014–2018. The sample size consisted of 861 non-family firms and 551 family firms. We investigated how the two mainsprings of corporate governance, namely ownership structure and board structure, influence the firm performance measured by ROA and Tobin's Q.

Our univariate analysis indicated that both family and non-family firms differ significantly in terms of ownership structure, board structure, and firm performance. We found that family firms outperformed non-family firms in terms of the mean values of ROA and Tobin's Q when the univariate analysis was invoked. Furthermore, the mean and median comparison tests (t-test and z-test) yield that family firms have higher performance than non-family firms with Tobin's Q, in particular. We note that this may happen because family firms' top priority is to seek sustainable growth as they want to pass their wealth to future generations, not on pleasing their shareholders in the short term (ROA).

For ownership structure, family firms are found to be less diversified than non-family firms, indicated by the lower percentage of the institution, government, and foreign shareholding, and less transparent in terms of having higher family ownership concentration. In terms of board structure, family firms have a small board size, fewer board meetings, and fewer independent directors on the board than non-family firms. The lower value of board-related characteristics does not necessarily indicate that the board of family firms is worse than that of non-family firms. It is likely due to the difference in size, the company's organizational structure, and the complexity of the firm's business.

Our multivariate analysis shows that family ownership has a significant positive impact on Tobin's Q. However, family ownership negates firm performance when ROA is taken into account. We note that this may happen because the management of family firms is more interested in improving the long-term growth of the firm, not to increase the short-term gain to please their shareholders.

Regarding the effects of governance elements on firm performance, we found that institutional shareholding appears to be a significant and positive factor for promoting the performance of both family and non-family firms as far as Tobin's Q is concerned. Moreover, board size encourages the performance of non-family firms, while such influence was not observed for family firms. In terms of ROA, foreign ownership inspires the performance of both family and non-family firms. However, the effect of foreign ownership was more noticeable for family firms, indicating that family firms can benefit more from foreign investors as they can bring in more radical changes to the firms. Furthermore, government ownership stimulates the performance of family firms up to a certain threshold level, while board independence significantly negates the same. Besides, we found that the performance of family firms run by the founder's descendants is superior to that of family firms run by the founder. As a whole, the study confirms previous findings that family firms outperform non-family firms in

the Japanese context using Tobin's Q and ROA measures. Simultaneously, the study outlines some governance factors that are instrumental in improving firm performance and policymaking as well.

However, this study is not free from certain limitations. We only studied governance variables available with Bloomberg. The inclusion of more governance factors with a longer time may hurt our results. Moreover, we did not investigate the management strategies adopted by different types of family firms, which might have an impact on the performance difference between firms. Moreover, a study on the link between corporate social responsibility and performance of different types of family firms in Japan may add value to the literature of family firms.

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Women on Boards and Firm Performance: A Microeconometric Search for a Connection

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Abstract: This paper discusses questions of the gender diversity of corporate boards vis-à-vis firm performance. Typically, researchers have asked if a female presence is associated with improved performance and more transparent governance. The paper's first part reports on several econometric attempts in the quest to prove the existence of such an association. The primary outcome is that the results vary over geographical, cultural, and time settings. The study presented in the second part examines European firms' annual reports from 2015. Binomial models, multiple regression, and quantile regression are applied resulting in the finding that female presence on a board is not significantly related to firm performance for this sample. Together with the picture that emerged from the paper's first part, this result leads to the possibility that the search for an association between women on boards and company performance is not fundamental. Nevertheless, modern business societies worldwide may need to boost the female presence on managerial bodies. Current econometric evidence indicates that this is not harmful to corporate results.

Keywords: corporate governance; board of directors; women in corporations; financial microeconometrics; multiple regression; quantile regression; diff-in-diff

1. Introduction: Corporate Boards Vis-à-Vis Gender Diversity

Topics in corporate finance and corporate governance research include the examination of such aspects of corporate board structure as the presence of independent directors, the formation of committees, and recently the presence of women. This paper discusses research attempts concerning the possible relationship between gender structure and the financial results of companies.

Research in empirical corporate finance is developing in many directions. Some studies have a sound theoretical setting, while some still need to be properly rooted in theory. Specific theories have proved to be unstable over time and space—as shown by empirics—and there is, perhaps, no need to strive for a unified theory of corporate finance. Instead, there is a growing demand for more "operational" results based on statistical data on companies (Gruszczyński 2020). This paper contemplates an area that is in the developmental phase, apparently without solid theory, and, perhaps, that is an advantage.

Empirical studies on women and the corporation have emerged in recent decades in vast numbers, along with changes in societies' views on gender issues. The new subject of the corporate presence of women has naturally become a topic for research in corporate governance, corporate finance, corporate law, and other areas. Researchers have concentrated on various aspects of women's presence in corporations, including the relationship between women on boards of directors (BoDs) and financial results.

The presence of women on corporate boards is no longer questioned, with major efforts being constantly directed towards increasing the proportion of women on boards. This has become a political issue since the "natural" process of board evolution into bodies reflecting the gender structure of

their respective societies seems to be rather lengthy. The result is that, in some countries, gender board quotas have been imposed, such as 40% in Norway, Spain, Iceland, and France, 33% in Belgium, and 30% in the Netherlands and Italy (Ahern and Dittmar 2012).

The European Commission in 2012 adopted a proposal for a directive "setting a minimum objective of having 40% of the under-represented sex in non-executive board-member positions in listed companies in Europe by 2020, or 2018 for listed public undertakings" (European Commission 2012). While the European Parliament voted in 2013 to back this law, until now, EU countries have not adopted the directive. In 2019, the Commission reported on "data confirming the positive impact of gender diversity in management on business performance, but also data indicating that the EU still scores low when it comes to equality in decision-making, and that the gap between Member States is widening" (European Commission 2019).

In Section 2, we propose an overview of this paper's subject, beginning with a brief account of theories regarding the female presence in organizational leadership, theories rooted in political science, sociology, psychology, economics, and finance. Furthermore, we comment on two meta-analyses summing up research devoted specifically to the association between women's presence on boards and company performance.

Section 3 presents a short survey of microeconometric methodologies applied in exploring gender vs. performance. The examples include studies that rely on techniques of multiple linear regression, panel data linear modelling, quantile regression, the diff-in-diff technique, and other methods. In Section 4, we show how econometric approaches may compete in discussing the direction of association between firm performance and women on BoDs for a sample of companies in Norway.

The study presented in Section 5 examines European firms' financial reports from the year 2015 and the association between women's presence on boards and their respective companies' performance. Applying binomial models, multiple regression, and quantile regression, we find that, for this sample, female presence on BoDs is not significantly related to firm performance.

Section 6 concludes.

2. Women on Boards and Financial Results—Theoretical Underpinnings and Meta-Analyses

There are multiple theories directed towards showing the necessity of female participation in all corporate structures, reflective of their presence in greater society. Aluchna and Krejner-Nowecka (2016) propose a list of such theories, including:

- the non-discrimination approach: "women represent 50% of the society and should be given rights to have the respective participation in corporate boards";
- the social/gender/feminist theory: "women's presence can help to change stereotypes embedded in others' expectations";
- the resource dependency theory: "women having adequate experience and education improve the board work quality";
- the diversity management perspective: "women enrich corporate boards contributing to communication, leadership style, different risk attitude and term orientation";
- the stakeholder theory: "women reveal stronger stakeholder representation and largest social and environmental concerns".

None of these theories tackle the question of the "impact" of female presence on corporate financial results. It seems that this issue is not theoretically solid and remains a "political" or "sociological" question rather than an economic or financial one. Eckbo et al. (2019) point out that "in principle, restricting shareholders' free choice of directors can reduce board effectiveness". There are studies pointing out that new female directors may lead to a reduction in firm value, that new and less experienced female directors may be "overly focused on monitoring and exhibit excessive risk aversion". On the other hand, "it is in principle possible for shareholders to benefit from the

diversity and broader skill set resulting from adding female directors". As can be seen from this paper, the evidence in each direction of reasoning is mixed.

Editors of the book "Women in corporate boards. An international perspective" (Aluchna and Aras 2018) state that "Female presence and involvement on boards improves firm performance, transforms corporate governance and leads to the transition towards more responsible business". This general observation should be limited, at least in regard to the aspect that can be statistically/econometrically examined—i.e., relating women's presence on boards and firm performance. As in many instances of research in corporate finance and corporate governance, this relationship may differ across countries, regions, time spans, samples, etc. Explaining those differences without a unified theory is a task outside the scope of economics and finance.

To this end, we reference the comprehensive meta-analysis provided by Halliday et al. (2020) that addresses gender diversity questions in the framework of psychology. They "integrate psychological theory related to implicit biases and agency theory, with institutional theory, to propose that the national context for gender equality moderates the extent to which characteristics of organizational leadership relate to female board representation". This comprehensive analysis begins with 1604 studies published in or before 2018. The final set examined in the authors' paper consists of 158 studies, mostly journal articles, from the period 2004–2018. The "sample" contains 60,648 organizations from 36 countries. Their final conclusion stresses the "importance of the national context for gender equality as a boundary condition for understanding the relationship between organizational leadership characteristics and female board representation". The national context is important, but this observation is, in fact, the only solid result from so comprehensive a meta-analysis.

There are attempts, however, to place the question of gender into the theoretical framework of economics/finance. For example, Taghizadeh-Hesary et al. (2019) show the disparity in the lending behavior of banks to small and medium-sized enterprises (SMEs) based on their owners' gender. They use the production function approach, distinguishing the capital of male- and female-owned companies. The major assumption is that "the loan default risk of female-owned companies is greater than the default risk of male-owned companies", placed in the context of Asia, where customarily female entrepreneurs face greater credit constraints than their male counterparts. Along with this assumption, it is shown that, indeed, there is gender-based inequity in bank lending. To mitigate this issue, the authors propose a governmental credit guarantee for female-owned enterprises and, subsequently, demonstrate that this would increase GDP growth. The elegant mathematical structure is then followed by a statistical–econometric analysis on a sample of 1492 Iranian SMEs in which it is shown that, actually, "female-owned SMEs perform lower relative to male counterparts as they have a higher default ratio and lower profitability, liquidity, and coverage". To sum up, what we really have here is a theoretical dispute, but it has no relevance to the empirical exercise that is the substance of this paper.

What remains as a major research possibility in examining gender edge vis-à-vis corporate categories is the application of a statistical–econometric methodology. Such research attempts typically use microdata on large numbers of companies and may be placed under the label of "financial microeconometrics" (Gruszczyński 2020).

There are at least two meta-analyses in this direction. Post and Byron (2015) use results from 140 studies (92 published, 48 unpublished) and examine "whether results vary by firms' legal/regulatory and socio-cultural contexts". The conclusion is mixed. On one side "female board representation is positively related to accounting returns" ($r = 0.047$; significantly higher than zero), and on the other "the relationship between female board representation and market performance is near-zero" ($r = 0.014$; not significantly different from zero). The authors indicate that much depends on the countries in

question: the relationships are stronger in countries with greater gender parity. In a sense, this appears to be a similar conclusion to the analysis by Halliday et al. (2020)[1].

Pletzer et al. (2015) present a meta-analysis of 20 studies from peer-reviewed journals that examine the possible relationship of female presence on corporate boards and firm financial performance. The primary conclusion is that the "mere representation of females on corporate boards is not related to firm performance". The authors explain that their analysis, unlike that of Post and Byron (2015), follows "a more rigorous and controlled methodological approach by investigating the relationship between percentage of females on corporate boards and firm financial performance, operationalized as return on assets, return on equity, and Tobin's *Q*". The primary hypothesis here is "that female representation on corporate boards is either positively or negatively related to firm financial performance, but that the magnitude of such a relationship is likely to be small".

Thus, the empirical research, as evidenced in three meta-analyses, does not convey the message of a significant relationship between women's presence on boards and firm performance. The primary outcome is that the mere representation of females in the governing bodies substantially relates to the "national context". A similar conclusion may also be attributed to research by Carrasco et al. (2015). The authors use Hofstede cultural dimensions methodology and apply it to a comprehensive data set from 32 countries from 2010. It turns out that two of the four Hofstede dimensions are related to the level of female representation on BoDs. These are power distance and masculinity. Companies in the countries where unequal distribution of power in institutions is accepted have relatively fewer women on BoDs. It is also the case in countries where values associated with the masculine role dominate. Thus, the national context seems to be an important determinant of female presence on boards.

Before embarking on specific issues of methodology, we point to the paper by Ferreira (2015) who clearly subscribes to the view of this paper. He states that research does not show a clear "business case for gender quotas", nor does it support the contrary: that female participation on BoDs reduces firm profitability.

However, there is always the question of the methodological quality of the research. This is discussed in the next section.

3. Financial Microeconometrics: Selected Empirical Studies on Gender vs. Performance

3.1. Methodological Considerations

In this section, we concentrate on specific studies, as well as on financial microeconometrics methodologies. Indications remain that the inconclusive outcomes might be embedded in the research question itself, as shown in Section 2, and may also be the result of an improper methodological setup.

Our argument, in some way, coincides with the line taken by Adams (2016) in her important paper published in the special issue of *The Leadership Quarterly* on strategic questions of female participation on boards vis-a-vis challenges faced by the research[2]. She argues that "more research needs to be done to understand the benefits of board diversity". The principal problems are data limitations, selection, and causal inference. This is in line with the reasoning presented by the same author in the paper Adams (2017) on possible flaws in corporate governance research. Gruszczyński (2018) indicates similar questions in the paper on good practices in corporate governance and accounting research.

For example, a significant correlation between the measure of female presence on boards and the measure of firm performance should not be interpreted as a causal relationship if the endogeneity problem is not taken into account. This is a situation in which the gender variable, being exogenous in the linear regression model explaining the performance variable, is also correlated with an error term. It

[1] These authors present another meta-analysis on how the female presence on boards relates to corporate social performance (Byron and Post 2016). Based on 87 studies from more than 20 countries, the authors find that this relationship is positive and is stronger in countries with higher stakeholder protection and gender parity.

[2] I thank an anonymous reviewer for referring this paper to me.

means the gender variable is correlated with another explanatory variable that has not been included in the model. Such a variable may be, for example, firm size: it is more likely that women are appointed to the boards of larger companies. Company size may also be a determinant of its performance. There are various types of remedies for endogeneity. One group includes techniques that aim at the source of the variability of the exogenous variable: the instrumental variables approach, or such methods as diff-in-diff or regression discontinuity design. An example of diff-in-diff is given later in this section. The second group comprises techniques that use panel data or matching estimation (Roberts and Whited 2013).

The techniques mentioned above belong to what are referred to as new microeconometrics or 'metrics' and are presented in the seminal books of Angrist and Pischke (2009, 2015), among other sources. The primary issue is how to "prove" causality between the variables. Thi appears to offer a way of solving the primary question here: what is the impact of female directors on firm performance? However, most techniques advocate the use of experiments or natural experiments. Adams (2016) points out that an experiment is impossible: "To experimentally identify the causal effect of gender diversity on firm performance, one would have to randomly assign female directors to firms and then measure subsequent firm performance". The same view is held by Ferreira (2015): "Causal effects will always be too hard to estimate, unless governments unintentionally help us with badly designed policies that randomly assign quotas to some firms and not to others".

The question is whether regression analyses may suffice without searching for causality. Obviously, regression tools are valuable, as evidenced in corporate finance and corporate governance research. Regression outcomes may even be close to ascertaining causality, especially when we use panel techniques (Gruszczyński 2018). On the other hand, to properly design and execute research with endogeneity in mind is sometimes hard, as pointed out in the survey paper of Atanasov and Black (2016).

Another concern should be raised here: the question of the statistical significance of the explanatory variables in the regression-type model. It is often the case in empirical corporate finance that some insignificant variables are not removed from the model due to their merit in research. Such practice is admissible and correct. Putting too much weight on statistical significance may not be correct (for more, see Gruszczyński 2020, section 2.8). Today, this is the subject of worldwide discussion among researchers who, in their hundreds, recently endorsed the call to "retire statistical significance" (Amrhein et al. 2019).

3.2. Selected Empirical Studies

From the plethora of studies on the topic, we choose a few, one of which specifically represents the "new microeconometrics" methodology. All belong methodologically to financial microeconometrics (Gruszczyński 2020).

Ionascu et al. (2018) examine Romanian companies listed on the Bucharest Stock Exchange 2012–2016 (343 firm-year observations). Their results indicate that, on average, the diversity of BoDs has no significant impact on firm performance. In the authors' words: "although firm performance seems to be positively correlated with gender diversity of the boards, the association is not robust and ceases to be significant after endogeneity is controlled for". The method employed is panel data linear regression with a dependent variable representing performance. There are three such variables attempted: return on assets (ROA), Market-To-Book ratio, and Tobin's Q. Such a setup is typical for most studies. The gender diversity variable is one of the explanatory variables in the regression. The authors consider three such variables: the proportion of female members on a board, a dummy variable indicating a woman as president of the board, and an interaction variable being the product of the first two variables. A major problem is always the selection of other predictors (explanatory variables, controls). The authors also try to perform the same analysis for profitable companies with a

marginally better result: for profitable companies, the relationship between female presence and firm performance is then marginally positive[3].

Gordini and Rancati (2017) use panel data analysis to establish the relationship between female presence (gender diversity) on boards and firm performance for 918 listed companies in Italy between 2011 and 2014. The authors use Tobin's *Q* as the measure of firm performance. The "female" variables are four (sequentially): a dummy representing at least one woman on the BoD, the percentage of female directors, the Blau index, and the Shannon index. The last two indices measure the gender diversity of the BoD with limits of zero (no diversity) and 0.5 or 0.69—perfect diversity or 50:50, respectively. According to Italian law from 2011, it is mandatory that there be at least one woman on a BoD. Nevertheless, only 73% of boards in the sample fulfilled this law. This variable specifically turns out to be insignificant in the models explaining Tobin's *Q* with other typical control variables. Other "female" variables are significantly positively related to Tobin's *Q*. Strangely enough, the authors placed ROA as one of the performance measures among the controls. The authors maintain that their study shows a "positive and significant effect" on Tobin's *Q* of the three variables measuring the presence of women on BoDs in Italy.

Examples of studies using the simple methodologies are as follows:

- Rossi et al. (2017) use a cross-section of Italian listed companies from 2016. The result is a significantly positive relationship between financial performance and the composition of the BoD. The methodology used is linear regression where price/book value is related to the percentage of women on the BoD.
- Kompa and Witkowska (2017) consider listed companies in Poland in 2010–2015. They study the correlation between changes in the feminization ratio of BoDs and changes in ROE as a measure of company performance. No significant correlation was observed.

Another study referenced here uses the more sophisticated approach of quantile regression. Conyon and He (2017) investigate 3000 US companies for the period 2007–2014 (over 18,000 firm-year observations). With two dependent variables, ROA and Tobin's *Q*, and a number of typical controls, the authors examine the association between the percentage of women on BoDs and firm performance. Firstly, they report OLS and fixed-effects OLS estimation results. The OLS gives a mixed message: a significant and positive association between women on boards and Tobin's Q, and a significant and negative association between women on boards and ROA. After controlling for firm-level fixed effects, the board gender diversity variable becomes insignificant in both cases. Now, the authors claim that the assumption (in OLS regressions) that "the board gender effect is constant across the performance distribution is not valid". Alongside such reasoning, a quantile regression is employed, which provides very promising results supporting the authors' main hypothesis: "Board gender diversity has a significantly larger positive impact on firm performance in high-performing firms than in low-performing firms". The paper shows that searching for a relationship between female presence on BoDs and performance requires sometimes more than simple techniques of multiple regression.

The new microeconometrics (as coined in Section 3.1) are represented in this survey by Sila et al. (2016), who investigate 1960 US firms with 13,581 firm-year observations for the period 1996–2010. The authors examine the gender diversity of corporate boards and its possible effect on company risk. The methodology employed applies linear regression, binomial probit, and diff-in-diff with matching. In stage (1), the authors use the binomial probit to explain the probability that at least one female director is appointed in a company in a given year. The major predictor is the risk variable defined (in one variant) as the variability of daily stock returns in the preceding year. The number of firm years with the appointment of at least one director is 7101. It is shown that risk may well predict a female appointment.

[3] Interestingly, an earlier study examining companies listed on the Bucharest Stock Exchange (2007–2011) by Vintilă et al. (2014) showed a mostly significant relationship between female representation on BoDs and firm value.

In stage (2), the authors estimate linear regression, with risk being explained by the proportion of women on the board and other control variables. The method used for estimation is GMM for a dynamic panel system. In effect, the authors find no evidence of a relationship between equity risk and a female appointment. In stage (3), an alternative strategy for identifying this relationship is applied with the use of diff-in-diff and matching. This amounts, here, to estimating the following model:

$$Risk_{it} = \alpha_0 + \alpha_1 Female\ Appointment_{it} * Post\ Period_{it} + \alpha_2 Female\ Appointment_{it} + \alpha_3 Post\ Period_{it} + CONTROL'_{it}\gamma + \varepsilon_{it}$$

The variable $Female\ Appointment_{it}$ = 1 for firms in treatment group, =0 otherwise. Firms comprising the treatment group appoint exactly one female director in year t to replace a departing male director (must be older than 60). The variable $Post\ Period_{it}$ = 1 in the post-treatment period, =0 in the before-treatment period.

The firms from the treatment group are matched to similar control firms that represent a group with a male director appointed to replace another male director (there are 153 matches possible). Matching is made with the propensity score and nearest-neighbor techniques. The model is estimated for both sets of data: for propensity score and for nearest-neighbor. The authors find that the $Female\ Appointment_{it} * Post\ Period_{it}$ variable is not significant in either version of the model. In other words, this is the causal evidence that appointments of female directors and male directors do not result in different risks. The final conclusion is that a board with a higher proportion of female directors is no more or less risk-taking than a more male-dominated board.

The research by Sila et al. (2016) is an example of how to use techniques of identifying the causal relationship between the gender structure of the board and the firm performance (in this case: equity risk).

Examples presented in this subsection are intended to show the diversity of possible methodological approaches that are available in the microeconometric toolbox and that may be used in regard to corporate governance questions like the one considered in this paper. The major hypothesis here remains as before: there is no solid evidence for a significant association between female presence on BoDs and firm performance across countries, regions, time spans, and samples.

4. The Case of Norway: Competing Econometric Studies

One interesting case concerns Norway, where gender quotas were imposed on listed companies a relatively long time ago—a 40% quota was imposed in 2003, becoming compulsory from 2008. A number of studies of Norway's gender balancing of corporate boards conclude that the gender quota law imposed large costs on the shareholders of firms. Eckbo et al. (2019) especially identify one paper by Ahern and Dittmar (2012) (AD), who state that their research reveals a causal effect of the imposition of the quota on (1) stock prices and on (2) companies' financial performance. Effect (1) occurred immediately after the announcement of the new law, while effect (2) was reflected in a significant decline in Tobin's Q in the following years. AD also maintain that the quota led to "younger and less experienced boards, increases in leverage and acquisitions, and deterioration in operating performance".

The AD study is strongly rooted in good econometric methodology, applied to a panel of 248 publicly listed companies in Norway for the period 2001–2009. The tools used include the event study on the stock price reaction to the initial announcement of the quota, the instrumental variable approach to investigate the "impact of the quota on Tobin's Q", the "effect of the quota on board characteristics", and the "effect of quota on firm policies", as well as the binomial logit for explaining companies' decisions to delist any time during the period 2003–2009. The AD paper appeared in the *Quarterly Journal of Economics* and has been widely cited and followed by other research in the area.

In the study by Eckbo et al. (2019), the authors use the AD data and perform a comprehensive new econometric analysis. In effect, the authors state that AD's results are not sustained when "simple

econometric adjustments" are applied. Eckbo et al. (2019) use the same methodology as AD with refinements that (the authors claim) are necessary. For example, the event study has been repeated but with the use of a portfolio approach—which yielded insignificant abnormal returns to major quota-related news events—and also with adjustment for cross-correlation, resulting in insignificant abnormal returns as well. In addition, the instrumental variable approach to panel Tobin's Q regression resulted in an insignificant effect of the quota on Q. Finally, by using the diff-in-diff regression, the authors prove that, unlike AD, there is no significant change in CEO experience following the quota.

The discussion reported here is an example of results that differ even when using the same sample. Such a message is not very encouraging. Perhaps, wider use of good practices and extending the reasoning foundation into areas outside economics and finance may be an appropriate solution when conducting such research in the future.

5. European Data: Microeconometric Exercise

The final part of this paper presents another study within the search for a relationship between female presence on BoDs and firm performance, this time for European companies in 2015. The data used in this study were collected by Olesiejuk[4] (2017) from the Amadeus (Orbis) database. There are 1194 observations selected on an availability basis (non-random sample), representing the same number of European companies and their financial statements for the year 2015.

The companies represent 18 countries, primarily Italy (49% of observations) and Spain (23%), followed by the UK (7%), Sweden (7%), and Norway (4%). The average number of BoD members is 3.57 and all the BoD members are male in 57% of the cases. Due to the large proportion of Italian companies in the full sample, we also consider a "no Italy" (limited) sample with 614 observations (companies).

In line with the research results presented in this paper, our search starts with finding predictors/correlates of the dummy variable *WomaninBoD* (=1 when there is at least one woman on the board, =0 otherwise). For the full sample, the *WomaninBoD* variable has the mean 0.4263—i.e., in 509 cases out of 1194, *WomaninBoD* = 1. In the limited sample, the *WomaninBoD* variable has the mean 0.4495—i.e., in 276 cases out of 614, *WomaninBoD* = 1.

The list of potential predictors for the variable *WomaninBoD* in the dataset includes more than 50 variables[5]; however, *WomaninBoD* is significantly correlated with only a few.

Tables 1 and 2 present the linear correlation coefficients of *WomaninBoD* with other variables that are significantly different than zero. Most correlations are low. Our plan now is:

(1) First, we try to find how the relationship between *WomaninBoD* and the other variables holds in the binomial regression model where *WomaninBoD* is the dependent variable. This is because we have here a cross-section situation and the attempted binomial model is just representing how in a given year (2015) the presence of women on the boards is associated with selected company characteristics/financials for that year. The novel approach is showing the connection in reverse: from the predictors to the dummy variable representing women on the BoD. When the performance variable appears as a predictor, this is the reverse causality setup—e.g., the better-performing companies may choose to appoint more (or fewer) female directors (Adams 2016). This interpretation is possible for our limited sample where the predictors include *ROCE* or *ROA*.

(2) Secondly, we attempt to repeat the typical linear regressions where, on the left-hand side, the "performance" variable is explained by *WomaninBoD* and other selected predictors.

[4] The Olesiejuk (2017) study is not used here.

[5] Since not all companies in the sample are listed, no market-based variables are available for the sample.

Table 1. Correlation of *WomaninBoD* with selected explanatory variables. Full sample.

Full Sample n **= 1194**	***WomaninBoD***	***ROCE***	***Logassets***	***BoDsize***	***Gearing***
WomaninBoD	1				
ROCE	−0.0693 *	1			
logassets	0.2174 *	−0.1430 *	1		
BoDsize	0.3468 *	−0.0874 *	0.5309 *	1	
gearing	−0.0738 *	−0.0713 *	−0.0231	−0.0620 *	1
solvency	0.1058 *	−0.1019 *	0.1636 *	0.1081 *	−0.6000 *

Table 2. Correlation of *WomaninBoD* with selected explanatory variables. Limited sample.

Limited Sample n **= 614**	***WomaninBoD***	***ROCE***	***ROA***	***Logassets***	***BoDsize***	***Solvency***
WomaninBoD	1					
ROCE	−0.0996 *	1				
ROA	−0.0792 *	0.7518 *	1			
logassets	0.2755 *	−0.1410 *	−0.1620 *	1		
BoDsize	0.4948 *	−0.0798 *	−0.0710	0.5736 *	1	
solvency	0.1011 *	−0.0595	0.1476 *	0.1094 *	0.0730	1
net_assets_ turnover	−0.0851 *	0.2065 *	0.0044	−0.1707 *	−0.0654	−0.3666 *

* indicates $p < 0.05$; Explanation of terms: gearing ratio = (non-current liabilities + current loans)/(shareholder funds) × 100; solvency ratio = (shareholder funds)/(total assets); *ROCE* = return on capital employed = (P/L before tax + extr. items + interest paid)/(shareholder funds + non-current liabilities); ROA = return on total assets = P/L before tax + extr. items/total assets; net assets turnover = (operating revenue)/(shareholder funds + non-current liabilities); non-current liabilities = long term debt + other non-current liabilities.

Tables 3 and 4 present the results of the first stage: estimating the logistic regression of *WomaninBoD* against some variables, but not more than two at a time. This is because of the high multicollinearity among the prospective correlates of *WomaninBoD*.

Table 3. Estimation results of binomial logit (logistic regression) for *WomaninBoD* as the outcome variable. Full sample (n = 1194) with *WomaninBoD* = 1 for 509 observations.

WomaninBoD	**Coeff.**	**Std. Err.**	**z**	**P > |z|**
solvency ratio	0.0048353	0.0029843	1.62	0.105
logBoD	1.418742	0.101768	13.94	0.000
constant	−1.773889	0.1514283	−11.71	0.000
LR chi2(2) = 264.85	Prob > chi2 = 0.0000		Pseudo R2 = 0.1626	
Count R2 (Cramer) = 0.701	Area under ROC = 0.757			

Table 4. Estimation results of binomial logit (logistic regression) for *WomaninBoD* as the outcome variable. Limited sample (n = 614) with *WomaninBoD* = 1 for 276 observations.

WomaninBoD	**Coeff.**	**Std. Err.**	**z**	**P > |z|**
ROCE	−0.005823	0.003341	−1.74	0.081
logBoD	1.598067	0.1472888	10.85	0.000
constant	−1.793394	0.1870708	−9.59	0.000
LR chi2(2) = 170.86	Prob > chi2 = 0.0000		Pseudo R2 = 0.2022	
Count R2 (Cramer) = 0.700	Area under ROC = 0.789			

The classification tables for logistic regressions are formed on the basis of Cramer's rule (Cramer 1999). This possibility is often neglected. When samples are unbalanced, Cramer (1999) advocates the use of a cut-off point α equal to the proportion of ones in the sample. In effect, the success rates for $y_i = 1$ and $y_i = 0$ are better spread than for the typical cut-off point of 0.5 (Gruszczyński 2019).

The interpretation effect of logistic regressions lies in showing that—despite poor correlation with prospective covariates—the variable *WomaninBoD* may formally be "explained" with such models. Classification results are rather weak but sensible—the fit measure of around 0.7 is common in microeconometric applications in corporate finance.

Now we place *WomaninBoD* among the regressors in the typical model considered in previous sections of this paper where the outcome variable is firm performance. After the correlation check, one should expect that *WomaninBoD* is insignificant in any model attempted in the classical way—i.e., as multiple regression, and, in fact, that is the case here. As an example, Tables 5 and 6 present the estimation results of two regressions: one for the full sample and one for the limited sample.

Table 5. Estimation results of multiple regressions with *WomaninBoD* as the predictor variable and *ROCE* as the dependent variable. Full sample (n = 1194).

ROCE	Model I	Model II	Model III
WomaninBoD	−2.330915 (1.704436)	−2.656997 (1.704133)	−3.00803 * (1.6794)
logassets	−2.429104 ** (0.5311289)	−2.439499 ** (0.5297278)	−1.875371 ** (0.5293145)
gearing	———	−0.0122183 ** (0.0045002)	———
solvency × *gearing*	———	———	−0.0027405 ** (0.000425)
constant	52.8078 ** (7.753808)	54.85445 (7.769805)	51.90963 (7.626242)
Adjusted R2	0.0203	0.0256	0.0526

Standard errors in brackets; * indicates $p < 0.1$; ** indicates $p < 0.05$.

Table 6. Estimation results of multiple regressions with *WomaninBoD* as the predictor variable and *ROA* as the dependent variable. Limited sample (n = 614).

ROA	Model I	Model II
WomaninBoD	−0.7753716 (0.8596029)	−1.047199 (0.8498533)
logassets	−0.8995534 ** (0.2461068)	−0.9889818 ** (0.2435302)
solvency	———	0.0805369 ** (0.0186925)
constant	19.54126 ** (3.615013)	17.76706 ** (3.587858)
Adjusted R2	0.0244	0.0516

Standard errors in brackets; ** indicates $p < 0.05$.

As shown in Tables 5 and 6 multiple regressions for performance against *WomaninBoD* reveal no significance of this variable, even in a typical setup for controlling the endogeneity—i.e., with the control variable being the size of the company, here represented by the *logassets* variable (see Adams 2016, Table 1).

The next step would be searching for relationships between *WomaninBoD* and firm performance along the distribution of the performance variable. In other words, we may try to employ quantile regressions as in the paper of Conyon and He (2017), mentioned in Section 3. Tables 7 and 8 present the results of the quantile regressions estimation for the full sample and for the limited sample. We used the setup from the multiple regression:

(1) the full sample performance variable is *ROCE* and the regressors are *WomaninBoD*, *logassets*, and the interaction variable *solvency* × *gearing*.

(2) the limited sample performance variable is *ROA* and the regressors are *WomaninBoD*, *logassets*, and *solvency*.

Table 7. Estimation results of quantile regressions with *WomaninBoD* as the predictor variable and *ROCE* as the dependent variables. Full sample (n = 1194).

Quantile	25	50	75
WomaninBoD	−0.7275284 (0.7895722)	−0.2503224 (1.07899)	−2.570621 (2.047829)
logassets	−0.2003255 (0.2488579)	−1.055661 ** (0.3400768)	−2.281304 ** (0.6454362)
solvency × *gearing*	−0.0003952 ** (0.0001998)	−0.0014783 ** (0.000273)	−0.0032773 ** (0.0005182)
constant	8.399047 ** (3.585488)	31.20172 ** (4.899749)	68.13485 ** (9.299297)
Pseudo R2	0.0041	0.0331	0.0727

Standard errors in brackets; ** indicates $p < 0.05$.

Table 8. Estimation results of quantile regressions with *WomaninBoD* as the predictor variable and *ROA* as the dependent variables. Limited sample (n = 614).

Quantile	25	50	75
WomaninBoD	−0.5104711 (0.5368787)	−0.5208956 (0.7291287)	−1.315783 (1.300562)
logassets	−0.03384130 (0.1538456)	−0.2523032 (0.2089359)	−1.294657 ** (0.3726834)
solvency	0.0177385 (0.0118086)	0.0572204 ** (0.0160371)	0.0822441 ** (0.0286058)
constant	0.9480991 (2.266561)	5.532674 * (3.078191)	27.01107 ** (5.490634)
Pseudo R2	0.0052	0.0162	0.0422

Standard errors in brackets; * indicates $p < 0.1$; ** indicates $p < 0.05$.

Quantile regressions were performed for centiles 25, 50, and 75. Tables 7 and 8 show that, along the full distribution of the performance variables, we do not see any connection between female presence on the boards and firm performance. This evidence is, to some extent, stronger than that resulting from multiple regressions.

Again, for this particular dataset, the association of women on boards and performance of companies seems not to be present.

The study presented in this section may be the starting point for a more thorough investigation. Firstly, the dataset could be improved by taking into consideration the time dimension and applying panel econometric techniques. Secondly, the differences between countries could be better examined—e.g., by considering further controls. Those may be governance-specific variables like country shareholder protection strength (Byron and Post 2016) and Hofstede dimension variables (Carrasco et al. 2015).

6. Conclusions

The results of research on the association of female presence on boards and firm performance worldwide are not consistent. This might be due to a lack of solid theories on this particular issue. The general reasoning points in all three possible directions: female presence and performance are (1) related negatively, (2) related positively, and (3) not related. Outcome (3) is advocated in this paper. We present examples of research showing all three types of associations. On the basis of selected works, we also show the variety of microeconometric methodologies that might be applied in the search for the relationship between female presence on boards and firm performance.

In the empirical part of the paper, we present a study of this association for a sample of European companies in 2015. With the use of binomial modelling, multiple regression, and quantile regression, we find that female presence on BoDs is not significantly related to firm performance for the sample of European companies.

This, together with the picture emerging from the paper's first part, leads to us stating that, perhaps, searching for an association between women on boards and performance is not fundamental. However, modern business societies worldwide may need to boost the female presence within managerial bodies. Current econometric research provides evidence that this is not harmful to corporate results.

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Capital Structure Choices in Technology Firms: Empirical Results from Polish Listed Companies

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Abstract: The main aim of the paper is the identification of capital structure determinants, with a special emphasis on investments in the innovativeness of Polish New Technology-Based Firms (NTBFs). Poland is a unique country in that it is an emerging market that was also promoted in 2018 to the status of a developed country. The study sample consisted of 31 companies listed in the Warsaw Stock Exchange that are classified as high-tech firms and covers the period 2014–2018. The following factors influencing the capital structure were analyzed: internal and external innovativeness and the firm's size, liquidity, intangibility, age, profitability, and growth opportunities. The results of the research provide empirical evidence that liquidity, age, and investments in innovativeness determine capital structure, which provides an additional argument supporting the trade-off theory and the modified version of the pecking order theory. More specifically, the results suggest that companies whose process of investment in innovativeness is based on the external acquisition of technology are able to attract external financing, while the process based on internally generated innovativeness (R&D activity) deters external capital. The results are interesting for policymakers in emerging markets.

Keywords: capital structure; New Technology-Based Firms (NTBFs); internal and external innovativeness; intangibility

1. Introduction

Over one hundred years ago, entrepreneurial activity undertaken in technologically advanced sectors was considered to be a primary source of innovation and economic growth (Schumpeter 1911). Nowadays, economic growth and competitive power are ascribed to the innovativeness of the economy to an even greater degree (Gherghina et al. 2020). From a policymaking perspective, special attention is devoted to high-tech companies and tools supporting innovative activity. Anecdotal evidence implies that the high-tech sector is a crucial driver of economic development. Furthermore, the endogenous growth theory assumes that the long-run growth rate has an endogenous character, and that the human factor plays a vital role (Kopf 2007). The decision of whether to invest more in R&D or to increase public spending on education is crucial in this context. The problem is especially important for EU countries, where, over the last decade, the lower level of investments in R&D and innovativeness has created a gap as compared to the main economic partners like the U.S. or China (Gil et al. 2019). Furthermore, investments in innovativeness create a knowledge-based society, produce intellectual capital, and finally, as (Popescu 2019) suggests, become an integral part of national wealth.

According to the results of the McKinsey Global Survey of Business Executives, on the corporate level, executives believe that innovation is the most required element of growth

(Carden et al. 2005, p. 25). (Hay and Kamshad 1994), at the beginning of the 1990s, designed and performed a questionnaire based on Small and medium—sized enterprises located in the U.K. The results of the study imply that investment in product innovation was, at that time, perceived as the single most crucial strategy, followed by the policy of broadening the product range and geographic expansion.

In recent years small, medium, and young companies active in high tech sectors have attracted special attention in economic literature, as they are deemed to be a major source of innovation and development for the economy. Some authors claim that these firms have a specific business model. (Giraudo et al. 2019), Aghion and Howitt (2005), Hall (2002) stress that these firms are characterized by a specific attitude toward grasping technological innovation. Still, they also suffer from inefficient mechanisms of capital allocations, which are very severe, especially for young firms which lack track record, stable cash flows, and collaterals. (Giraudo et al. 2019) indicate that financial constraints can be especially severe for so-called bank-based economies, like Europe. Howell (2016), who investigates barriers in financing innovative firms in China, stresses that the problem of financial constraints for innovative firms can be especially severe in transitioning economies with a less developed system of financial intermediaries.

From the policymaking point of view, special attention is devoted to so-called New Technology-Based Firms (NTBFs). The term was supposedly coined by Arthur D. Little (Little 1977), who defined NTBFs as an independent venture less than 25 years old that supplies a product or service based on the exploitation of an invention or technological innovation. The issue invoked by many researchers is financial constraints, which are encountered by NTBFs at the early stage of development. So far, most studies have been focused on developed countries like the US, UK, Germany, France, or Ireland, where the institutional market environment is well established and at the same time most developed in terms of technology and science. These countries also represent a long history and have extensive experience in supporting the development of innovative activity. The high-technology firms in these countries have access to the best research centers, the best universities, and are subject to a very competitive market, and therefore their activity is based mostly on internally generated innovation.

However, scant research is devoted to the other emerging or less developed countries whose economies are trying to catch up with the leading innovators. This is especially apparent, as (Vintilă et al. 2017, p. 38) note, for countries from Eastern Europe, which endeavor to line up with Western Europe. The specific NTBFs located in these countries have other distinctive attributes. Firstly, since they are usually in emerging economies, there is no equivalent to the best research centers and access to the best universities. Secondly, there are almost no headquarters and/or research centers of multinational companies, which are usually located in the most developed countries. Thirdly, it is much more difficult for high-tech companies to compete for leading researchers with multinational companies. Fourthly, it is much more challenging to compete with high-tech companies from leading countries due to scarce resources in terms of finance, marketing, patent protection, etc.

As a result, high-tech companies in developing countries often adopt a different strategy in which innovative activity is based in substantial part on the acquisition of external technology and to a minor degree on internally generated innovation. The purchase and implementation of new technology is the preferred and less risky strategy in comparison to the development of in-house produced innovative processes. Therefore, the specificity of the high-tech companies in emerging and developing markets is slightly different in comparison to NTBFs from leading countries. The problem is especially visible within the EU, where the concept of "Two-Speed Europe" is apparent in the economic press. Therefore, as (Vintilă et al. 2018, p. 571) point out, the disparities between the West and East require a deeper understanding of proper public policy.

The main aim of the paper is the identification of determinants of the capital structure of NTBFs in a country that has an emerging economy. The focus of this study is on technological firms (NTBFs) headquartered in Poland, which is a very unique and specific case. Poland was the first CEE economy promoted by FTSE Russel's index provider with the Emerging Market to

Developed Market status. Since 2018, Poland has been classified as one of the 25 most advanced global economies, including the U.S., U.K., Germany, France, Japan, etc. Therefore, Poland is considered a success story in terms of economic development, but at the same time is a country with one of the lowest levels of corporate R&D expenditures within EU countries. This contradiction urges us to investigate deeper the determinants of the capital structure of Polish NTBFs with special attention given to investments in innovativeness. We select companies at a certain stage of development that are listed on the stock exchange, mostly because of the higher quality of accounting information reported in the financial statements as compared to the non-listed companies. We hypothesize that investment in innovation has an inconclusive influence on financial leverage. Therefore, we separated it into two categories: innovation generated internally (R&D projects) and innovation acquired externally. These two types of investments have significant and distinct attributes, which we posit have a differential impact on financial leverage. We provide empirical evidence that the former kind of investment has negative, while the latter one a positive impact on financial leverage. The other hypotheses conjecture the impact of the other firm's attributes like a firm's size, liquidity, intangibility, age, profitability, and growth opportunities.

As far as we know, there is no study related to emerging economies in which investments in innovativeness are separated into externally acquired and internally generated and treated as a potential determinant of capital structure. Our hypotheses are tested on a sample of 102 firm-year observations (34 companies). The study period (2014–2018) ends at the moment when Poland was promoted to a group of countries with Developed Market status, so it can be regarded as a study of a country with the Emerging Market status.

The first section presents a literature review of the most important studies related to the problem of the financial structure of high-tech companies, the theories, and hypothesis development. The second section presents the sample characteristics, research design, and empirical results. The last section concludes with the most important issues resulting from empirical research.

2. Theories of Capital Structure

Over the past several decades a number of capital structure theories have been developed which attempt to explain the creation of structures of economic entities' financing. The classical capital structure theories include *Net Income Theory, Net Operating Income Theory*, and *Traditional Theory*. Net Income Theory is based on the assumption that a firm's value is proportionate to its share of debt in capital structure, so a firm's maximum value is reached in the situation of its maximum indebtedness. Net Operating Income Theory assumes the dependence of a firm's value on the value of operating income; in the situation of determined conditions capital structure does not affect a firm's value. According to Traditional Theory, a proper balance should be maintained between internal and external sources of financing. Therefore, a reasonable level of debt increases a firm's value (Durand 1952). However, the best known classical theories are those created by F. Modigliani and M. Miller (MM). In their famous paper MM argue that a firm's value is not dependent on the capital structure but rather owners' expectations with regard to cash flows (Modigliani and Miller 1958). The conclusions based on the assumption of perfect capital markets were partly rejected in MM's next work, which took into account the issue of taxation (Modigliani and Miller 1963). MM finally admitted that indebtedness has a positive impact on a firm's value thanks to possible tax burden reductions. In the context of determining the capital structures of high-tech companies, MM and the remaining classical theories are of limited practical application (Coleman and Robb 2012; Ullah et al. 2010). High-tech firms, due to high-risk levels, do not heavily rely on debt financing; however, high debt levels have a negative impact on the value of high-tech companies.

The capital structure of high-tech firms can be more affected by the agency costs theory. Its basics were developed by Fama and Miller (1972), and initially by Jensen and Meckling (1976). It assumes the existence of conflicts of interest between owners, lenders, and managers. Managers do not always act with the intention of protecting owners' interests—they often pursue their own interests, which can

be different (Novaes and Zingales 1995). In such a situation owners are forced to exercise additional control over the management's activities, which generates additional costs—agency costs. One of the ways of linking the interests of the above groups is relating the management's compensation to the company's shares. Another situation can occur in which managers implement risky investment projects, generating additional risk for lenders, while only owners benefit from higher profits. Debt can then act as a factor that disciplines the management, enforcing more active operating policies, and more effective investment policies (Kenourgios et al. 2019). In this situation, debt decreases agency costs (Novaes and Zingales 1995). Agency costs tend to be very high in companies with high unique value (Colombo et al. 2014; Sau 2007). The higher the agency costs, the lower the firm's value (Lins 2003).

A possibly significant role in high-tech firms is played by trade-off theory. Its creators are Kraus and Litzenberger (1973). All financing methods have both advantages and drawbacks. Higher debt levels provide an opportunity to deduct interest from taxable income. However, it should be noted that there are other methods of reducing tax burden with the use of non-interest tax shields including effective depreciation policies, or, in a broader sense, tax optimization (DeAngelo and Masulis 1980). It should be stressed that a company can benefit considerably from relatively high tax rates. A company's heavy reliance on indebtedness in its capital structure increases business risk and results in the costs of bankruptcy (Baxter 1967). The higher the bankruptcy costs, the lower a firm's value. Higher debt levels in the balance sheet total originally increase a firm's value, but at a certain point, a firm's value decreases (Adrienn 2014). The costs of bankruptcy are then higher than tax shield positive effects. A practical confirmation of the trade-off theory is the occurrence of the so-called industry effect. The functioning of an enterprise within one industry is dependent on similar factors—economic entities are characterized by similar operating cycles, risk levels, and agency costs, hence their similar share of debt in overall financing. The companies whose share of debt in the structure of financing is below industry average tend to increase it, unlike entities that have a large share of debt in their financing structure and try to lower its level (Kędzior 2012). The industry effect is not identical in all industries. In industries characterized by stiff competition and diversified agency costs, debt levels can vary. Unequal access to advanced technologies has a similar impact on indebtedness (Michaelas et al. 1999). The above factors result in the existence of an optimal industry capital structure, which economic entities seek to achieve in their long-term operations (M'ng et al. 2017).

In the case of innovative companies, it is difficult to estimate the risk of the sources of financing within the framework of trade-off theory. Many threats should be regarded as potential, and their materialization is conditional and not easy to estimate (Sau 2007), hence difficulties in choosing adequate sources of financing. Choices made by high-tech firms with regard to financing are affected by a rapidly changing business environment and the complexity of applied technologies (Li et al. 2006). These entities do not have the ability to offer adequate guarantees to mitigate lenders' risk (Sau 2007). Innovative firms have higher bankruptcy costs (Aghion et al. 2004; Sau 2007), so the share of liabilities in the balance sheet total cannot be dominant. High-tech companies with a relatively high volume of intangible assets are less inclined to borrow funds. On the other hand, high growth companies rely on debt financing to a smaller degree (Castro et al. 2015). Transaction costs in such entities are also high due to risk factors and, generally, limited volumes (Revest and Sapio 2012). Their market value is subject to large fluctuations, especially as their financial standing deteriorates. It results from the fact that their valuation is based on specialized assets as well as large growth potential. Therefore, valuation changes on stock exchanges play a crucial role in high-tech firms (Revest and Sapio 2012).

The financial conditions and capital requirements of high-tech firms depend on the stage of their development (Sau 2007). At the initial stage of development economic entities' cash flows are often negative, so they are not able to repay their debts, and the acquisition of funds is difficult. In their early stages, high-tech firms' biggest problem in product commercialization based on the use of familiar technologies is the acquisition of funds for operating activities (Minola et al. 2013).

The creation of capital structure is greatly affected by the pecking order theory. The theory was created by Donaldson (1961), and then elaborated and modified by Myers and Majluf (1984).

The authors divide sources of financing into external and internal sources. The choice of the sources of financing is mainly determined by their cost which is lower for internal capital. Therefore, companies should finance their operations by relying on retained earnings, followed by debt and, finally, the issue of shares (Stulz 1990). This order is justified by information asymmetry in relationships between companies, banks and external investors. Banks and external investors have more difficulty accessing information about companies than people operating within company structures, so in light of the higher risk of transferring capital, they require higher interest on loans and higher rates of return. Information asymmetry leads to moral hazard and adverse selection. The adverse selection indicates that banks find it difficult to distinguish between effective and ineffective investment projects, which generates additional costs and increases risk. A high level of adverse selection also results from great uncertainty with regard to future return on investment rates as compared with traditionally implemented projects (Carpenter and Petersen 2002). Moral hazard indicates that owners benefit more from implementing risky investment projects than debtors (Aoun and Heshmati 2006). High information asymmetry results, to a considerable degree, from the large development potential of high-tech firms (Castro et al. 2015). High information asymmetry in the technology sector mainly applies to small companies. Therefore, such companies can often be undervalued (Coleman and Robb 2012).

Pecking order theory assumes that the accessibility of information about a high-tech firm has an impact on the choice of capital structure. To avoid problems resulting from the disclosure of internal information to a larger group of stakeholders, high-tech firms give preference to internal sources of financing (Hogan et al. 2017; Scherr et al. 1993). Due to such factors as uncertainty with regard to the ultimate results of innovative investment projects, possible cases of underinvesting and overtrading, difficulties in monitoring R&D activities, and the frequent lack of comprehensive knowledge about technology among investors and banks, access to external financing can be limited (Revest and Sapio 2012). Generally, high reinvestment rates in technology firms force them to seek external sources of financing in the absence of their own funds (Berggren et al. 2000).

The acquisition of external capital implies the necessity of disclosing additional information about planned operating or investment activities. Small and medium-sized high-tech firms are not inclined to disclose such information. Similar opinions are held by Revest and Sapio (2012). Technology firms are unwilling to disclose detailed information about R&D programs due to a very competitive market and the fear of losing competitive advantage. Aoun and Heshmati (2006) also claim that because of the confidential character of business operations high-tech firms have difficulty disclosing comprehensive financial data, and hence face problems with acquiring funds for business activities. As a result, markets do not possess full information, and lenders have limited knowledge about the current operations of high-tech firms (Ullah et al. 2010). Transaction costs and greater flexibility of operations justify reliance on retained earnings as a source of financing (Grinblatt and Titman 2002). A number of empirical research studies point to a negative correlation between profitability and indebtedness (Bhayani 2010a; Korkmaz and Karaca 2014). Therefore, profitable firms rely on debt financing on a limited scale.

Technology firms tend to choose financing through the issue of shares rather than indebtedness. This mainly refers to young firms at an early stage of development (Minola et al. 2013). Innovative firms are characterized by attractive investment possibilities as compared with other business entities, but the costs of the issue of shares should be regarded as high (Aghion et al. 2004; Castro et al. 2015). Larger technology firms have a greater ability to raise funds through the issue of shares (Mac an Bhaird and Lucey 2010). Frequently, young firms without a long credit history and relationships with banks are left with no other option but to issue shares (Carpenter and Petersen 2002). Because of the lack of collateral in the form of tangible assets, innovative companies tend to rely more frequently on share capital. The issue of shares does not have to be secured by tangible assets and does not increase the threat of bankruptcy. High-tech firms can successfully implement R&D programmes if they are able to convince investors to purchase issued shares (Carpenter and Petersen 2002). The idea

of the issue of shares is also justified by technology firms' tendency to implement high returns but also risky investments (Carpenter and Petersen 2002).

Because of the risk of share dilution and takeovers, innovative companies tend to rely on debt financing (Aghion et al. 2004). If the lack of transparency of disclosures is acceptable, high-tech firms can also resort to bank loans (Berggren et al. 2000). As firms grow and gain more experience, the range of information asymmetry reduces, the value of assets (especially tangible assets) increases, and access to bank loans becomes easier (Hogan et al. 2017). High-risk firms may not be granted loans, but they are still able to successfully implement the process of issuing shares.

It seems, however, that pecking order theory turns out to be more useful in large economic entities, which rarely issue shares because of the high values of retained earnings and the possibility of acquiring corporate bonds (Akgül and Sigali 2018). Nevertheless, within a short time horizon, enterprises are likely to create their capital structure based on the pecking order theory. On the other hand, in longer periods of time in which the changeability of cash flows and economic conditions is less severe, companies are likely to rely on trade-off theory (Bontempi 2002). Pecking order theory (POT) is probably more effective in describing the choice of sources of financing in mature companies as compared with high growth entities.

The signaling theory, created by Ross (1977), has a different impact on capital structure creation. Due to information asymmetry, people operating inside and outside of an organization have unequal access to information about a company's financial standing. External stakeholders make intensive efforts to obtain information about a company's future financial condition and future share valuations. Therefore, they seek additional signals concerning an economic entity's actual financial condition. The most reliable signals and those that cannot be easily imitated refer to dividend policies and capital structure decisions (Frankfurter and Wood 2002; Deesomsak et al. 2004). Increased indebtedness should be regarded as a positive signal—it indicates a bank's favorable assessment of an entity's creditworthiness and stable projected financial results and cash flows. It can be assumed that current and projected financial results will not be diluted. On the other hand, the issue of shares is sometimes treated by financial markets as a negative signal. Companies with less optimistic financial result predictions tend to finance their operations through the issue of shares (Leland and Pyle 1977). Managers choose the issue of shares if their current valuation is excessively high. The market's negative response to the issue of shares can be even more severe if investors perceive a company as being characterized by great information asymmetry (Minola et al. 2013). The range of information asymmetry is very high for new investment projects, new areas of activity and new strategies. Over time asymmetry tends to decrease (Harris and Raviv 1988). Information asymmetry relates to new areas and issues—past events of key significance are reflected in the price of shares (Harris and Raviv 1988).

Last but not least important is the financial life cycle theory, which assumes that a firm's capital structure preferences vary with their life cycle (Butzbach and Sarno 2018). The life cycle determined the availability of financial resources and the cost of capital. The theory implies that smaller and younger companies exhibit higher information asymmetry, which in turn increases the cost of capital. We expect that in the case of NTBFs the financial life cycle theory may be of use due to the fact that R&D activity increases information asymmetry and the fact that NTBFs are typically young companies with low or no reputation, and have almost no (or very low) carrying amount of tangible assets.

3. Literature Review and Hypothesis Development

Determinants of capital structure have been at the heart of finance theory for many decades. Still, as Dobusch and Kapeller (2018) indicate, innovation advancements and digital technologies have a big influence on changes in firms' strategic choices, so there is a need to reconsider factors influencing corporate financing decisions, especially in high-tech sectors. The sector is expected to be a crucial factor affecting access to finance, in part because firms in different industries will be seeking to access finance for diverse reasons. High–tech firms very often look for sources of financing for innovative or

R&D activity. Hall (2010) addresses the extent to which innovative firms are fundamentally different from established companies and how it is reflected in their financing.

In terms of methodology, the critical problem concerns the identification and measuring of financial constraints. In other words, the operationalization of this problem may be expressed by the identification determinants of financial leverage, and there is vast literature concerning that problem. However, papers related to the determinants of high-tech companies or NTBFs represent a much narrower field of study. There are at least several significant factors whose impact on financial leverage was empirically investigated and documented. These factors include, among others, the intangibility of assets, R&D intensity, the firm's size, age, liquidity, profitability, intangibility, and institutional setting.

Several researchers identified and documented the fact that access to finance for high-tech companies is constrained. Lee et al. (2015), based on the study of 10,000 UK small and medium-sized companies[1], found that access to finance is much more difficult for innovative firms and that this problem has worsened since the 2008 financial crisis. They investigated the relationship between innovation and access to funding while controlling for firm characteristics (size, age, sector, several personal features of the management), and the likelihood of applying. Their focus was on the change in access to capital for innovative firms caused by the 2008 economic crises. It is important to note that their definition of innovative firms is much broader than in other studies, and extends beyond R&D intensive, high technology industries. The results suggest that there are barriers to obtaining external finance for innovative projects, even controlling for several factors that might have influenced more difficult access to funds. They indicate that there are two kinds of problems in financial systems. The first one is related to structural problems connected with financial constraints for innovative firms. The second problem concerns cyclical issues caused by the financial crisis, which, surprisingly, has had a more severe effect on non-innovative firms' access to finance. They find that innovative firms in the UK show higher demand for external capital but encounter more significant barriers to obtaining financing (restricted supply). In their case, there is a much higher imbalance between demand and supply compared with non-innovative firms.

Brown and Lee (2019) challenged the assumption of innovative firms having problems with access to credit. They concluded, based on the survey of 8000 UK SMEs in the period following the financial crisis of 2008, that there is no difference in access to external finance for high growth SMEs and other companies. The authors focus on the high growth of SME firms but admit that those are particularly likely to be innovative firms, and R&D activity is especially seen as growth-inducing. They find that a vast majority of high growth companies (achieving rapid growth in turnover and employment) rely strongly on debt, not equity finance for investment purposes (the situation is different in the case of working capital purposes). Based on these findings, the authors question the rationale for UK government policy aimed at increasing credit availability for high growth innovative companies.

An important strand of literature concerning the financing of innovative firms is focused on venture capital and other forms of equity financing tailored to financing risky, innovative projects. Economic literature shows that innovative firms are more dependent on equity than debt financing (Brown et al. 2009; Brown et al. 2013; Falato et al. 2018). Still, there is also a growing interest in access to bank financing (the more standard, traditional form of funding).

3.1. Intangibility

Studies exploring the relationship between intangible assets and capital structure are still relatively rare. In the economic literature, tangible assets are widely recognized as an important determinant of financial leverage because of their potential to be treated as collateral. However, investigating the influence of intangibles on the corporate capital structure is of vital importance because in today's economy a large and still increasing part of companies' assets is represented by intangibles. For obvious

[1] SMEs are defined as those with fewer than 250 employees, but excluding those without employees—so SME Employers.

reasons, it should be assumed that this phenomenon is especially evident in the case of high tech companies, where innovation activity is crucial. For that reason, intangible assets account for a substantial part of total assets. However, the situation is more complicated because of the phenomena of underreporting of R&D outlays, which is a visible problem in today's financial reporting on emerging economies.

As Lim et al. (2020) indicate, internally generated intangible assets are reported in balance sheets and other companies' reports. For that reason, it is very difficult to evaluate the impact of intangibles on financial leverage (under accounting rules, most of the internally generated intangible assets are not recognized on the balance sheet).

Peters and Taylor (2017), based on a sample of U.S. firms, estimated that an average firm acquires externally only 19% of intangible capital. Therefore, the vast majority of intangible assets are missing from the balance sheet, so they construct a proxy to measure the value of internally acquired assets by accumulating past intangible investments reported on firms' income statements. They define the stock of international intangible capital as the sum of knowledge capital and organizational capital. Knowledge capital is created in the process of R&D activity, and to measure it, Peters and Taylor (2017) use the perpetual inventory method. The accounting approach is different from externally acquired intangible assets that are capitalized.

Lim et al. (2020) also point out that intangible assets may discourage debt financing because of poor collateralizibility and high valuation risk. However, they come to the conclusions that identifiable intangible assets have the same positive influence on financial leverage as tangible assets, and that they support debt. The study is based on a sample of 469 US public companies between 2002 to 2014. The dataset consists of targets of acquisitions, and in such transactions, there is a disclosure requirement for the acquiring firms to allocate the purchase price paid for the target to two main subsets of tangible and intangible assets. Authors in their research use fair value estimates (not the usually used book value) of both tangible and intangible assets. They divide intangible assets into two categories: identifiable intangible assets (among them technology-related as patents and in-process R&D, marketing-related as trademarks, trade names, customer contracts, customer relationships, and others as non-compete agreements, unproven mineral or gas properties) and unidentifiable intangible assets—goodwill.

Hall (2010) indicates that in the case of high-tech companies, not only are a significant part of results intangible, but "much of it is in the form of human capital embedded in the heads of the employees." It has low salvage value and is also idiosyncratic, which means that when a company goes out of business, it is a signal that its value is low. As Hall stresses, except for certain types of patents, there is little market for distressed intangible assets. This is one more reason for debt financing being poorly suited to the financing of R&D intensive sectors.

Some studies in the economic literature investigate the relationship between one subset of intangible assets—patent counts—and financial leverage. The main limitation of these studies is that there are no objective methods in the valuation of patents.

Mann (2018) calculated that in 2013, 38% of US patenting firms used patent portfolios as collateral for secured debt, so this type of intangible assets contributes significantly to the financing of innovation. Mann (2018) also stressed that 16% of patents produced by American firms have been pledged as collateral at some point. The pledgeability of patents depends on their high level of citation counts and generality. Brown et al. (2009) points out that companies using patents as collateral mainly belong to the high-tech sector and feature low tangibility. Therefore, we posit the following hypothesis:

Hypothesis 1 (H1). *Intangibility has a significant and negative impact on the financial leverage of NTBFs.*

3.2. Investment in Innovativeness

There is ample empirical evidence suggesting that the capital structure of R&D intensive firms exhibits significantly less debt than in the case of other firms. The problem of financial constraints in financing R&D intensive or innovative firms is well pronounced in economic literature. These problems are also referred to in economic literature as structural problems of the financial system in financing R&D or, more broadly, innovations. The reasons for that include higher risk, information asymmetry between financing providers and companies themselves (the main theoretical premise for the difficulties SMEs face when accessing external capital, which are due to the context-specific nature of R&D projects, which makes them very difficult for valuation), and the lack of collateral in the case of firms based mainly on intangible assets (denied finance due to their lack of collateral). Studies typically suggest that all these reasons cause innovative firms to encounter severe obstacles when it comes to acquiring debt financing. Internal finance is usually insufficient to finance rapid growth.

A study by Alderson and Betker (1996) provides evidence that there is a positive relation between liquidation costs and R&D in the corporate sector. Therefore, R&D activity is associated with higher sunk costs than other types of investments.

Guiso (1998) finds evidence for a representative sample of about 1000 Italian manufacturing firms with 50 or more employees. Those which belong to the high-tech sector are more likely to be credit-constrained than low-tech companies. Measurement problems in the proxies for high-tech firms make it difficult to provide a precise estimate of the size of the effect. The author also points out that credit constraints have a highly counter-cyclical pattern with the proportion of firms, with limited access to financing increasing during the downturn.

A very important issue is the relation between intangibility and investment in innovativeness. We distinguish two types of investments in innovativeness, which are measurable in the accounting system: external and internal. The internal one refers to R&D outlays expended in a given period (usually one year) on the firm's own invention. The external one refers to the expenditures on other intangible assets acquired externally, having mainly an innovative character. The last concept—intangibility—refers to the attribute of total assets, which has a cumulative and resource character. Usually, high intangibility is caused by heavy investments in innovativeness over a longer period. However, in some instances, it can be triggered by a low carrying amount of tangible assets. Therefore, from the perspective of a given reporting period, the mutual correlation between intangibility and investments in innovativeness is not necessary. Both concepts: intangibility and investments in innovativeness refer to similar but different concepts.

Firstly, we conjecture that, in a country that is at the stage of development classified as an emerging market, the more a firm invests in an innovative in-house project, the less the bank sector is willing to provide external capital. We argue that in the case of emerging markets, the informational asymmetry gap caused by the R&D project is even higher than in the case of developed markets. Secondly, we hypothesize that the external acquisition of innovation (i.e., technology) does not create informational asymmetry. Therefore, it does not increase the cost of external capital. Quite the opposite, it makes a company a more attractive client for the bank sector, with better prospects for the future. Therefore, we posit that the more a company invests in externally acquired innovation, the more leveraged it will be. Based on the above-mentioned chain of reasoning, we posit the following hypotheses:

Hypothesis 2 (H2). *Internal investments in innovativeness in NTBFs from emerging countries have a significant and negative impact on financial leverage.*

Hypothesis 3 (H3). *External investments in innovativeness in NTBFs from emerging countries have a significant and positive impact on financial leverage.*

3.3. Liquidity

Liquidity is another determinant that has an impact on capital structure and is usually understood as a measure of a firm's capability of debt repayment. High liquidity implies that a company has the potential to pay back debt or shareholders (Ozkan 2001). Low risk of insolvency allows acquiring debt at a lower cost (Morellec 2001). More liquid companies are more prone to undertake riskier projects and finance them via bank loans thanks to a lower risk of solvency problems (Ramli et al. 2019).

According to the pecking order theory, more liquid companies tend to finance their activity mainly by their funds (retained earnings). By doing that, companies avoid taking more costly debt and disclosing confidential information to financial institutions (banks) or investors. Therefore, many researchers hypothesize an inverse relationship between liquidity and financial leverage (Kara and Erdur 2015; Karacaer et al. 2016). Internal financing is preferred over debt, and the surplus of cash flows allows the financing of investment projects. Higher liquidity translates to financial flexibility and opens up possibilities of acquiring debt at a lower cost. Based on our experience, we suppose that in the case of emerging markets liquidity may play an important factor in shaping the capital structure of high-tech companies. Therefore, we conjecture the following hypothesis:

Hypothesis 4 (H4). *The liquidity of NTBFs located in emerging markets has a significant and negative impact on financial leverage.*

3.4. Size

One of the most studied firm parameters is company size. Firm size is likely to influence capital structure in several ways. Larger firms are usually treated as less risky and believed to have fewer constraints in obtaining a bank loan. Risk is higher in the case of small firms, which, due to the lack of scale, cannot diversify the risk and invest in multiple projects (Freel 2007). The financial constraints in financing are well pronounced, especially in the case of small and medium-sized innovative firms (Schneider and Veugelers 2010; Hutton and Lee 2012; Mina et al. 2013; Lee et al. 2015).

At least several important characteristics of a firm's size are invoked in the literature. Bigger companies are able to operationalize more debt in their balance sheets due to more collateral on the asset side (Karacaer et al. 2016; Cai and Ghosh 2003). The size of a company is correlated with its age. In other words, bigger companies are usually the older ones, which means that they are already established in the market, have a deeper knowledge of the market and customer preferences, and have higher credibility, which results in lower operational risk. The financial situation of bigger companies is usually more stable, and the variability of their cash flows and financial risk is lower. Bigger companies may utilize the economies of scale and transfer the cost of short-term financing to their suppliers or clients. Bigger companies tend to engage in international activities, therefore they are more able to diversify their operations and raise funds in foreign capital markets. The cost of external capital is typically lower for bigger companies in comparison to smaller ones. Additionally, bankruptcy costs are lower for bigger companies, and as a result, they are more flexible in terms of managing their liabilities (Demir 2009). Informational asymmetry is lower for bigger companies, which corresponds to a higher quality of financial reporting. Finally, transaction costs necessary to obtain bank loans are usually lower for bigger companies (Hall et al. 2004). All the above factors supposedly make the cost of attracting external capital lower and may imply that the bigger a company, the higher its financial leverage. The study conducted by Nenu et al. (2018), based on the sample of Romanian companies provides empirical evidence supporting this statement. The authors of that study point out that the trade-off theory may explain the research outcome.

In the literature, one can also find the opposite arguments. Bigger companies often accumulated retained earnings for many years, and external capital was not necessary (Kara and Erdur 2015). Bigger companies are also more prone to the problem of moral hazard (Frank and Goyal 2008). Many cases from the past show that bigger companies tend to accept excessive growth, which translates

to lower operational efficiency and, finally, an increased cost of external capital (Ammar et al. 2003). Agency costs are usually higher for bigger companies, which means that monitoring and auditing are more costly (Yildirim et al. 2018). However, higher long-term debt may provide additional incentives to managers for the creation of shareholder value (Izdihar 2019).

External finance is vital for innovative SMEs, as they usually lack the internal sources of financing needed for the commercialization of their innovations (Beck and Demirguc-Kunt 2006; Schneider and Veugelers 2010). The business model of innovative firms is riskier, and the intangible assets account for a bigger part than physical property in their balance sheets, which creates a problem in bank valuation. Intangibles are context-specific, which creates a problem for banks who value them and use them as collateral for lending. Also, Canepa and Stoneman (2008), Czarnitzki (2006), and Freel (2007) suggest that all these structural problems with innovative financing firms are amplified in the case of SMEs. Finally, as Kijkasiwat and Phuensane (2020) documented, bigger companies are more able to benefit from external and internal innovative projects, while the smaller ones only benefit from internal projects.

In the case of NTBFs, an increase in size should result in a decrease in operational and investment risk. However, it is probably at a higher level compared to other firms. Likewise, bankruptcy costs should be lower, yet substantial. The scope of information asymmetry will decrease, agency costs may be lower, but not low. It can be expected that NTBFs' willingness to attract external capital will increase with its size (Berggren et al. 2000). Therefore, we conjecture the following hypothesis:

Hypothesis 5 (H5). *The size of NTBFs located in emerging markets has a significant and positive impact on financial leverage.*

3.5. Age

The next important determinant of capital structure—a firm's age—is especially important in the case of the high-tech sector. Some authors take into account the age of the firm as a determinant in obtaining a bank loan. According to Cowling et al. (2012), the size of the company and its track record influence bankers' decisions to credit an entity, putting small and young firms at a disadvantage. Older companies also have more fixed assets, which can serve as collateral for the long-term credit loan, which also makes the debt more accessible and less costly. The results of empirical studies suggest that the firm's age allows it to curtail limits typical for high-tech companies, especially higher risk. Older firms have lower bankruptcy costs, lower costs of external capital, a broader customer base, more stable financial results over time, and more profitable companies (Malik 2011; Bhayani 2010b).

The firm's age, or the period counted since the IPO on the stock market, is positively correlated with the quality of corporate governance, and, consequently, lowers the agency costs and the cost of the bank loan (Kieschnick and Moussawi 2018). On the other hand, older firms usually accumulated retained earnings from the previous periods and may not strive for capital offered by the bank sector (Mac an Bhaird and Lucey 2010). Younger firms suffer more from agency problems, and this is the reason why access to external capital is hampered (Mac an Bhaird and Lucey 2010). As the firm gains experience and records a more extended credit history, the risk of moral hazard becomes lower.

Younger firms usually suffer from lack of capital, and for this reason, they often apply for external capital to finance their investment projects (Bhayani 2010b; Hall et al. 2004). At the same time, due to the problem of moral hazard, which is a very distinctive feature of young, technological firms, applying for and getting a bank loan is the way through torment (Hogan et al. 2017). Easier access to external capital for NTBFs is possible and can be observed in countries where the financial system is based on a well-developed banking sector. Therefore, we posit the following hypothesis:

Hypothesis 6 (H6). *The age of NTBFs located in emerging markets has a significant and positive impact on financial leverage.*

3.6. Profitability

The next important characteristic of the company—profitability—is an important determinant of capital structure. According to the pecking order theory, a firm first instances its activity from retained earnings. If this source is not sufficient, a company tries to obtain external sources of capital (Myers and Majluf 1984). From this perspective, higher financial leverage does not always imply or correlate with higher profitability.

Another implication may be derived from the trade-off theory, which assumes a state of balance between equity and debt capital, while the cost of debt capital is lower. More profitable companies usually have sufficient financial resources necessary to pursue their investment plans. However, more profitable companies may find a tax shield to be a decisive argument for increasing financial leverage (Bouallegui 2006), which is especially important for companies from countries where the tax rate is high. The theory of free cash flows also posits that more profitable companies should indebt themselves because it provides a self-control mechanism. It forces management to transfer free cash flows as dividends to their shareholders instead of investing in less profitable investment projects (Izdihar 2019).

Highly profitable companies have much easier access to external financing at a much lower cost (Cassar and Holmes 2003). This is also supported by the substitutive theory, which posits that less risky and more profitable companies are much more able to finance their activity from external sources, especially debt. High profitability also minimizes the risk of bankruptcy, and for this reason, the capacity of indebtedness is increased (Ramli et al. 2019). Highly profitable companies, which finance their activity from internal sources, are not required to disclose detailed information on their operations (Li and Islam 2019). Internal sources of finance (retained earnings) and increased indebtedness may be attractive for investors since a firm's shareholding is not diluted (Karacaer et al. 2016). On the basis of the above discussion, it may seem that the impact of profitability on capital structure is ambiguous (Degryse et al. 2012). However, from the perspective of NTBFs, we can suppose that more profitable companies would have much better credit standing and better access to debt. Therefore, we treat the firm's profitability parameter as a control variable.

3.7. Growth Opportunities

Growth opportunities are an important firm characteristic influencing capital structure in the high-tech sector. Most often, high-tech companies tend to use their own equity funds because of innate higher risk and the necessity of more costly supervision of this type of company (Myers 1977). High growth opportunities, on the one hand, create the chance of development, but on the other hand, pave the way for new risk. Usually, enormous growth opportunities accompany low equity values which are necessary to finance important investment projects. Fortunately, these companies, even when dealing with severe financial problems, don't have problems with raising equity capital. Indebtedness may put pressure and discipline on the management and enforce a more efficient decision-making process. The valuation process of high-tech companies is based on their future potential (option), which is heavily burdened with risk. Therefore, the market valuation is under the threat of impairment. This is especially important considering that the asset is in substantial part intangible and, as a result, cannot serve as collateral (Karacaer et al. 2016). Thus, some researchers (Rajan and Zingales 1995) hypothesize an inverse relationship between growth opportunities and financial leverage. This relationship is also implied by the pecking order theory, which posits that a firm tends to finance its activity by internal funds and, afterward, look for external ones. Agency costs theory provides similar implications for high-tech companies. Additional monitoring costs related to management supervision may be substantial, especially when growth opportunities do exist, which supposedly will lead to an increased cost of debt. High-tech companies will be discouraged from taking on more debt in their balance sheet in order to minimize potential conflict between shareholders and creditors (Ramli et al. 2019). The implication of the substitution theory also confirms

that relationship, because high-tech companies are more prone to the risk of financial situation deterioration. Therefore, we treat the firm's growth opportunities as a control variable.

4. Sample Characteristics, Research Design, and Results

The study sample consisted of 31 companies listed on the Warsaw Stock Exchange classified as high-tech firms in sectors like biotechnology, R&D in physics, natural sciences, engineering, biology, medical laboratories, computer software, e-commerce, marketing analysis, etc. We decided to use data derived from firms listed on the stock exchange because of a higher quality of accounting data. These companies, under the scrutiny of stock market institutions and the public, are obliged to meet higher standards of transparency and are audited. Companies may also be classified as NTBFs because the oldest firm in the study period is 17 years old, and the average age is around six years. The initial sample consists of 155 firm-year observations covering the period of 2014–2018. The final sample is limited to only 102 firm-year observations due to the missing data.

Our main object of interest is capital structure, and as a dependent variable, we use the leverage ratio calculated as total liabilities to total assets. As a proxy for the innovation generated internally, we use a ratio of the sum of R&D expenses recorded in the P&L statement and year-to-year change in R&D outlays recorded in the balance sheet, deflated by the total assets. In our opinion, this is the only possible way to measure R&D outlays based on information derived from a financial statement. As the proxy for the innovation acquired externally, we use a year-to-year change of intangibles extracted from the balance sheet, excluding R&D expenses recognized. We also use a set of control variables such as profitability (ROE) and growth opportunities. In order to avoid the influence of outliers, all data were winsorized. Table 1 presents the characteristics of the main variables used in the model.

Table 1. Sample statistics.

Variable	No. of Obs.	Min.	Max.	Mean	Median	St. Dev.	Variance	Skewness	Kurtosis
LEV	155	0.004	1.000	0.448	0.375	0.298	0.089	0.392	2.029
INTANGIBILITY	155	0.000	0.939	0.216	0.121	0.238	0.057	1.125	3.438
INNOV_INT	155	0.000	0.543	0.067	0.003	0.099	0.010	1.795	6.650
INNOV_EXT	155	0.000	1.000	0.091	0.003	0.168	0.028	3.443	3.260
CUR_RATIO	155	0.007	10.000	2.737	1.592	2.862	8.193	1.552	4.329
SIZE	155	4.143	14.952	9.793	9.818	2.093	4.380	−0.131	3.443
AGE	155	0.000	17.000	6.072	6.000	3.934	15.475	0.655	2.957
ROE	155	−1.000	1.000	−0.140	−0.043	0.484	0.234	−0.123	3.026
SALES_TR	117	−1.000	1.000	0.111	0.091	0.656	0.431	−0.177	2.010

Source: our own elaboration based on the data from financial statements.

In order to avoid intercorrelated variables in the model, we performed a correlation analysis, the results of which are presented in Table 2. The highest correlations, however moderate, are between a firm's age and profitability (ROE), financial leverage, and size. The results are logical and correspond to the conclusions of the literature review section. The older a company is, the higher its profitability. Similarly, the older the firm is, the more able it is to indebt itself. Finally, bigger companies tend to be more profitable. The results show that variables INNOV_INT and INNOV_EXT are weakly correlated. The rest of the correlation coefficients of independent variables are at a low or moderate level, so including them in the model is not controversial.

Table 2. Correlation between variables.

Variable	Lev	Size	Age	Roe	CUR_RATIO	SALES_TR	Intangibility	INNOV_INT	INNOV_EXT
LEV	1.000								
INTANGIBILITY	0.134	1.000							
INNOV_INT	−0.254	−0.018	1.000						
INNOV_EXT	0.029	0.071	0.200	1.000					
CUR_RATIO	−0.632	−0.201	0.207	0.022	1.000				
SIZE	−0.119	−0.011	0.333	0.090	0.136	1.000			
AGE	0.388	−0.224	−0.053	−0.107	−0.286	0.291	1.000		
ROE	−0.082	−0.185	0.087	−0.028	0.132	0.384	0.410	1.000	
SALES_TR	0.011	−0.082	0.069	0.213	0.032	0.084	0.028	0.064	1.000

Source: our own elaboration based on the data from financial statements.

To test the hypotheses formulated in the previous section, we used the following model:

$$LEV_{i,t} = INTANGIBILITY_{i,t} + INNOV\_INT_{i,t} + INNOV\_EXT_{i,t} + CUR\_RATIO_{i,t} + SIZE_{i,t} + AGE_{i,t} + ROE_{i,t} + SALES\_TR_{i,} \quad (1)$$

where:

$LEV_{i,t}$—financial leverage (total liabilities/total assets) of the i-company in t-year
$INTANGIBILITY_{i,t}$—the ratio of intangibles to total assets of the i-company in t-year
$INNOV\_INT1_{i,t}$—the ratio of internally generated intangibles to total assets of the i-company in t-year
$INNOV\_EXT2_{i,t}$—the ratio of externally acquired intangibles to total assets of the i-company in t-year
$CUR\_RATIO_{i,t}$—liquidity of the company measured as a current ratio (current asset/current liabilities)
$SIZE_{i,t}$—the size of the i-company in t-year as a logarithm of total assets
$AGE_{i,t}$—age of the i-company in t-year
$ROE_{i,t}$—profitability of the i-company in t-year measured as a return on equity
$SALES\_TR_{i,t}$—sales trend of the i-company in t-year calculated as year-to-year change of sales (sales from the t-year minus sales from the t−1 year, and deflated by the sales from t−1 year)

We ran a regression with a robust option in order to obtain robust coefficients. It allows us to avoid many problems with the specification of the model.

We performed an extensive post-estimation diagnosis to test our model. We tested the model for multicollinearity using the variance inflation factor and detected none. We ran a Shapiro-Wilk test for residuals, and we couldn't reject the null hypothesis which states that they are normally distributed. Finally, we used the Ramsey RESET to test for the specification of the model; results (0.048) are in the borderline and may suggest that there are some problems with the specification of the model. The model is better at detecting influence on the dependent variable and should not be treated as a predictive model. The model detects some critical links between variables and has acceptable predicting power (adj. R = 0.54). First of all, we found a strong influence of the firm's age on financial leverage, which suggests that the older the firm is, the more leveraged it is. The results fit the theory and results of other studies. The second important conclusion is that the more liquid the company is, the less leveraged it is. The implication of that result may be that younger companies that are usually less leveraged tend to maintain a safe cash position and hold more cash within the company. Bigger companies may allow themselves to keep a relatively lower level of liquidity because they are able to raise cash faster if needed through the bank system. Therefore, we provide empirical evidence supporting our fourth and sixth hypotheses.

From our perspective, the most crucial results refer to the variables INNOV_INT and INNOVE_EXT. The p-value of those variables is at a low (10%), yet still statistically significant (see Table 3). Firstly, INNOV_INT has a negative coefficient, which suggests that the more a company invests in an innovative in-house project, the less willing a bank sector is to finance it with debt. This provides empirical evidence supporting our second hypothesis and may be explained by the higher informational asymmetry generated by the R&D project, which probably translates to a higher cost of debt. Secondly, INNOV_EXT has a positive coefficient, which implies that the bank sector is willing to provide more external funds to companies acquiring innovation externally. We ascribe that result to the fact that

external acquisition of technology/invention is perceived to be less risky and the final output more predictable. Again, we provide an argument supporting the third hypothesis. The results must be interpreted with caution, and the hypotheses need to be tested on high-tech companies from other emerging markets.

Table 3. Regression analysis.

Independent Variables	Coefficient	*p*-Value	
INTANGIBILITY	0.126	0.256	
INNOV_INT	−0.334	0.095	*
INNOV_EXT	0.138	0.091	*
CUR_RATIO	−0.045	0.000	***
SIZE	−0.012	0.328	
AGE	0.024	0.000	***
ROE	−0.062	0.361	
SALES_TR	0.011	0.758	
Constant	0.504	0.000	
A number of obs.	102		
R^2	0.55		
Adjusted R^2	0.54		

* significance at 10% level; ** significance at 5% level; *** significance at 1% level. Source: our own elaboration based on the data from financial statements.

Unfortunately, we find no empirical evidence supporting the first and the fifth hypothesis. With regard to the firm's size, this may be explained by the fact that the majority of companies are of moderate size. In the case of the intangibility parameter, we suppose that this parameter would be more important for companies in sectors other than high-tech. In our opinion, this matter needs further investigation.

5. Concluding Remarks

High-tech firms play an increasingly important role in the contemporary economy. Their growth is more dynamic than classical industries. Employment in high-tech industries has increased considerably, while other industries often record reductions in the number of employees. High-tech firms, especially NTBFs, are characterized by high risk, great information asymmetry, high agency and bankruptcy costs, and a great likelihood of deterioration in their financial standing, which makes access to external financing and, in particular, debt financing, more difficult.

The results of empirical studies allow for the verification of the second hypothesis which states that internal investments in innovativeness have a negative impact on the level of indebtedness in NTBFs, while external investments in innovativeness have a positive impact on the level of debt. These results can undoubtedly be attributed to higher information asymmetry and risk in financing new technologies generated internally as compared with innovations purchased on the market, the usefulness of which is well known and proven. It should be noted that internal investments in innovativeness are not always bound to succeed, and their output is very risky. Financial liquidity has an adverse effect on the level of indebtedness in the structure of financing, so companies with high liquidity and availability of their own funds rely on their own resources and, possibly, on debt financing (Hypothesis 4). Due to big market changes and changes in technologies, highly liquid NTBFs give preference to financing based on their own funds. Age has a positive impact on the share of debt in the capital structure (Hypothesis 6). Those NTBFs which are well established on the market and have long credit history and high reliability tend to rely on debt financing. This effect can be limited in NTBFs with excess liquidity. The impact of intangibility turns out to be statistically insignificant. This may result from the fact that the possession of intangible assets is not a necessary, sufficient or decisive factor in determining a decrease in debt financing. The size of NTBFs does not have a positive impact on indebtedness probably due to the fact

that the analyzed sample comprises moderate-sized entities. The impact of profitability and growth potential is also limited. The impact of these factors on debt levels in NTBFs is probably diversified.

Polish NTBFs create their capital structure, which to a certain degree can be explained by the trade-off theory. This view can be justified by the positive impact of age and liquidity on the level of indebtedness, resulting in lower bankruptcy costs. The analyzed NTBF's population also fits the agency theory because of the limited scale of business operations and relatively limited market experience. Pecking order theory applies to the analysis to a smaller degree—an impact of profitability, size, and risk on indebtedness is not visible. Polish NTBFs apply the following order of financing: retained earnings followed by share capital and debt financing.

The obtained results can be useful for high-tech firms, stock market investors, banks and standard setters. Without support offered by the government and various public institutions the development of NTBFs, especially in countries with a low level of innovativeness, can be hindered due to difficulties in acquiring necessary funds for expansion.

This paper attempts to narrow a theoretical gap in the area of capital structure creation and explore the impact of capital structure theory on the level of indebtedness in NTBFs in an emerging economy. We believe that the empirical verification of the impact of internally and externally generated investment in innovativeness, and the verification of the impact of other capital structure factors on NTFBs in emerging markets characterized by low innovativeness, can be regarded as a significant contribution to the research of the determinants of capital structure in NTBFs. In our opinion, there are not many research studies on emerging markets which empirically verify the determinants of NTBF capital structure, hence the need for further analyses.

The major limitations of this work include a relatively short period of research and a small number of analyzed NTBFs. Further analyses should comprise a larger number of countries and observations, as well as a longer period of study. Possibly significant determinants of NTFB capital structure include various corporate governance characteristics and macroeconomic and country-level factors.

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Corporate Governance Characteristics of Private SMEs' Annual Report Submission Violations

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Abstract: Managers are, by law, responsible for the timely disclosure of financial information through annual reports, but despite that, it is usual that they are engaged in the unethical behaviour of not meeting the submission deadlines set in law. This paper sheds light on the afore-given issue by aiming to find out how corporate governance characteristics are associated with annual report deadline violations in private micro-, small- and medium-sized enterprises (SMEs). We use the population of SMEs from Estonia, in total 77,212 unique firms, in logistic regression analysis with the delay of presenting an annual report over the legal deadline as the dependent and relevant corporate governance characteristics as the independent variables. Our results indicate that the presence of woman on the board, higher manager's age, longer tenure and a larger proportion of stock owned by board members lead to less likely violation of the annual report submission deadline, but in turn, the presence of more business ties and existence of a majority owner behave in the opposite way. The likelihood of violation does not depend on board size. We also check the robustness of the obtained results with respect to the severity of delay, firm age and size, which all indicate a varying importance of the explanatory corporate governance characteristics.

Keywords: corporate governance; information disclosure; timeliness of financial reporting; law violation; private firms

1. Introduction

The aim of this paper is to analyse the interconnection between corporate governance characteristics and the violation of the annual report submission deadline in private micro-, small- and medium-sized enterprises (SMEs). According to the theory of upper echelons, managers' experiences, values and responsibilities condition firms' decisions, strategy and even their performance (Hambrick and Mason 1984). One responsibility of the board of directors is the timely submission of firms' compulsory accounting information in order to make it public and accessible for the decision-making of firms' stakeholders. It has been established that board composition is associated with the transparency, correctness and timeliness of financial reporting (Beasley 1996; Abdelsalam and Street 2007; Hermalin and Weisbach 2012).

Prior studies suggest that high levels of corporate governance may reduce managers' earnings manipulations and the tendency to commit fraud, and help to achieve higher levels of information transparency or even condition credit ratings (Ashbaugh-Skaife et al. 2006; Prior et al. 2008; Scholtens and Kang 2013; Liu et al. 2017). However, most of the literature is focused on corporate governance and financial reporting disclosure practices in public and large firms (Carslaw and Kaplan 1991; Abernathy et al. 2014; Lim et al. 2014; Efobi and Okougbo 2014; Spiers 2018; Bae et al. 2018), which could be conditioned by agency problems and disagreeing objectives among shareholders in such firms. Still, reporting disclosure is also relevant for private SMEs

(Clatworthy and Peel 2016). Much of this concern stems from the recognition that small firms serve as an engine of economic growth and innovation around the world (Cowling et al. 2015).

Corporate governance and accounting information disclosure violation, but also their interconnections, are different between public and private firms. In SMEs, board and owners often overlap, and thus, different functions of these two corporate governance levels are consolidated (Gabrielsson and Huse 2005; Brunninge et al. 2007). The incentives to disclose information vary across stakeholders (Berglöf and Pajuste 2005), and even across shareholders. Consequently, the concept of corporate governance of SMEs differs from listed firms (Uhlaner et al. 2007; Voordeckers et al. 2014). Large companies are more concerned about market behaviour than private ones, which in turn are more tax-oriented (Brunninge et al. 2007) and have lower scrutiny as many of them are not audited (Höglund and Sundvik 2019). In this sense, Östberg (2006) posits that disclosure is a form of minority protection that decreases the scope of extracting private benefits by controlling shareholders. Non-audited private SMEs also need to have the information ready for creditors (Collis 2008; Peek et al. 2010). Indeed, small firms may face difficulties in accessing formal financing due to their informational opacity (Ortiz-Molina and Penas 2008). Managers of SMEs can choose, which information to divulge and which to contain, whether to present it timely or not and if it is accurate or biased information (Hoskisson et al. 1994). Thus, opportunistic information disclosure behaviours could appear more likely in SMEs.

The context of this research is Estonia, which is considered to be one of the most advanced digital societies in the world, and consequently, permits full access to SMEs' information. The Estonian legislative system and institutions are harmonized with EU regulations, which increases the comparability of Estonian SMEs with firms with similar sizes from other EU countries. Our dataset is composed of 77,212 Estonian private SMEs, using data procured from the Estonian Business Register (EBR), which contains firms' annual reports (compulsory once per year) and up to date information about firms' boards and owners. With logistic regression analysis, we show which corporate governance characteristics, representing three distinct corporate governance dimensions, increase or decrease the likelihood of violating the legal deadline set for annual report submission.

The paper contributes to the literature by presenting an original conceptual framework for the corporate governance dimensions affecting SMEs' risk behaviour, specifically timely annual report submission violation. Only a few previous studies explore corporate governance variables in the SME context (Spiers 2017). In addition, violation of annual report submission deadlines is a rarely studied topic in the case of SMEs (Lukason and Camacho-Miñano 2019).

We show that corporate governance can be used to explain annual report submission deadline violations in the SME context. Thus, this paper fills the major gap in prior research with respect to how corporate governance can affect firms' behaviour in the SME context (Li et al. 2020). For private SMEs, earlier studies have used a limited number of corporate governance factors (e.g., the number of board members), partly due to the difficulty of accessing such data. In this study, the factual corporate governance information was obtained directly from the business register, not from questionnaires as in most of the studies. Concerning annual reports, the bulk of the literature concentrates on the time of disclosure, not on the violation (Luypaert et al. 2016; Lukason and Camacho-Miñano 2019), which is the approach of this study. In addition, the institutional context has been suggested as an important issue due to the necessity of cross-cultural governance research (Uhlaner et al. 2007). According to La Porta et al. (1999), governance issues differ from one context to another, and Estonia's context is different from the Anglo-Saxon countries, based on which most of the studies have been composed so far.

The paper is structured as follows. First, the literature review section outlines corporate governance dimensions being potentially associated with timely annual report submission violation and outlines the literature-based expectations concerning the interconnections between the latter and specific corporate governance variables. Then, the study's sample, variables and method sections are presented. This is followed by empirical results, robustness tests, and discussion. Finally, the study concludes

this research arguing its main implications and limitations, while suggestions for future research are also provided.

2. Corporate Governance Characteristics and Timely Accounting Information Disclosure Violations in Private SMEs: Development of Research Propositions and Hypotheses

2.1. Conceptual Framework of the Study

The violations of law occur in a firm when its managers do not comply with the legal requirements for either content, forms or time. Information on time is essential to align all firm stakeholders' interests (Singhvi and Desai 1971); generally, the older the information, the less useful it is. In addition, the timely disclosure of information is a way to reduce the information asymmetry between firms' stakeholders (Owusu-Ansah and Leventis 2006; Donnelly and Mulcahy 2008). The latter is possible through transparency, one of the important qualities of governance according to Hermalin and Weisbach (2007).

According to the upper echelons theory, the organization is a reflection of its top managers (Hiebl 2014). Based on the seminal paper by Hambrick and Mason (1984), the characteristics of firm's top managers and their strategic choices help to explain the organization's performance. Consequently, organizational outcomes such as firms' disclosure practices are influenced by the board's characteristics due to the monitoring role of corporate governance. Broadly, corporate governance is the setup of direction and control in companies (Huse 2007), given the separation of these two functions. The regulation of corporate governance originates from the time when ownership and management of businesses first became separated in accordance with the agency theory (Fama and Jensen 1983). Thousands of papers have been published about corporate governance related to multiple aspects of firms from that seminal paper. However, the extant evidence does not provide a clear answer if better corporate governance has a positive influence on information disclosures (Beekes et al. 2016).

As provided in the introduction, most of the studies about corporate governance are focused on large and listed firms but not on SMEs and private companies (Abor and Adjasi 2007; Spiers 2018). For instance, Durst and Henschel (2014, p. 18) even propose a different definition of corporate governance in small companies, where the focus is set on the interplay with relevant stakeholders to achieve a strategic change, rather than focusing only on the routine control function. Corporate governance in privately held firms includes many factors and variables that condition decision-making as to violate or not the disclosure of compulsory information, such as different organizational and/or institutional contexts (Uhlaner et al. 2007).

Clarke and Klettner (2009) and Uhlaner et al. (2007) suggest that directors of small firms are more worried about survival than planning and control as corporate governance imperatives. In this line, Crossan et al. (2015) emphasize that the lack of governance within small companies is a conditioning factor for business failure, while similar opinions are shared by Saxena and Jagota (2015) and Spiers (2017). Thus, an organic interconnection exists between corporate governance and risk behaviour of managers, one example of which is the timely accounting information disclosure violation (later also referred to as TADV).

We posit a theoretical concept in which corporate governance characteristics could condition risk behaviour in firms (see Figure 1). Our central standpoint states that based on the upper echelons' theory, firms' risk behaviour is conditioned by their management. In detail, we rely on three main theoretical streams of corporate governance (see Nicholson and Kiel 2007), that is, agency, stewardship and resource dependence theories, to outline the dimensions relevant to study the interconnection between corporate governance and risk behaviour. First, we rely on agency theory, the central question of which are the nonaligned interests of managers and owners in corporate governance (e.g., Jensen and Meckling 1976). Thus, our first dimension of interest considers the convergence of decision-making in a firm, which we name in the further text as "power concentration". Second, we rely on the resource dependence theory, which postulates that corporate governance channels firms' internal and external resources into performance (e.g., Pfeffer and Salancik 2003). In light of this theory, we focus on a specific type of internal resource, that is, the managers' "experience" dimension. Third, we rely on the stewardship

theory, which considers managers having aligned interests with owners, and thus, behaviour differences of firms are subject to inherent characteristics of managers (e.g., Donaldson and Davis 1991). The third dimension is named the "demographic diversity" of managers. These three dimensions are discussed further as follows, coming to the postulation of research propositions for each of the dimensions. Under each research proposition, specific testable hypotheses are developed. The same approach of using research propositions and specific testable hypotheses has been frequently used in management research (see e.g., Zajac and Westphal 1996). The postulated hypotheses rely on the (most) usual corporate governance characteristics applied to depict these dimensions in the literature.

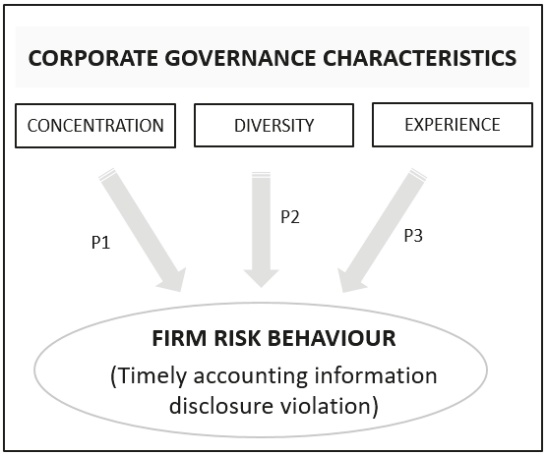

Figure 1. Conceptual framework of the study. Source: Own elaboration.

2.2. Power Concentration and TADV

Although much attention has been paid to the role of boards (Daily et al. 2003), many small firms do not have formal boards but only a unique manager who concentrates on all the functions of the board, while managers and owners are often overlapping. Occasionally, in addition to the founder or owner-manager, there may also be one or two family members on the board, with a unique way of making decisions (Gabrielsson 2007). The varying power concentration among private firms grounds the first dimension that could condition SMEs' decisions concerning timely information disclosure violations. This dimension is relevant, as the agency theory posits that adequate monitoring or control mechanisms need to be established to protect stakeholders from conflicts of interests (Kiel and Nicholson 2003; Parsa et al. 2007), therefore avoiding information asymmetry. In general, more power concentration in a firm's board suggests less pressure for disclosing information as there is less demand for transparency (Carney 2005; Beuselinck and Manigart 2007). Thus, the first proposition (P1) about corporate governance dimensions states that:

P1: Larger power concentration will increase the likelihood of TADV.

In relation to the need for concrete information disclosure policy by firms' decision-makers, there are two corporate governance characteristics that measure the power concentration of decision-making, namely ownership concentration and managerial ownership. The former means whether firms have a high concentration of ownership in one or a few large shareholders that own the majority of shares in the firm. High levels of ownership concentration foster risk-taking (Nguyen 2011). The concentration of ownership and the unification of ownership and control may lead to managers being subjected to less pressure from outside investors who demand accountability and transparency (Carney 2005). In private firms, concentrated ownership means that large shareholders tend to have less interest in disclosing information because they are well informed of what is happening in the firm. In the same

line, Beuselinck and Manigart (2007) argue that private equity firms with majority shareholders are likely to have lower-quality financial reporting systems compared to those with minority shareholders only. Additionally, if decision-making is concentrated, firm risk behaviour can be assimilated with that of the owner. Taking the prior reasoning into account, the first hypothesis (H1a) related to the power concentration proposition is as follows:

Hypothesis 1a. *Ownership concentration will increase the likelihood of TADV.*

The second corporate governance variable to capture power concentration is managerial ownership, focused on the shares owned by their own managers, that is, the involvement of owners in running a firm. Most SMEs are closely held, and owner-managed (Brunninge et al. 2007), and consequently, they do not disclose much information, because they do not need to make it public. Moreover, managers of those firms have much information "in the head" (Uhlaner et al. 2007). Accordingly, we posit the second hypothesis (H1b) concerning the power concentration proposition:

Hypothesis 1b. *Managerial ownership will increase the likelihood of TADV.*

2.3. Demographic Diversity and TADV

As boards of directors monitor the disclosure of business information, their characteristics may condition the policy of business information disclosure (Hambrick 2007; Hiebl 2014). As outlined earlier, the theory of upper echelons is based on the idea that managerial characteristics could affect their choices and that the choices of managers are influenced by their cognitive base and values (Hambrick and Mason 1984). However, psychological factors of managers are very difficult to measure, and thus, demographic variables are considered as good proxies (Hambrick and Mason 1984; Nielsen 2010). In this sense, "managers' unique disclosure styles are associated with observable demographic characteristics of their personal backgrounds" (Bamber et al. 2010, p. 1131). Bamber et al. (2010) note that managers must comply with legal deadlines for submission, in addition to deciding what type of voluntary information may be disclosed.

One of the corporate governance characteristics considered by prior literature to affect the quality of the corporate board's monitoring, and thus, firm's financial performance, is the board's demographic diversity (Campbell and Minguez-Vera 2008; Carter et al. 2010; Shehata et al. 2017) as a way to portray the influence of personal and psychological characteristics of managers. In this sense, greater diversity is beneficial because that variety may influence what information is brought into decision-making processes (Post and Byron 2015), although there is a trade-off between the benefits and costs of diversity on board effectiveness (Bennouri et al. 2018). We argue that certain demographic profiles reduce risk-taking, and thus, are more likely to lead to law-abiding actions. In this line, the second proposition (P2) in relation to the board's demographic diversity is posited as:

P2: Certain demographic characteristics will reduce the likelihood of TADV.

One specific characteristic of demographic diversity in the board is the age of a manager, which reflects well the attitude towards risk and actual risk-taking behaviour (Plöckinger et al. 2016). Thus, the manager's age is related to risk aversion (Jianakoplos and Bernasek 1998) and even to the acceptance of financial fraud (Troy et al. 2011). Younger managers are more inclined towards risky strategies such as law violations. On the contrary, more mature managers are more risk-averse (MacCrimmon and Wehrung 1990). Older CEOs are less involved in dishonest actions (Troy et al. 2011) because maturity has also been associated with higher levels of moral development and stricter interpretations of firm's ethical standards of conduct (Serwinek 1992), therefore resulting in a lower likelihood of engaging in or facilitating unethical behaviours (Ortiz-de-Mandojana et al. 2018). Consequently, for the demographic diversity proposition, the first hypothesis (H2a) is stated as follows:

Hypothesis 2a. *Managerial age will reduce the likelihood of TADV.*

A common measure of demographic diversity is gender. According to prior literature, risk aversion also differs by gender (e.g., Jianakoplos and Bernasek 1998; Ho et al. 2015). The specific corporate governance variable usually applied is the existence of women on the board. From an informational perspective, female directors may contribute to decision-making processes because of their different knowledge, experience, and values (Kanadli et al. 2018). In addition, even in majority male boards, women isolation and minorities have the potential to influence the board's decision-making (Kanadli et al. 2018). Some authors argue that female directors are more likely to be objective and independent (Fondas 2000), and thus, they could follow legal requirements better than male directors because women directors reduce the level of conflicts (Nielsen and Huse 2010). Indeed, their presence enhances board information, perspectives, debate and decision-making (Burke 2000). For example, an equilibrated board tends to mitigate earnings management practices, reinforcing obedience to the law (Saona et al. 2018). Other studies in this line support the idea that women are more ethical than men (Glover et al. 2002; Larkin 2000; Wahn 2003). In this way, earnings quality and voluntary disclosure levels increase when gender diversity exists in boards (Krishnan and Parsons 2008; Liao et al. 2015). Some authors argue that having women in boards influences not only what information is used in decision-making but also how, because females do have different organizational skills than males (Adams and Funk 2012; Post and Byron 2015). Additionally, Ho et al. (2015) found that companies with female CEOs report information more conservatively when companies face high litigation or risks. Relying on the afore-given argumentation, we posit the following hypothesis (H2b) for the demographic diversity proposition:

Hypothesis 2b. *The presence of women on the board will reduce the likelihood of TADV.*

2.4. Experience and TADV

One of the most usual attributes of executives in the risk-taking literature is their experience (May 1995; Hoskisson et al. 2017), as experienced managers are reluctant to make changes and consequently take fewer risks (Hambrick and Fukutomi 1991; Miller and Shamsie 2001). Thus, experienced managers are more risk-averse and violate laws less. They have life and business experiences and perhaps past violation consequences such as prior penalties, which make them not to violate laws. The more experience managers have, the more business problems and more solutions they have had to deal with. Accordingly, the third proposition (P3) can be posited as follows:

P3: More entrepreneurial experience will reduce the likelihood of TADV.

The experience dimension could be measured as the combination of tenure (the board's inside experience) and business ties (the board's outside experience). Board tenure is the time spent on the board of a specific firm and it is expected to increase the director's knowledge of the firm and its business environment (Vafeas 2003) as well as commitment towards the company (Buchanan 1974). The tenure of directors on the same board captures the knowledge of the company's strategy and functioning (Harris and Shimizu 2004). As the boards of SMEs have fewer members, each board member should be fairly well informed on all aspects of the firm. Longer serving CEOs have greater temporal depth, as greater exposure to various events in the past helps to design more effective decisions impacting future outcomes (Ortiz-de-Mandojana et al. 2018). Related to the timely information disclosure violation, a longer board tenure could reduce the occurrence of it, because the longer CEOs have been in the firm, the more experienced they can be on the consequences of a law violation. Concerning other legal requirements, Baatwah et al. (2015) found that longer-tenured CEOs are linked with a timelier completion of the audit report. Similarly, Schrand and Zechman (2012) posit that managers of misreporting and fraudulent firms generally have shorter tenures. Thus, the first hypothesis (H3a) for the experience proposition states as follows:

Hypothesis 3a. *Board tenure will reduce the likelihood of TADV.*

Another proxy of managers' experience is multiple directorships or ties, a corporate governance variable that measures whether board members hold director positions in several firms at the same time. Managers with multiple directorships may be perceived positively since they facilitate the exchange of vital information for firms (Connelly and Slyke 2012) and because they are more likely to understand the business environment of the company (Hillman et al. 2007). Additionally, working in several firms may be conditioned by board members having uncommon skills and strong abilities in both monitoring and advising subordinates (Falato et al. 2014). In addition, the past penalties because of violating the law the board members with many ties have experienced in other firms could also reduce the risk of a new law violation. Thus, relying on the afore-given motivation, we posit the following hypothesis (H3b) for the proposition about experience:

Hypothesis 3b. *Multiple directorships will reduce the likelihood of TADV.*

2.5. Board Size and TADV

Finally, as one of the main characteristics frequently used in the literature of corporate governance from large and/or listed firms is board size (Huse 2000), we assume that it is also relevant in SMEs, although less than in large and/or listed firms. Normally, the board size of SMEs is small, but still, there could be difficulties or conflicts in what information disclosure policy the company should have due to opposite opinions. According to the literature of public firms, the presence of a large number of directors implies a reduction of the board's effectiveness in management control (Yermack 1996; Eisenberg et al. 1998; De Andres et al. 2005; Cheng 2008) and an effective board can also be engaged in better disclosure practices (Willekens et al. 2005).

From another angle, a larger board will bring together a greater depth of intellectual knowledge, and therefore, could improve the quality of strategic decisions. An additional director could bring more human capital to the company, therefore increasing the board's information and specific knowledge about the business and its environment. The latter will increase the firm's efficiency (Adams and Ferreira 2007; De Andres and Vallelado 2008; Linck et al. 2008); and as mentioned before, efficiency in boards conditions its disclosure practices. Consequently, there could be a link between board size and information disclosure, while there are contradictory explanations with respect to whether it will increase or decrease the likelihood of TADV. Thus, we include board size in the analysis as a control variable to shed light on the controversy about its role in association with TADV.

3. Data, Variables and Method

3.1. Study's Data

In this study, we apply firm-level data from Estonia and the population includes 77,212 unique private SMEs, accounting for roughly 50% of all Estonian private SMEs registered at the end of 2014. While we did not include large and/or listed firms in the analysis, some additional contractions were made to the whole population of firms. Namely, we do not include firms having (at least some) corporate owners or foreign individuals as managers/owners, as in case of them we are not able to calculate (all) the variables documented in Section 3.3. In addition, we are not including firms lacking an annual report because of not being obliged to submit it for different reasons (e.g., a firm is too young or in the liquidation procedure). All information obtained is factual and originates from the Estonian Business Register (see also Sections 3.2 and 3.3). The median firm in the analysis is 7.3 years old and a micro firm by size (i.e., total assets 22 thousand euros). Thus, the median firm in the population refers to an older micro firm, which dominates the firms' population in other countries as well. In the case of all firms, we consider the annual report submission delay for the fiscal year of 2014 and corporate governance variables are calculated from the last day firms had to present the annual report (for the vast majority of cases that date is 30 June 2015). The boards and owners of SMEs change infrequently,

thus the usage of a single year is justified. Despite the latter, the TADV behaviour can vary through reporting years, and thus, in order to guarantee the robustness of the results with respect to the year chosen for the analysis (i.e., 2014), we check the results for another fiscal year (i.e., 2015) as well.

3.2. Dependent Variable

The dependent variable is TADV as our aim is to analyse what specific corporate governance factors are associated with this behaviour. For portraying TADV, we code a binary dependent variable (BINARYDELAY), which equals 1 if the company does not present the annual report on time (i.e., exceeding the legal deadline at least by one day) and 0 otherwise.

All Estonian SMEs have to disclose their financial statements (i.e., balance sheet, income statements and explanatory notes) once per year and online. This presentation of the annual report has a legal deadline of six months from the fiscal year end. For the vast majority of firms, the fiscal year end is also the calendar year end, that is, the 31st of December every year. Thus, in the latter circumstance, the deadline for uploading the annual report is the 30th of June the following year.

In order to enhance the context of the violation further, we distinguish between mild and severe delayers in further analysis. Namely, as a mild delay, we consider a delay of up to 365 days (i.e., one year) and a severe delay is over 365 days. Such coding is based on the Estonian legal considerations. Namely, according to the Estonian Commercial Code, this is the minimal date after which the Estonian Business Register can start the deletion procedure of a firm because of not submitting the annual report. We base the severity of the submission delay on this legal consideration to avoid a subjective selection of the relevant break-even time. The usage of two types of violators enables us to study, how non-violators differ from either modest or severe violators, but also, how modest and severe violators differ from each other. It is not rational to distinguish between different types of non-violators, as firms can freely choose when to submit their annual report during the legally allowed half-year period after the end of the fiscal year, and usually, they do it in June.

3.3. Independent Variables

Based on the motivation in the literature review section, we use three dimensions, further splitting them into six independent variables portraying corporate governance characteristics of a firm (see Table 1). The independent variables were calculated mostly based on their formulas in previous studies.

For capturing the ownership concentration, variable MAJORITY is used, which indicates in a binary form, whether there is a majority owner (i.e., having more than 50% of the shares) present. According to the Estonian regulation, an owner having more than 50% has the power to decide upon most of the actions in a firm, thus the usage of that threshold is well-motivated with legislation. Another variable for the concentration dimension is managerial ownership. To portray managerial ownership, the variable BOARDOWNER is used, which is a ratio of shares owned by the board members to the total shares. Thus, this variable directly portrays the overlap between the two levels of corporate governance (i.e., owners and board members). It must be emphasized, that the Estonian SMEs are subject to a two-level corporate governance system, in which the board is subordinate to owners directly, while the board members are legally responsible for all firm's activities.

For the demographic diversity dimension, the manager's age is portrayed with MANAGERAGE, which is calculated as the biological age of the oldest board member. Although in previous studies the mean age of board members has been used as well, it does not suit herewith, as we intend to capture the life experience available on the board, not the average experience. Furthermore, as a large proportion of firms have single-person boards, the usage of mean age would not be a suitable option. The context of gender is captured with the presence of a woman on the board (reflected with a binary variable WOMAN obtaining 1 on that occasion and 0 otherwise). In studies focusing on larger firms, a gender proportion has been used, but that option is not suitable in the case of SMEs, of which the overwhelming majority have only one or two individuals on the board.

Table 1. Variables in the analysis.

Dimension	Variable Coding	Variable Content	Expected Sign
Dependent variable			
TADV dependent variable	BINARYDELAY	Whether a firm violated the annual report submission date at least by 1 day (coded as 1) or not (coded as 0)	
Independent variables			
Concentration dimension's independent variables	MAJORITY (for H1a)	Whether there is a single majority owner (i.e., >50%) in the firm (coded as 1) or not (coded as 0)	+
	BOARDOWNER (for H1b)	Share of the stock the board members hold divided by total stock	+
Diversity dimension's independent variables	MANAGERAGE (for H2a)	Biological age of the oldest board member	-
	WOMAN (for H2b)	Whether there is a woman on the board (coded as 1) or not (coded as 0)	-
Experience dimension's independent variables	TENURE (for H3a)	Tenure length of the longest serving board member in years	-
	TIES (for H3b)	Number of other board memberships the board members hold	-
Control variable	BOARDSIZE	Number of board members	

Source: own elaboration. Note: for robustness tests, BINARYDELAY is recoded to account for mild and severe violators (see also Sections 3.2 and 3.4).

For the experience dimension, business ties are portrayed with the variable TIES, which reflects the number of board memberships in other firms the board members of the firms under question hold. Thus, this variable reflects the scope of ongoing business experience outside the firm under question. Managerial tenure is captured with the variable TENURE, which reflects the time in years the longest-serving board member has been on their position. TENURE could also be used as a ratio of the time the longest-serving board member has been on their position to the firm's age. Still, such a ratio would easily lead to overestimating firm-specific experience in the case of (very) young firms. Finally, the control variable reflecting board size is captured by BOARDSIZE, which reflects the number of board members in the firm.

3.4. Statistical Method

In the case of the base model, binary logistic regression (BLR) will be used with BINARYDELAY as the dependent variable and seven corporate governance variables listed in Table 1 as independent or control variables. The model tested with BLR is as follows:

$$\text{BINARYDELAY} = \beta_0 + \beta_1\text{MAJORITY} + \beta_2\text{BOARDOWNER} + \beta_3\text{MANAGERAGE} + \beta_4\text{WOMAN} + \beta_5\text{TENURE} + \beta_6\text{TIES} + \beta_7\text{BOARDSIZE}$$

We will also run three additional BLRs to check how: (a) non-violators differ from mild violators, (b) non-violators differ from severe violators, (c) mild violators differ from severe violators. The latter BLRs help to disclose, how the results vary when the severity of the violation is incorporated into the analysis.

Moreover, in further analysis, we divide the firm population into two subpopulations based on either the median size or median age, in order to check the robustness of the base results with respect to firm size and age differences. Additional BLRs are run in the subpopulations, which enable us to outline how smaller/larger or younger/older firms differ from the base results. The usage of more categories (e.g., breaking the firm population based on size or age quartiles) is not reasoned, as the ranges of size and age variables are not wide enough to justify the usage of a large number of subpopulations. We do not apply size and/or age as control variables due to (serious) multicollinearity issues, which can emerge from applying them with the chosen independent variables (e.g., with variables MANAGERAGE or TENURE).

It is not rational to use different types of logistic regressions (e.g., multinomial or ordered) herewith, as by keeping BLR as the only method, we can exactly compare the coefficients in different models, and by doing that, outline whether the independent variables behave differently when various contexts (i.e., the severity of delay, firm size or age) are altered. Finally, we run bootstrapping with 100 subsamples in order to study, how the coefficients of independent variables vary in the subpopulations of the whole population.

4. Results and Discussion

In the case of using BINARYDELAY as a factor, Welch robust ANOVA indicates (see the descriptive statistics in Table 2) that the means are different for all six independent variables at $p < 0.001$. Thus, all independent variables could potentially exhibit significance in discriminating between (non-)violators in BLR.

The conducted BLR analysis (see Table 3) testing the model specified in Section 3.4 indicates that at $p < 0.05$ level all six independent variables discriminate between (non-)violators, while the control variable BOARDSIZE is significant only at the $p < 0.1$ level. When the presence of a majority owner (MAJORITY) and board memberships in other firms (TIES) lead to a higher likelihood of violation, then in turn older managers (MANAGERAGE), women on the board (WOMAN), longer tenure (TENURE) and a larger amount of shares owned by the board members (BOARDOWNER) all reduce the likelihood of violation. Thus, H1a, H2a, H2b and H3a are supported in BLR, while H1b and H3b are rejected. Although larger boards could to a certain extent exhibit a lower likelihood of delay, the significance level of that variable does not enable to draw any ultimate conclusions, especially when considering the population size used in this study.

Table 2. Descriptive statistics of corporate governance variables.

Firm Type	Statistic	MAJORITY	BOARDOWNER	MANAGERAGE	WOMAN	TENURE	TIES	BOARDSIZE
Non-violators	N	54,081	54,081	54,081	54,081	54,081	54,081	54,081
	Mean	0.81	0.88	47.30	0.38	8.01	1.41	1.31
	Std. Dev.	0.39	0.28	11.84	0.48	5.22	2.10	0.57
	Median	1.00	1.00	46.44	0.00	6.79	1.00	1.00
	Min.	0.00	0.00	18.73	0.00	0.50	0.00	1.00
	Max.	1.00	1.00	92.56	1.00	20.28	10.00	7.00
Violators	N	23,131	23,131	23,131	23,131	23,131	23,131	23,131
	Mean	0.84	0.87	44.25	0.35	6.88	1.67	1.28
	Std. Dev.	0.37	0.30	11.29	0.48	4.74	2.36	0.54
	Median	1.00	1.00	42.94	0.00	5.59	1.00	1.00
	Min.	0.00	0.00	19.32	0.00	0.50	0.00	1.00
	Max.	1.00	1.00	93.60	1.00	20.24	10.00	7.00
Total	N	77,212	77,212	77,212	77,212	77,212	77,212	77,212
	Mean	0.82	0.88	46.39	0.37	7.67	1.49	1.30
	Std. Dev.	0.39	0.28	11.76	0.48	5.11	2.18	0.56
	Median	1.00	1.00	45.38	0.00	6.34	1.00	1.00
	Min.	0.00	0.00	18.73	0.00	0.50	0.00	1.00
	Max.	1.00	1.00	93.60	1.00	20.28	10.00	7.00

Source: Own elaboration.

According to our expectation, P1 assumes a positive relationship between both variables of the board's power concentration dimension and TADV. However, our results are inconclusive. The ownership concentration variable enables the support of P1, as high levels of ownership concentration can foster risk-taking, in line with Nguyen (2011). Moreover, minority shareholders might not make much pressure as outside investors who demand more transparency (Carney 2005). Conversely, when managers hold a larger proportion of the shares, they are less likely to be engaged in TADV. As the manager-owners of the firm, they are more engaged/committed to decision-making processes, and in this case, they also have a direct responsibility to face law violations. It can be assumed, that although manager-owners have much information "in the head" (Uhlaner et al. 2007), and thus, are not in need to publish annual reports quickly, they are still more worried about the personal reputation loss and legal consequences of violations.

Table 3. Logistic regression model for BINARYDELAY (0—non-violator, 1—violator).

Variable	B	S.E.	Wald	Sig.	Exp(B)	VIF
MAJORITY	0.222	0.025	77.912	0.000	1.249	1.45
BOARDOWNER	−0.160	0.029	31.356	0.000	0.852	1.09
MANAGERAGE	−0.018	0.001	490.339	0.000	0.982	1.36
WOMAN	−0.079	0.017	20.514	0.000	0.924	1.10
TENURE	−0.028	0.002	224.590	0.000	0.973	1.33
TIES	0.064	0.004	295.859	0.000	1.066	1.13
BOARDSIZE	0.035	0.018	3.551	0.060	1.035	1.63
Constant	0.009	0.050	0.033	0.855	1.009	

Source: Own elaboration. Notes: Average variance inflation factor (VIF) 1.30. See the model's general form in Section 3.4.

Related to the proposition P2, certain demographic characteristics should have a negative relationship with TADV, which found proof with the two variables employed. When members of the board are less risk-prone as women, have more life-experience measured as being biologically older, then the probability of TADV is lower. According to prior studies, age and gender are two relevant conditions against risk, that is, older managers and women are more risk-averse than young ones and men (Jianakoplos and Bernasek 1998; Troy et al. 2011; Ho et al. 2015). In addition, female directors are more likely to be objective and independent (Fondas 2000), therefore decreasing risk-taking (Elsaid and Ursel 2011), and thus, also following rules and official requirements to disclose financial information on time. Older managers with experience are less involved in dishonest and unethical behaviours than young ones (Troy et al. 2011; Ortiz-de-Mandojana et al. 2018). This could be due to the fact that old managers have experienced other law violations in their business life, which could have had negative consequences, for instance in the form of fees, penalties, reputation reduction, or decreases of credit ratings. Thus, they do not want to conduct more misbehaviours.

Regarding the third proposition P3 reflecting board experience, firms are supposedly less risk-taking when their managers have more experience, but proof for this was found only by using the TENURE variable. Being engaged in a firm for a longer period makes the managers more capable of consolidating financial information quicker, but also, they might have witnessed the negative consequences of TADV already before. In turn, being a board member in other firms acts in the opposite way. While multiple directorships are related to uncommon skills and strong abilities in both monitoring and advising (Falato et al. 2014; Harris and Shimizu 2004), such individuals could be busy directors who may lack the time needed to execute their monitoring well (Johnson et al. 2013; Jiraporn et al. 2009). However, some empirical research has concluded that "criticisms levelled against these directors may be unfounded" (Harris and Shimizu 2004, p. 791), and perhaps, there are other potential explanations related to this variable.

Our results show that board size is not associated with TADV. This might be because the board size in private firms is very small and many times is made up of the unique owner who is also the unique manager. In addition, when there are more members in private firms' boards, they could also be from the same family, therefore making the same decisions as they are defending the same interests (Zona 2015).

Table 4 extends the base BLR analysis by introducing different types of violators. When violators are broken into two types, that is, mild violators (up to 365 days delay) and severe violators (more than 365 days delay), an interesting feature is that the significances and effect directions of independent variables are not altered, although the magnitude of the effect of specific variables can (largely) vary. It is possible to generalize that when comparing non-violators with a specific type of violator (either mild or severe), in case of all independent variables, the effect is always stronger in the case of severe violators. Many independent variables are not significant when distinguishing between mild and severe violators, namely only two variables (i.e., MANAGERAGE and TENURE) are significant at $p < 0.01$. Thus, violators differ more from non-violators than different violators differ between themselves.

As the effects in the case of mild violators are not as strong, we can suggest that perhaps the decision to follow or not the disclosure regulation in the case of mild violators could be the case of "carelessness". Such managers do not really want to violate the regulation, but for instance, when the composition of the annual report is left "to the last minute", it cannot be prepared on time and perhaps not all board members can accept and sign the report enough quickly. The latter "carelessness" logic is corroborated by prior studies such as Cheng (2008) or Arosa et al. (2013).

Table 4. Additional logistic regression models for the subpopulations of BINARYDELAY in comparison with the base model.

	All Firms (0 Non-Violator; 1 Violator)		**Subpopulation 1 (0 Non-Violator; 1 Mild Violator)**		**Subpopulation 2 (0 Non-Violator; 1 Severe Violator)**		**Subpopulation 3 (0 Mild Violator; 1 Severe Violator)**	
Variable	**B**	**Sig.**	**B**	**Sig.**	**B**	**Sig.**	**B**	**Sig.**
MAJORITY	0.222	0.000	0.214	0.000	0.232	0.000	0.053	0.254
BOARDOWNER	−0.160	0.000	−0.121	0.000	−0.223	0.000	−0.114	0.020
MANAGERAGE	−0.018	0.000	−0.017	0.000	−0.020	0.000	−0.004	0.002
WOMAN	−0.079	0.000	−0.063	0.002	−0.111	0.000	−0.059	0.063
TENURE	−0.028	0.000	−0.010	0.000	−0.072	0.000	−0.064	0.000
TIES	0.064	0.000	0.064	0.000	0.066	0.000	0.005	0.456
BOARDSIZE	0.035	0.060	0.053	0.011	−0.025	0.425	−0.068	0.048
Constant	0.009	0.855	−0.593	0.000	−0.636	0.000	−0.023	0.795

Source: Own elaboration. Note: All firms, 54,081 non-violators and 23,131 violators, SP1 54,081 non-violators and 15,917 mild violators, SP2 54,081 non-violators and 7214 severe violators, SP3 15,917 mild violators and 7214 severe violators. See the model's general form in Section 3.4.

Table 5 provides additional BLR models in case the applied population of firms is broken in two based on either median size or age of firms. Likewise, with the violation context, the BLRs focusing on different size or age groups indicate that the variables are significant and the effects are in the same direction, but the magnitudes of the effects vary. Still, unlike with the violation context, there is more variation with respect to whether smaller/larger size or younger/older age of firms leads to the independent variable having a weaker/stronger effect in distinguishing between (non-)violators.

Table 5. Additional logistic regression models of BINARYDELAY for smaller/larger and younger/older firms in comparison with the base model.

Variable	**All Firms**		**Smaller Firms**		**Larger Firms**		**Younger Firms**		**Older Firms**	
	B	**Sig.**	**B**	**Sig.**	**B**	**Sig.**	**B**	**Sig.**	**B**	**Sig.**
MAJORITY	0.222	0.000	0.209	0.000	0.250	0.000	0.115	0.001	0.338	0.000
BOARDOWNER	−0.160	0.000	−0.196	0.000	−0.154	0.000	−0.238	0.000	−0.121	0.004
MANAGERAGE	−0.018	0.000	−0.017	0.000	−0.018	0.000	−0.015	0.000	−0.020	0.000
WOMAN	−0.079	0.000	−0.122	0.000	−0.070	0.010	−0.058	0.013	−0.110	0.000
TENURE	−0.028	0.000	−0.027	0.000	−0.021	0.000	−0.028	0.000	−0.016	0.000
TIES	0.064	0.000	0.057	0.000	0.078	0.000	0.055	0.000	0.071	0.000
BOARDSIZE	0.035	0.060	0.113	0.000	−0.021	0.406	0.019	0.481	0.049	0.051
Constant	0.009	0.855	0.026	0.712	−0.114	0.113	0.109	0.130	−0.196	0.009

Source: Own elaboration. Note: For the distinction of smaller/larger and younger/older firms, the population is broken in two based on median size (natural logarithm of total assets) 9.98 or median age (firm age in years at 30 June 2015) 7.34. See the model's general form in Section 3.4.

When the BLR is run with another fiscal year (i.e., 2015), the results are not altered (see Table A1). Namely, the only variable clearly not significant, likewise with the base model calculated by using the fiscal year 2014, is the control variable BOARDSIZE. In turn, in the case of independent variables, the signs of the coefficients remain the same and absolute values of the coefficients are very similar, like for the base model documented in Table 3. Thus, the results are robust with respect to the year chosen for analysis. Table A1 also shows the bootstrapping results for the year 2014. In a 100-sample bootstrapping, the signs of independent variables' coefficients do not change for the lower and upper 95% confidence intervals, thus the subpopulations of firms are quite similar to the findings obtained

with the base regression model on the whole population documented in Table 3. The bootstrapping result is an expected scenario based on the age and size contexts in Table 5, which also do not indicate the change in variables' signs.

The results of the study are consolidated into Table 6, which in future research can be used as a benchmark for the association of timely accounting disclosure violation and corporate governance attributes in SMEs. As a contribution to the literature, we found that certain demographic attributes in the board make them less likely to be violators of the accounting regulation, while the power concentration and experience on the board can lead to varying violation behaviour, depending on what variable of the specific dimension is considered. In addition, corporate governance characteristics have more pronounced effects on the violation probability when the violation becomes more severe.

Table 6. Summary of the associations found in this study.

Corporate Governance Dimension	Variable	Base Effect on Violation	Context of Size	Context of Age	Context of Violation Length
Power Concentration (Proposition 1 inconclusive)	MAJORITY (H1a accepted)	Increases	Effect stronger in larger firms	Effect stronger in older firms	Effect stronger for severe violators
	BOARDOWNER (H1b rejected)	Decreases	Effect stronger in smaller firms	Effect stronger in younger firms	Effect stronger for severe violators
Demographic Diversity (Proposition 2 true)	MANAGERAGE (H2a accepted)	Decreases	Effect stronger in larger firms	Effect stronger in older firms	Effect stronger for severe violators
	WOMAN (H2b accepted)	Decreases	Effect stronger in smaller firms	Effect stronger in older firms	Effect stronger for severe violators
Entrepreneurial Experience (Proposition 3 inconclusive)	TENURE (H3a accepted)	Decreases	Effect stronger in smaller firms	Effect stronger in younger firms	Effect stronger for severe violators
	TIES (H3b rejected)	Increases	Effect stronger in larger firms	Effect stronger in older firms	Effect stronger for severe violators

Source: Own elaboration. Note: The first column includes the result for the three research propositions (either true, inconclusive or false; inconclusive means one true and one false evidence), while the second column includes the result for the acceptance/rejection of postulated six hypotheses.

5. Conclusions and Future Research

The objective of this research was to analyse the association between corporate governance characteristics and timely accounting information disclosure violations in private SMEs. Relying on an SME population in a developed European economy, namely Estonia, a set of theoretically motivated corporate governance (independent) variables was studied with annual report submission delays (as the dependent variable) in different logistic regression analyses. Evidence was found that certain demographic diversity in the board (as portrayed by women on the board and managers' older age) reduces the likelihood of violation, while variables portraying power concentration (managerial ownership and ownership concentration) and board experience (tenure length and business ties) provided mixed results.

Varying stakeholders can benefit from the results of this study. First, as non-timely disclosure has been proven to be associated with either financial distress or bankruptcy (Altman et al. 2010; Lukason 2013; Luypaert et al. 2016; Lukason and Camacho-Miñano 2019), creditors can account specific corporate governance characteristics in case of lengthy delays. In the latter circumstance, financial information from the past can already be obsolete, and thus, non-financial variables could be of remarkable value to predict distress or bankruptcy. Second, based on the results, state institutions monitoring timely submission have a better understanding, which corporate governance characteristics in association with firm size and age can lead to a law violation with a higher likelihood. The latter enables, for instance, the targeting of likely lengthy violators earlier to guarantee better transparency in the business environment. Last but not least, as the general foundation of this study was risk behaviour more broadly, the findings can provide valuable hints, which corporate governance characteristics could potentially be triggers for other risk behaviour types.

Finally, this paper is not free from limitations, being fully related to future research proposals. First, our paper is focused on one country, Estonia, and thus, our findings could be altered by the peculiarities of this country, for example, the accounting disclosure (violation) legal framework and its implementation. Future research could be conducted in other countries in order to check whether cultural or legal settings have an impact on how corporate governance is linked to accounting disclosure violations. Second, our approach to corporate governance is limited to a certain set of dimensions and variables portraying them, and thus, future research could be enhanced to account more for psychological or personal characteristics such as ethical level, past violation behaviour or past training/education of managers. Third, although the results were validated with another fiscal year, the violations could be studied in a longer time frame, to either detect certain disclosure pattern changes or even consider corporate governance changes, should these occur.

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Appendix A

Table A1. Model composed with another fiscal year 2015 and bootstrapping results for the year 2014.

Variable	B-2014	Sig.-2014	B-2015	Sig.-2015	BS 95% CI Lower	BS 95% CI Higher
MAJORITY	0.222	0.000	0.189	0.000	0.165	0.277
BOARDOWNER	−0.160	0.000	−0.169	0.000	−0.219	−0.089
MANAGERAGE	−0.018	0.000	−0.014	0.000	−0.019	−0.016
WOMAN	−0.079	0.000	−0.066	0.000	−0.124	−0.049
TENURE	−0.028	0.000	−0.014	0.000	−0.032	−0.024
TIES	0.064	0.000	0.053	0.000	0.057	0.074
BOARDSIZE	0.035	0.060	0.010	0.593	−0.001	0.066
Constant	0.009	0.855	−0.337	0.000	−0.069	0.095

Source: Own elaboration. Notes: BS—bootstrapping, CI—confidence interval. BS results were obtained with 100 bootstrap samples for the year 2014 population. B and Sig.—coefficient and *p*-value either for the whole populations from 2014 or 2015.

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Does Corporate Governance Compliance Increase Company Value? Evidence from the Best Practice of the Board

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Abstract: Drawing upon agency theory, we address the limitations of best practice code in the context of emerging governance, emphasizing the role of concentrated ownership. While the code provisions were formulated in developed countries, the transfer of one-size-fits-all guidelines may not address the characteristics and challenges of emerging and post-transition economies. Specifically, we emphasize that provisions of corporate governance codes are aimed at solving the principal–agent conflict between shareholders and managers. These guidelines may remain limited in addressing principal–principal conflicts between majority and minority shareholders and have either a lesser effect on valuation or none at all. Using a unique sample of 155 companies listed on the Warsaw Stock Exchange during the period 2006–2015, with hand-collected data from declarations of conformity, we tested the hypotheses on the link between corporate governance compliance (with board) practice and company value. The period of 2006–2015 was chosen deliberately, due to the relative stability of corporate governance code recommendations over this time. The results of our panel model reveal a negative and statistically significant relation between corporate governance compliance and company value. We contribute to the existing literature providing new evidence on compliance practice in the context of concentrated ownership, and the limited effect of code provisions in addressing structural challenges of corporate governance in emerging post-transition economies and hierarchy-based control systems.

Keywords: corporate governance best practice; corporate governance compliance; company value; Warsaw Stock Exchange

1. Introduction

The adoption of best practice codes has been one of the most influential trends in corporate governance in the last 20 years (Aguilera and Cuervo-Cazura 2004; Zattoni and Cuomo 2008; Cuomo et al. 2016), being noted in both developed and emerging economies. Conceptually, codes of best practice offer self-regulation for companies (Hooghiemstra and van Ees 2011) and aim to resolve the inherent principal–agent conflict, strengthen monitoring tools over management and limit the power of corporate officials (Pritchett 1983). As a result, corporate governance guidelines reduce information asymmetry, empower shareholders, and lower agency costs (Chang 2018). Despite institutional differences across corporate governance regimes, the code provisions remain similar (Cicon et al. 2012; OECD 2015). In practice, the set of recommendations on board work, and the structure of executive remuneration and standards of transparency have been viewed as a systemic response to corporate governance inefficiencies identified during disruptive corporate scandals (Aguilera et al. 2009; Krenn 2015).

Prior studies identify the value added by the adoption of best practice. The positive effects for those companies complying with corporate governance principles relate to increased investor trust and lower risk (Durnev and Kim 2005). With greater transparency, investors are more interested in allocating their funds in company stocks. Compliance also leads to enhanced company reputation, lower cost of capital, better performance, higher return on investment, and higher market valuation (Mazotta and Veltri 2014; Kaspereit et al. 2017). Nevertheless, despite the belief in the positive effect of higher compliance, scholars have addressed limitations in the transfer of Anglo-Saxon corporate governance guidelines to countries having different institutional environments and company characteristics (Chen et al. 2011). The criticism of the one-size fits-all approach indicates the structural differences in ownership structure, cultural norms, and socializing patterns, which may result in problems of code implementation, such as an instrumental approach to adoption (Fotaki et al. 2019), manipulation (Okhmatovskiy and David 2012), and decoupling (Martin 2010; Sobhan 2016). These issues may reduce compliance benefits and limit the effect of higher valuations.

In countries characterized by concentrated ownership and wedge between control and cash-flow rights, the conflicts between majority and minority shareholders become the prime concern of corporate governance (La Porta et al. 1999; Bennedsen and Nielsen 2010; Hamadi and Heinen 2015; Huu Nguyen et al. 2020). While the flexibility of the codes and the universalism of best practice enable the adoption of code guidelines for a concentrated ownership environment, in compliance terms, it remains the decision of powerful blockholders as to whether they constrain themselves in exerting their power over the company and their willingness to share "control of control" (Perezts and Picard 2015). The gap between "formal adoption of structures and their actual daily use" (Perezts and Picard 2015, p. 833) or the lack of congruence between enacted values and espoused values (Fotaki et al. 2019) are more likely to occur in countries with insufficient investor protection, inadequate transparency standards, and weak institutions. These conditions, accompanied with ownership concentration, happen to materialize in developing countries, as well as emerging and post-transition economies (Huu Nguyen et al. 2020). Implementing codes of best practice in the context of what is termed "emerging governance" reveals a different logic, since "arrangements adapt and evolve over time", as a result of "the co-habitation of different institutional, regal and ownership tradition and assumptions from more established governance models" (Mahadeo and Soobaroyen 2016, pp. 739–40).

In this paper, we aim to add to the existing literature on corporate governance compliance in developing and emerging markets (Outa and Waweru 2016; Sarhan and Ntim 2018), in addition to smaller economies (Chang 2018), and to deliver insights on the implementation of best practice codes in a post-transition and post-communist economy (Okhmatovskiy and David 2012; Albu and Girbina 2015). In this light, we pose a question concerning the market valuation effect for the implementation of best practice codes. Drawing upon agency theory, we address the limitations of best practice codes in an emerging governance context, emphasizing the role of concentrated ownership. While the existing literature emphasizes that the prime objective of best practice implementation lies in creating conditions to attract investors to invest funds (Chang 2018), the reality of operating in the context of concentrated ownership may offer different incentives for blockholders (Chen et al. 2011). Compliance per se may be seen in terms of a cost, a loss of power, or a threat from the exposure of internal structure to the scrutiny of the general public. We study the link between compliance practice and company value in relation to ownership concentration and ownership by distinct shareholder types, including financial, individual, industry, CEO, and state.

The contribution of the paper is twofold. Firstly, we provide much-needed evidence on longitudinal compliance practice in an unfavorable environment of insufficient investor protection, concentrated ownership, and a hierarchy-based corporate governance system under a post-communist legacy. We study the scope and dynamics of compliance with best practice in the context of reemerging trust and civic society, yet where institutions and the legal system are still insufficiently effective. Secondly, developing further the approach proposed by Chen et al. (2011) on the limitations of best

practice adoption in emerging markets, we analyze the relations between compliance practices and company value.

The remainder of this paper is organized as follows. First, we outline the concept of corporate governance best practice by recourse to agency theory, which explains the motivation for compliance. We explain practices by listed companies in the context of emerging governance, concentrated ownership, and a hierarchy-based control system. Then, we present prior studies on the relations between corporate governance compliance and company value and performance. This is followed by a presentation of our research design, presenting our study sample, data collection, descriptive statistics, and econometric models. Our analysis is based on a sample of 155 companies listed on the Warsaw Stock Exchange in the years 2006–2015. The period of 2006–2015 was chosen deliberately, due to the relative stability of corporate governance code recommendations. Our findings suggest that implementing new corporate governance practice is an incremental process. Descriptive statistics are consistent with prior studies on emerging and post-transition countries and demonstrate a slow but steady increase in the number of complying companies, though still lagging behind well-established economies (Albu and Girbina 2015; Chang 2018). The results of the constructed models reveal a statistically significant and negative relationship between all three constructed measures of compliance and firm value as measured by Tobin's Q. We discuss implications for theory and practice and formulate suggestions for further research in the final sections.

2. Corporate Governance Best Practice

2.1. Corporate Governance Code in the View of Theory

The existing literature analyzes corporate governance from the perspective of inherent conflicts which exist in the organization context and are explained by agency theory (Fama and Jensen 1983; Shleifer and Vishny 1997). According to agency theory, the conflict between shareholders and managers arises from the separation of ownership and control (Jensen and Meckling 1976), observed predominantly in the context of dispersed ownership structure. The principal–agent conflict, known as the agency conflict of type I, refers to information asymmetry and differences in time horizon and risk diversification opportunities, which characterize the relation between shareholders and managers (Jensen and Meckling 1976). The theory explains that managers may have the tendency of maximizing their own wealth, acting at the cost of shareholders (Fama and Jensen 1983; Shleifer and Vishny 1997).

Given that dispersed ownership, which offers an ideal environment for the emergence of principal–agent conflict, remains in a global context more the exception than the rule (La Porta et al. 1999) more interest in corporate governance studies has been devoted to concentrated ownership (Su et al. 2008; Loyola and Portila 2019). While concentrated ownership provides a natural mechanism for mitigating principal–agent conflict (Coffee 1999; Berglöf and Claessens 2006), it leads to the emergence of the agency conflict type II, which refers to the relations between majority and minority shareholders (Wang and Shailer 2015; Edmans 2014; Khan et al. 2020). Principal–principal conflicts materialize in the majority shareholders' actions related to investment and dividend policy, in order to enjoy private benefits (Gilson and Schwartz 2013) and to extract value from the company at the expense of minority investors (Krivogorsky and Burton 2012; Wang and Shailer 2015). In addition, majority investors tend to appoint their own representatives to the board to limit the access to information and decision-making for minority investors (Shleifer and Vishny 1997).

Agency conflicts are inherent in organizations and remain naturally linked to more complex ownership structures characterized by the presence of shareholders who differ in terms of their type (industry, family, and financial), as well as the size and the time horizon of their investment (Hamadi and Heinen 2015). In reaction to these conflicts, corporate governance offers a set of mechanisms and institutions for reducing potential problems by aligning the interests of managers with the interests of shareholders and by aligning interests of majority and minority shareholders. This alignment can be exerted with monitoring and incentive schemes. Monitoring exercised by internal forces, such as ownership, board

composition, and structure, and by external mechanisms, including markets for corporate control, competitive labor markets, shareholder activism, rating agencies, and media (Aguilera et al. 2015; Elgharbawy and Abdel-Kader 2016) is expected to reduce agency conflicts. Despite ongoing efforts to formulate and enforce principles, "effective corporate governance still remains a puzzle for practice and research" (Fotaki et al. 2019, p. 1).

Best practice codes offer corporate governance principles on oversight and control over the firm (Cuervo 2002; Aguilera and Cuervo-Cazura 2004; Chizema 2008; Tricker 2012). The best practice concept assumes voluntary adoption according to the comply or explain rule, providing flexibility in terms of scope and pace for implementing code recommendations (Tan 2018). It is viewed an example of self-regulation of listed companies (Hooghiemstra and van Ees 2011). The codes address selected dimensions of corporate governance, such as functioning of the board, shareholder rights, transparency, auditing, and remuneration (OECD 2015), and they are designed to provide principles and norms for creating shareholder value (Mallin 2004). The codes offer widely recognized and accepted guidelines for addressing governance inefficiencies (Lipman 2007; Arcot et al. 2010; Tricker 2012) and are often inspired by international organizations, such as the OECD, or regulatory and supervision authorities, such as the European Commission (e.g., the European Commission Communication 284 to the European Council and the European Parliament) or the US Securities and Exchange Commission.

In the conceptual framework of agency theory, the adoption of code provisions is expected to mitigate information asymmetry and reduce conflicts between shareholders and managers. Increasing disclosure and addressing the problems of hidden action, hidden information, and hidden intention compliance lower investment risk and enhance investor trust (Durnev and Kim 2005; (Mazotta and Veltri 2014; Kaspereit et al. 2017). In the context of ownership concentration, majority shareholders may be motivated for compliance by the assumption that their interests are "interchangeably merged with the interests of the corporate entity and whatever is good for the society must be good for the corporation in the long run" (Pritchett 1983, p. 997). This resonates in the commitment to adopt the rules of fairness, an ethical stance which is in the best interests of the company. Blockholders may decide to voluntarily constrain themselves in exerting their power over the company and by their willingness to share "control of control" (Perezts and Picard 2015), driven by the notion that "corporate actions are related to long run corporate benefit and there is no taint of self-dealing or conflict of interests" (Pritchett 1983, p. 997).

Implementing the code is driven by numerous reasons. Firstly, the idea of self-regulation and "soft law" provided by the code assumes that the market monitors compliance. This means that investors express their acceptance of conformity with the code via increasing their holdings of a company's shares, leading to an increase of company value (Gompers et al. 2003; Black et al. 2006; Goncharov et al. 2006; Renders et al. 2010). Consequently, investors penalize non-complying companies through selling their shares (Easterbrook and Fischel 1996).

Secondly, the code principles are formulated according to the needs and interests of institutional investors, for whom high conformity translates into high trust towards the company management (Arcot et al. 2010). Compliance with internationally recognized and easily comparable standards increases transparency and lowers the risk associated with firm operation (Bistrowa and Lace 2012). In a sense, greater compliance is understood as higher protection of shareholder interest.

Thirdly, corporate governance conformity not only aims to develop efficient monitoring and oversight to protect shareholder value, but also aims to legitimize the presence of the firm on the stock market. Competition between companies to attract investors and raise funds for growth generates coercive or normative imitation (Guler et al. 2002). According to the legitimization perspective, companies implement new practices in order to enjoy the benefits of meeting social expectations. "If practices become institutionalized, their adoption brings legitimization to the adopting organization or social system" (Aguilera and Cuervo-Cazura 2004, p. 422). Firms are differently motivated to comply with best practice, and such conformity does not necessarily result in greater efficiency or effectiveness. The declaration of conformity issued by listed companies may either fail to lead to better performance or

higher firm value, or else it may not necessarily be motivated by the strategy of increasing shareholder value. Instead, compliance may be a product of the endogenously determined structure of internal firm governance or result from isomorphic dynamics driven by the firm's legitimization policy (Hermalin and Weisbach 2003).

In sum, according to agency theory, firms operate in an economically rational way and search for practices and organizational solutions that improve performance with respect to resources utilized and effectiveness (Williamson 1981). Thus, the decisions on corporate governance compliance and the implementation of best practice are undertaken for the purpose of obtaining efficiency gains (Aguilera and Cuervo-Cazura 2004). The process of innovation diffusion introduces new solutions, improves company performance, and is driven by technical and rational needs (Zattoni and Cuomo 2008). It is motivated by rational arguments and is expected to improve company efficiency. Thus, well-performing companies which previously met shareholder expectations with respect to financial results, share price, and company value are more responsive to formal requirements and shareholder expectations with respect to the board's functioning, structure, and composition, as well as transparency standards and remuneration policy. Compliance with the code recommendations constitutes a signal for investors that the firm, its executives, and board directors aim at protecting shareholder interests and endeavor to enhance shareholder value (Hermes et al. 2007).

2.2. Corporate Governance Code and Company Value

Studies on corporate governance compliance offer a wide range of qualitative and quantitative analyses revealing the degree, scope, and dynamics of compliance (Seidl et al. 2013; Shrives and Brennan 2015; Okhmatovskiy 2017), in addition to its relation to company performance and value (Stiglbauer and Velte 2014; Rose 2016; Roy and Pay 2017). Conceptually, studies are based on the assumption that companies with poor corporate governance should have lower valuations in comparison to companies with effective corporate governance, since investors do not tolerate higher risk of expropriation without receiving a premium for such investments (Gompers et al. 2003; Goncharov et al. 2006). A positive link between the quality of governance and performance is observed in studies on European (Drobetz et al. 2003; Gompers et al. 2003; Bauer et al. 2004; Goncharov et al. 2006; Renders et al. 2010; Bistrowa and Lace 2012), Japanese (Aman and Nguyen 2007), and American (Bhagat and Bolton 2008) companies.

Specifically, a series of studies analyze the dynamics of compliance with corporate governance codes and the link between the compliance and firm performance. Goncharov et al. (2006) examine the declared degree of compliance for a sample of German DAX30 and MDAX listed firms and find that "the compliance with the Code is value-relevant after controlling for endogeneity bias" (Goncharov et al. 2006, p. 432). Research on a sample of 140 German companies reveals that companies with a higher value of Tobin's Q are more likely to comply with the recommendation on disclosing the remuneration schemes of individual directors (Andres and Theissen 2008). A study on a large sample of 1199 observations on FTSE companies and 33,667 observations of Worldscope firms (Renders et al. 2010) shows that—when controlling for endogeneity by introducing instrumental variables and eliminating the sample selection bias—there is a positive link between the quality of corporate governance (measured by the rating variable) and company performance. The strength of this relationship depends on the quality of the institutional environment, while "improvements in corporate governance ratings over time result in decreasing marginal benefits in terms of performance" (Renders et al. 2010, p. 87). A positive link between company performance measured by return of equity (ROE) and return on assets (ROA) indicators and total corporate governance comply or explain disclosure scores is noted in a sample of Danish firms (Rose 2016). This study indicates a positive effect for two categories: board composition and remuneration policy, while no impact on performance is reported for increasing compliance with the recommendations on risk management and internal controls.

Similar results are shown in a study on the impact of corporate governance quality on stock performance in a sample of 116 firms from 10 Central and Eastern European countries for the period of 2008–2010 (Bistrowa and Lace 2012). Based on the model rating, the firms characterized by the highest

corporate governance quality (top 25%) outperformed companies with the worst corporate governance quality (bottom 25%) by 0.98% on a monthly basis.

Although studies document a positive association between corporate governance compliance and firm value and performance (Goncharov et al. 2006; Renders et al. 2010; Rose 2016), the opposite may also be true (Bhagat and Black 2002). The assumed effect referring to higher company valuation, increased legitimization towards constituencies, and positive ethical spillovers may be constrained by a number of reasons. Firstly, the pricing effect takes place when investors believe in the reliability of information provided by firms to the market. This may not necessarily be the case, as the declaration of conformity is neither verified nor audited. Moreover, companies may choose to comply with provisions which are either relatively easy to follow or which appear useless from an investor standpoint (Goncharov et al. 2006; Sobhan 2016).

Secondly, the voluntary approach to compliance and the absence of enforcement mechanisms may lower the credibility of the conformity statement and may weaken the positive economic consequences (Healy and Palepu 2001; Goncharov et al. 2006). With the given institutional and ownership characteristics in emerging and post-transition economies, codes of best practice aim to resolve the inherent principal–principal conflict and add to the protection of minority investors (Mahadeo and Soobaroyen 2016). In spite of this, "publicly mandated commitment to corporate governance, business ethics and legal compliance" (Adelstein and Clegg 2016) is significantly constrained. Insufficient enforcement mechanisms, combined with institutional skepticism, increases "the declarative and instrumental use of corporate governance structures and their actual daily use" (Perezts and Picard 2015, p. 833). This can lead, as shown in a study on Hungary, to a "disjuncture between formal commitment to code adoption and its effective implementation" (Martin 2010, p. 145). Therefore, the effective implementation of codes of best practice depends on the perceived benefits and costs by majority shareholders.

Thirdly, compliance with the code guidelines may be viewed as explicit information on the corporate governance structure and standards for board functioning and investor protection. The declaration of conformity issued by listed companies may either not lead to better performance or higher firm value or not necessarily be motivated by a strategy of increasing shareholder value. Instead, compliance may be a product of the endogenously determined structure of internal firm governance or result from the isomorphic dynamics driven by company legitimization policy. Research reveals the impact of endogeneity in the process of board formation and monitoring (Hermalin and Weisbach 2003). The legitimacy driven effect should be particularly strong for poorly performing companies, which, by publishing a declaration of corporate governance conformity, intend to compensate shareholders reacting to unsatisfying financial results.

Fourthly, while we acknowledge the contribution of agency theory, we also consider the limitations of the rationale approach to corporate governance compliance. Since legitimacy is crucial for organization survival, as it provides access to resources from the environment (Deephouse 1996; Mizruchi and Fein 1999), companies may be "prone to construct stories about their actions that correspond to socially prescribed dictates about what organization should do" (Mizruchi and Fein 1999, p. 656). In addition, companies may tend to declare adherence with corporate governance principles without any substantive compliance.

Fifthly, legitimacy motivation is observed in many companies, regardless of the country of origin or operation. However, in the context of weaker institutions and insufficient investor protection, this declarative character (Okhmatovskiy 2017), overstatement (Sobhan 2016) or instrumental approach (Fotaki et al. 2019) to compliance may result in no effect on market valuation (Gherghina 2015).

We follow the approach proposed by Chen et al. (2011), who argue that the provisions of corporate governance codes are designed around companies in developed economies. They suggest that best practice "cannot mitigate the negative effect of controlling-shareholder expropriation on corporate performance" (Chen et al. 2011, p. 115). This is caused by two main limitations. Firstly, code provisions are designed to solve type I principal–agent problems between shareholders and managers, while they

do not address conflicts between majority and minority shareholders. Secondly, the core of best practice code lies in the guidelines on board structure and operation, which structurally will not be implemented in a concentrated ownership context since majority shareholders appoint their own representatives to the board (Shleifer and Vishny 1997; Ferrarini and Filippelli 2013; Gaur et al. 2015). Put differently, not only are the code provisions not substantively implemented by boards, but they also fail to respond to the structural problems and challenges of corporate governance in emerging economies. Investors do not observe positive effects with regard to lower asymmetry, lower risk, or more efficient oversight; thus, there is no resulting higher valuation. In sum, recognizing the limitations of corporate governance codes in the context of concentrated ownership, we formulate the following hypotheses:

Hypothesis 1a (H1a). *Formal compliance with board best practice is negatively associated with firm value.*

Hypothesis 1b (H1b). *Minimum compliance with board best practice is negatively associated with firm value.*

Hypothesis 1c (H1c). *Substantive compliance with board best practice is negatively associated with firm value.*

3. Research Design

3.1. Sample and Data Collection

We intended to test the hypothesis regarding the link between compliance with best practice and company value on a unique sample of companies listed on the Warsaw Stock Exchange over a long period, during which corporate governance conformity evolves and gradually becomes institutionalized. We purposefully choose sample companies listed over a 10-year period (2006–2015) that are characterized by their relative stability of corporate governance code recommendations. We constructed a balanced panel to investigate companies which were listed over the whole period of our analysis and reveal similar attributes with regard to corporate governance practice. Over the analyzed period, the numbers of companies listed on the Warsaw Stock Exchange varied due to initial public offerings (POs) and delisting, as reported in Table 1.

Table 1. Number of companies listed on the Warsaw Stock Exchange.

Years	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Listed companies	284	351	374	379	400	426	438	450	471	487
Initial public offerings (IPOs)	38	81	33	13	34	38	19	23	28	30
Delisted firms	9	14	10	8	13	12	7	11	8	13

Source: GPW, www.gpw.pl/statystyki.

We start with 284 firms quoted on the Warsaw Stock Exchange in 2006. We eliminate companies operating in the insurance sector, real estate firms, companies with missing observations and those delisted over the analyzed period. Our final sample consists of a balanced panel with 155 companies and 1550 observations. We collect data on company financial characteristics and performance, company value, and ownership structure from the IQ Capital data base. Prior research emphasizes the essential role of the board for mitigating agency costs, for attaining sufficient quality in corporate governance (Khan et al. 2020). Data on compliance include the conformity—or the lack thereof—of a given company with best practice on the following: the presence of two independent directors, information concerning the identification of independent board members, the presence of an independent board chairman, and the formation of an audit committee and remuneration committee on the supervisory board. Due to the absence of such data in any available database, all information on compliance is collected by hand directly from annual reports of the companies in the sample. The analyses were performed, using STATA16 software.

3.2. Variables

We operationalize our variables, following the research procedures adopted in prior studies. We employ Tobin's Q, defined as market value to book value, as our explained variable (Kim et al. 2015). Compliance with board best practice is our explanatory variable. Due to the essential role of corporate governance, we focus on compliance with recommendation on the supervisory board (Seidl et al. 2013; Huu Nguyen et al. 2020). Specifically, we include information on the presence of independent directors on the board, chairman status, the formation of an audit committee and other committees within the supervisory board, and publication of the compliance statement included in the annual report and its size (length). In order to test for the relationship between conformity to best practices and company value, we introduce three compliance variables: formal compliance (FORMALCOMPL), minimum compliance (MINCOMPL), and substantive compliance (SUBSTCOMPL). FORMALCOMPL is constructed as an arithmetic sum of compliance with the best practice on the presence of two independent directors and the formation of an audit committee and remuneration committee on the supervisory board. MINCOMPL is defined as the minimum level of compliance and is the arithmetic sum of compliance with the best practice on the presence of two independent directors and the formation of audit committee on the supervisory board. SUBSTCOMPL refers to substantive, pragmatic compliance and is the arithmetic sum of compliance with the best practice on the presence of two independent directors with the information of board directors who are independent, the presence of an independent board chairman, and the formation of a separate audit committee and remuneration committee on the supervisory board. SUBSTCOMPL is a measure which depicts compliance in substance, rather than its declarative character. Formally, the amendments of the Accounting Act imposed the obligation to form an audit committee within the supervisory board. According to the act, in the case of supervisory board with the minimum legal size of 5 directors, the whole board can function as the committee. We include additional variables which depict (1) whether a company reports the existence of an audit committee within the board, (2) whether the whole board performs the function of the audit committee, and (3) whether a separate committee within the board is formed.

Finally, we use control variables on ownership structure, company size, and financial performance. We operationalize the variables on ownership structure, following prior studies (Thomsen and Pedersen 2000; Krivogorsky and Burton 2012). Specifically, we use ownership variables on concentration (the largest shareholder), in addition to the shareholders' stakes by selected types (financial, foreign, CEO, and government), to control for the impact of ownership on firm value. In both cases, we measure the potential effect of ownership concentration and shareholder identity, using the variable of the size of the stake owned (Krivogorsky and Burton 2012; Florackis et al. 2015). Finally, we use standard control variables covering the company size (assets and debt) and performance (ROA). The list of variables used in the analysis is provided in Table 2.

Table 2. Summary of variables.

Variable	Description	Type
	Regressand	
ln_Q	Natural logarithm of value of Tobin's Q (market value/book value)	Quantitative, real
	Regressors	
FORMALCOMPL	Formal compliance with best practice on the presence of two independent directors, and the formation of an audit committee and remuneration committee on the supervisory board	Quantitative, real
MINCOMPL	Minimal compliance with best practice on the presence of two independent directors, and the formation of an audit committee on the supervisory board	Quantitative, real

Table 2. *Cont.*

Variable	Description	Type
SUBSTCOMPL	Substantive compliance with best practice on the presence of two independent directors with the information who of board directors are independent the presence of an independent board chairman, and the formation of a separate audit committee and remuneration committee on the supervisory board	Quantitative, real
FILASHA_sq	Square root of percentage of company's shares held by the largest shareholder	Quantitative, real
INSTINV_sq	Square root of percentage of company's shares held by financial investors	Quantitative, real
INDUSTINV_sq	Square root of percentage of company's shares held by industry investors	Quantitative, real
CEOSHA	Percentage of company's shares held by the CEO	Quantitative, real
GOVSHA	Percentage of company's shares held by the government	Quantitative, real
ln_ASSETS	Natural logarithm of the value of assets (current prices, million PLN)	Quantitative, real
ADJ_ROA	Sector-adjusted and time-adjusted return of assets ratio (see note below)	Quantitative, real
DEBT	Debt (current prices, million PLN)	Quantitative, real
DEBT_ON_ASSETS	Debt versus assets	Quantitative, real

Note: The value of return of assets (ROA) variable is the value of the return of assets measure of a company, adjusted by the year of observation and the sector it operates in (Vintila et al. 2014). This measure is calculated with the use of the median value of ROA for each sector and year, as follows: $ADJ\ ROA_{it} = sign(ROA_{it} - median\ ROA_{SE,t}) \cdot \sqrt{|ROA_{it} - median\ ROA_{SE,t}|}$, $i = 1, \ldots, 155$; $t = 2006, \ldots, 2015$, where i—number of the company, $SE \in$ {Industry, Services, Construction, Financial}.

3.3. Descriptive Statistics

We transform some variables (as shown in Table 2) into square root or natural logarithm measures for the purpose of constructing econometric models which allow for economic interpretation. Below we report the process of variables transformation, presenting natural values of our variables (Tables 3–8). Table 3 reveals the distribution of our explained variable, Tobin's Q.

Table 3. Distribution of Tobin's Q—number of companies and untransformed variables.

Value	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
(0;1)	13	24	106	57	49	103	96	75	83	83
(1;2)	48	50	29	67	73	42	47	56	46	37
(2;3)	35	29	11	21	25	6	5	14	17	15
(3;4)	24	24	6	5	3	3	2	4	5	9
>4	35	28	3	5	5	1	5	6	4	11

As reported in Table 3, the distributions of Q are one-modal, yet since 2008, they reveal strong positive asymmetry, which means that, over the analyzed period, there are more years characterized with a low value of Q than a high one. A more balanced distribution of Q is revealed in the first year of the analyzed period, while since 2008, we depict the effects of the financial crisis peaking in 2011. Due to the asymmetric distribution, we analyze the median value of Q, as shown in Table 4.

Table 4. Mean value of Tobin's Q by sector and year, and untransformed variables.

Sector	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Median for industrial companies	2.1	2.0	0.7	1.1	1.4	0.7	0.8	1.2	0.9	0.85
Median for services companies	2.35	1.8	0.8	1.1	1.15	0.75	0.7	0.9	0.9	1.00
Median for construction companies	3.05	2.9	1.45	1.65	1.65	0.7	0.8	0.95	0.9	0.8
Median for financial companies	3.8	4.0	1.3	1.65	1.85	1.35	1.45	1.8	1.7	1.25
Median for all companies	2.5	2.0	0.7	1.2	1.4	0.7	0.8	1.0	0.9	0.9
Arithmetic mean for all companies	3.005	2.597	1.048	1.423	1.546	0.974	1.107	1.369	1.228	1.467

Table 4 reveals variations of Q in the specified sectors of operation. The maximum values of Q were noted in the initial years of the analyzed period, with a strong drop in 2008 and some recovery in 2010–2011, followed by a subsequent decline. The recovery of the median Q value in 2013 is mostly evident for industrial companies. Stagnation is observed for service and construction sectors until the end of the analyzed period. A similar trend is noted for companies operating in the financial sector, yet the values of Tobin's Q remain at the higher level. The differences between the median and arithmetic mean confirm the expectation of the positive asymmetry of Q.

Next, we investigate the variability of Tobin's Q over the analyzed period and across the years under consideration, using the standard deviation and average mean, as presented in Table 5.

Table 5. Variability of Tobin's Q, and untransformed variables.

Standard Deviation	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Overall					1.450					
Between	1.976	1.776	0.913	0.916	1.019	0.803	1.063	1.232	1.167	1.597
Between variation coefficient	0.658	0.684	0.871	0.644	0.659	0.824	0.960	0.900	0.950	1.089
Within					1.131					
Within variation coefficient	0.376	0.436	1.079	0.795	0.732	1.161	1.022	0.826	0.921	0.771

The between variation coefficient, which measures the variability of Tobin's Q, has risen since 2009, suggesting the variability of adaptability and capability to survive amongst listed companies. The within variation coefficient is calculated as the quotient within standard deviation, which remains stable across time, and the arithmetic mean of Tobin's Q for the given years (Table 4).

We test the variables used in the econometric analysis, employing the Shapiro–Wilk normality test (null hypothesis assumes normal distribution of variable) and the Harris–Tzavalis stationarity test for a balanced panel (null hypothesis assumes the variable has unit root). Tests are run for the untransformed variables. The results are given in Table 6.

Table 6. Shapiro–Wilk normality test and Harris–Tzavalis stationarity test for variables, and untransformed variables.

Variable	Shapiro–Wilk Test		Harris–Tzavalis Test	
	Critical Value	Prob > z	Critical Value	*p*-Value
Q	13.584	0	−17.101	0
FORMALCOMPL	8.449	0	−7.050	0
MINCOMPL	6.352	0	−6.482	0
SUBSTCOMPL	9.784	0	−7.448	0
FILASHA	9.294	0	−13.845	0
INSTINV	9.907	0	−8.602	0
INDUSTINV	9.685	0	−14.422	0
CEOSHA	14.573	0	−8.548	0
GOVSHA	13.670	0	−8.515	0
ASSETS	16.367	0	−9.385	0
ADJ_ROA	7.998	0	−21.974	0
DEBT_ON_ASSETS	12.692	0	−14.598	0

None of variables have normal distribution and reveal a stationary distribution over the analyzed period at every level of significance. While the absence of a normal distribution of variables may constitute challenges for econometric modeling, the stationary distribution does not hinder further analysis. Thus, using the logarithm or square root of selected variables before employing them as regressand or regressors means recognizing the non-linearity in the analyzed link between Tobin's Q and selected company attributes. It does not serve as a solution to eliminating non-stationarity of variables. Table 7 presents descriptive statistics of variables used in econometric modeling.

Table 7. Descriptive statistics of variables, and untransformed variables.

Variable	Mean	Median	SD	Min	Max	Skewness	Kurtosis
Q	1.576	1.1	1.449	0	9.5	2.294	9.333
FORMALCOMPL	1.526	1.0	1.348	0	8	0.896	4.280
MINCOMPL	1.154	1.0	0.889	0	3	−0.052	1.730
SUBSTCOMPL	1.449	1.0	1.572	0	9	1.302	4.678
FILASHA	35.706	31.570	21.938	0	99.0	0.413	2.211
INSTINV	26.803	22.760	22.019	0	98.870	0.808	3.089
INDUSTINV	22.984	0	28.894	0	99.8	0.778	2.111
CEOSHA	4.426	0	11.213	0	77.500	3.303	14.826
GOVSHA	2.841	0	11.899	0	84.750	4.740	25.902
ASSETS	1997.9	138.4	7148.6	1.51	70,198.9	5.561	38.663
ADJ_ROA	−0.010	0	0.245	−1.220	0.890	−0.519	4.222
DEBT_ON_ASSETS	0.208	0.177	0.190	0	1.999	2.420	15.894

As shown in Table 7, variables are characterized by asymmetry and kurtosis. Only the distributions of MINCOMPL, FILASHA, INDUSTINV, and ADJ_ROA remain moderately asymmetric, while distributions of other variables are strongly asymmetric (FORMALCOMPL, SUBSTCOMPL, and INSTINV) or extremely asymmetric (Q, CEOSHA, GOVSHA, ASSETS, and DEBT_ON_ASSETS). The strong asymmetry present in the majority of variables may lead to lesser explanatory power of the estimated econometric models and may limit the ability to interpret kurtosis. In addition, the minimal value of Tobin's Q is zero, which was not transformed into a logarithm. However, a value of zero is present in only eight cases from 1550 observations, making it an acceptable number.

We analyze the distribution of compliance variables, specifically formal compliance, minimum compliance, and substantive compliance, as shown in Table 8.

Table 8. Distribution of compliance variables (formal, minimum, and substantive).

Year	FORMALCOMPL			MINCOMPL				SUBSTCOMPL		
	0	1–3	4–8	0	1	2	3	0	1–3	4–8
2006	134	21	0	134	14	6	1	133	18	4
2007	101	54	0	102	34	18	1	101	46	8
2008	63	90	2	64	51	37	3	71	70	14
2009	35	114	6	36	54	61	4	47	89	19
2010	25	122	8	27	51	72	5	36	100	19
2011	19	129	7	21	49	79	6	35	101	19
2012	18	130	7	21	46	82	6	32	103	20
2013	18	134	3	21	39	88	7	32	102	21
2014	17	131	7	20	45	84	6	32	103	30
2015	16	132	7	19	44	85	7	27	107	21

The data presented in Table 8 are indicative of a constant improvement in compliance by the sample companies in all the measured categories over the analyzed period. For each identified variable, the number of companies which do not comply with any code provisions drops significantly—from 133 or 134 firms in 2006 to 16–27 firms in 2015. Interestingly, the highest improvement is noted for the medium value of compliance—formal compliance between 1 and 3 increases from 21 companies in 2006 to 132 companies in 2015. The growth for the high value of compliance end is marginal—formal compliance between 4 and 8 is noted in 0 companies in 2006 and increases to 7 companies in 2015.

Using a Pearson linear correlation coefficient, we report the correlation coefficients of regressand and regressors in Table 9.

Table 9. Correlation coefficients of variables, regressand and regressors.

Variables	ln_Q	(1)	(2))	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Q (1)		1.00											
FORMALCOMPL (2)	−0.11	−0.13	1.00										
MINCOMPL (3)	−0.09	−0.10	0.71	1.00									
SUBSTCOMPL (4)	−0.06	−0.08	0.87	0.50	1.00								
FILASHA (5)		−0.09	0.13	0.19	0.16	1.00							
FILASHA_sq	−0.11	−0.12	0.16	0.21	0.18								
INSTINV (6)		0.02	0.03	0.10	0.03	−0.12	1.00						
INSTINV_sq	0.10	0.04	0.04	0.10	0.03	−0.12							
INDUSTINV (7)		−0.04	0.12	0.09	0.16	0.54	−0.16	1.00					
INDUSTINV_sq	−0.04	−0.06	0.12	0.09	0.16	0.46	−0.10						
CEOSHA (8)	−0.17	−0.09	0.11	0.05	0.07	0.04	−0.02	−0.21	1.00				
GOVSHA (9)	−0.04	−0.07	−0.01	0.01	0.03	0.19	−0.05	−0.04	−0.09	1.00			
ASSETS (10)		0.04	0.18	0.19	0.26	0.24	0.24	0.17	−0.09	0.26	1.00		
ln_ASSETS	−0.13	0.03	0.17	0.26	0.26	0.40	0.27	0.18	−0.13	0.37			
ADJ_ROA (11)	0.35	0.28	0.04	0.05	0.01	0.03	0.17	0.03	−0.03	0.03	0.13	1.00	
DEBT_ON_ASSETS (12)	−0.06	−0.05	0.06	0.01	0.05	0.08	−0.01	0.03	0.08	−0.05	0.04	−0.24	1.00

Table 9 presents the correlation matrix for both untransformed and transformed variables (with the use of logarithm and square root measures). In rows with two lines, the upper line represents the value of the untransformed variable, while the bottom line shows the value of transformed variables. The column "ln_Q" presents the coefficient of linear correlation between regressand and regressors. The correlation matrix illustrates the strength and directions of the analyzed relations between variables, similar to linear correlation. It shows the relations in which the value of a given variable increases or decreases by a stable unit in line with the value change of another variable within a given time (year).

With the non-linear relations, the Pearson linear correlation coefficient may incorrectly suggest a magnitude which may be stronger than initially anticipated. The statistical test indicates that all correlation coefficients higher than 0.04 may be viewed as statistically different from zero. As reported in Table 8, changes in ln_Q are correlated with ROA, assets, CEO ownership and ownership concentration. A weaker link is noted for compliance measures. With low correlation coefficients, we do not identify the multicollinearity problem.

3.4. Econometric Modeling

We test our hypotheses on the links between firm value and compliance with board best practice, with the use of the following econometric model:

$$Q = f\left(Compliance,\ FILASHA_{SQ},\ INSTIN_{SQ},\ INDUSTIN_{SQ},\ CEOSHA,\ GOVSHA,\ \ln\_ASSETS,\ ADJ\_ROA,\ DEBT\_ON\_ASSETS\right)$$

where *Compliance* is FORMALCOMPL, MINCOMPL, and SUBSTCOMPL.

We test the formulated hypotheses with the use of panel analysis (Cameron and Trivedi 2005, 2010). Constructing the econometric models, we address three main issues. Firstly, we consider the problem of heteroskedasticity with the parallel variability of random variables between units and time period, which requires the adoption of a method for estimating parameters robust enough for standard estimates errors. We acknowledge heteroskedasticity and calculate the values of robust errors with the use of a Wald test in all models. Secondly, we run a Hausman test to determine the type of the model to be constructed. For each model, the significance level equals zero, indicating a rejection of the null hypothesis and acceptance of the alternative hypothesis to choose the fixed effects model. Thus, we decide to run fixed effects for all A–C models, meaning that the individual effects which differentiate the reactions of the companies under analysis are represented by an intercept, which remains stable over time.

Considering the heteroskedasticity of the random variable we use a dedicated version of the Hausman test (rhausman test). Next, for A–C models, we employ an F-test to determine the statistical significance of the entire set of regressors. In each of the models, we reject the null hypothesis, suggesting that there is no variable that impacts the changes in the value of the regressand in the models. We also run the Shapiro–Wilk test, which assumes a normal distribution of the random variable. This hypothesis is rejected. Finally, to test for multicollinearity of regressors, we determine the variance inflation factor (VIF) for each regressor in a given model. A VIF below 2, as is revealed in the A–C models, eliminates multicollinearity. The VIF coefficients, overall and between, are close to zero, signifying that the A–C models only explain the time changes of Tobin's Q value. These tests support the supposition that the changes of each explanatory variable have a statistically significant impact on the value of explained variable.

The results of the tests and models under discussion are reported in Table 10.

Table 10. Estimation results for dependent ln_Q.

Regressors	Model A	Model AS (Std.)	Model B	Model BS (Std.)	Model BC	Model C	Model CS (Std.)
FORMALCOMPL [L1]	−0.089 (0.025) ***	−0.147 [1.349]					
SUBSTCOMPL [L1]			−0.082 (0.025) ***	−0.159 [1.572]			
dec_SUBSTCOMPL [L1]					−0.035 (0.026)		
MINCOMPL [L1]						−0.157 (0.033) ***	−0.171 [0.889]
INDNED [L1]					−0.129 (0.025) ***		
FILASHA_sq	−0.061 (0.024) **	−0.149 [1.980]	−0.063 (0.024) **	−0.153 [1.980]	−0.060 (0.025) **	−0.060 (0.024) **	−0.146 [1.980]
INSTINV_sq	−0.031 (0.017) *	−0.091 [2.467]	−0.031 (0.016) *	−0.096 [2.467]	−0.031 (0.020)	−0.028 (0.014) *	−0.087 [2.467]
INDUSTINV_sq	−0.035 (0.012) ***	−0.156 [3.614]	−0.037 (0.012) ***	−0.163 [3.614]	−0.036 (0.011) ***	−0.036 (0.011) ***	−0.161 [3.614]
CEOSHA	−0.014 (0.004) ***	−0.189 [11.213]	−0.014 (0.004) ***	−0.197 [11.213]	−0.014 (0.004) ***	0.013 (0.004) ***	−0.183 [11.213]
GOVSHA	−0.007 (0.003) **	−0.101 [11.899]	−0.007 (0.003) **	−0.100 [11.899]	−0.007 (0.003) **	−0.008 (0.003) **	−0.112 [11.899]
ln_ASSETS	−0.210 (0.096) **	−0.514 [1.991]	−0.209 (0.097) **	−0.512 [1.991]	−0.203 (0.098) **	−0.207 (0.096) **	−0.506 [1.991]
ADJ_ROA	0.759 (0.105) ***	0.229 [0.245]	0.751 (0.104) ***	0.226 [0.245]	0.742 (0.104) ***	0.759 (0.105) ***	0.228 [0.245]
DEBT_ON_ASSETS	0.350 (0.205) *	0.082 [0.190]	0.332 (0.204) *	0.077 [0.190]	0.341 (0.203) *	0.335 (0.202) *	0.083 [0.190]
INTERCEPT	1.898 (0.567) ***		1.908 (0.574) ***		1.908 (0.583) ***	1.916 (0.563) ***	
N (observations)	1387		1387		1387	1387	

Table 10. *Cont.*

Regressors	Model A	Model AS (Std.)	Model B	Model BS (Std.)	Model BC	Model C	Model CS (Std.)
n (companies)	155		155		155	155	
Max VIF	1.61		1.67		1.95	1.65	
R_sq within	0.172		0.170		0.181	0.183	
R_sq between	0.003		0.003		0.007	0.005	
R_sq overall	0.006		0.005		0.004	0.003	
F test	13.19		13.08		15.68	16.37	
Prob > F	0		0		0	0	
Shapiro–Wilk test z	11.81		11.84		5.16	11.80	
Prob > z	0		0		0	0	
Hausman chi^2 test	78.26		62.17		116.35	67.04	
Prob > chi^2	0		0		0	0	

Notes: The symbol of L1 by the regressor name indicates the variable value lagged by 1 year. The robust standard error for each coefficient in models A, B, and C is reported in parentheses; *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$, where the p-value is called the observed level of significance. The significance test for the coefficients is the t-statistics test. Models AS, BS, and CS are models estimated for standardized variables, with standard deviations for values of non-standardized variables presented in parentheses.

As shown in Table 10, for each A–C model, a given set of regressors differs only by one variable on compliance. We use a compliance variable lagged by 1 period (year) to examine the effect on the company market valuation after the publication of the conformity declaration and the information on compliance practice. The results indicate a negative correlation between compliance with board best practice and Tobin's Q. The negative association is noted for all three measures of compliance, i.e., formal compliance (FORMALCOMPL), minimum compliance (MINCOMPL), and substantive compliance (SUBSTCOMPL). This means that from the perspective of our hypotheses we find support for H1, which assumes a negative association between compliance with best practice code and firm value. We also find support for H2, as we observe a negative and statistically significant relation between the minimum level of compliance with code provisions and Q. Finally, for H3, our results reveal a negative relation between company value and SUBSTCOMPL, which measures the most substantive scope of compliance. Hence, we find support for H3, as well.

In addition, we tested A–C models for endogeneity. Based on prior studies, we identify ln_ASSETS as the potential endogeneity driver and we proceed as follows. We estimate fixed-effect models with the same set of regressors, using two approaches: the least-squares method (LS) and instrumental variables method (IV). In the latter model, we use the lagged value of ln_ASSETS as the instrument. We estimate both models for 2007–2015, in order to ensure full comparability. We use a Hausman test, comparing LS model (null hypothesis) with the IV model. The rejection of the null hypothesis would suggest selection of the IV model and would indicate that the ln_ASSETS variable may cause endogeneity problems. We find no reason to reject the null hypothesis, which implies that we should choose the LS model and that we do not note endogeneity issues. For models A–C, we do not reject the null hypothesis, so fixed effect models estimated with the use of the least squared method offer the most appropriate approach. Thus, there is no need to adopt instrumental variables, and the variable of ln_ASSETS does not cause an endogeneity problem. As a consequence, it follows that the use of other estimation methods is not appropriate.

We address the question concerning the changes in the values of regressors that have the strongest impact on changes in the regressand. For this purpose, we estimate the equivalents for the A–C models with standardized variables. The coefficients in models with standardized variables show how the regressand changes within its own standard deviation if the regressor values change by one standard deviation. Table 10 shows the values of standardized coefficients and values of standard deviation of regressors for models AS, BS, and CS in dedicated columns. Models estimated with standardized variables reveal that the signs of the regression parameters and the values of t-statistics of regression parameters do not change, so the statistical significance of the relations does not change

either. Other values of the statistical verification for our models remain stable, as well. The value of ln_Q ranges between −2.303 and 2.251, with the standard deviation equal to 0.815. It shows that ln_ASSETS and ADJ_ROAs have the strongest impact on a change in the regressand value, followed by CEOSHA, FILASHA, and compliance. DEBT_ON_ASSETS reveals the lowest impact on the change of ln_Q.

Finally, we run an additional BC model with the measure of decomposed substantive compliance (dec_SUBSTCOMPL). We observe that, in the A–C models, the variable for independent directors is the main explanatory component, since WSE-listed companies do not report numerous aspects included in the substantive compliance measure (e.g., independent chair, the identification of independent directors, and the formation of a separate audit committee). Thus, in the BC model for decomposed substantive compliance (dec_SUBSTCOMPL) we exclude the variable of INDNED from compliance. As presented in Table 10, for the BC model, the decomposed substantive compliance (dec_SUBSTCOMPL) remains statistically insignificant, while INDNED is statistically significant. While this approach offers a deeper insight into compliance practice, it has two limitations: Firstly, dec_UBSTCOMPL and INDNED are strongly correlated; secondly, neither are more strongly correlated with the variable ln_Q than SUBSTCOMPL. This means that introducing two variables instead of one measure, being the sum of the two variables, may increase parameter estimation error and consequently render the regressors statistically insignificant. Importantly, the decomposition of SUBSTCOMPL into INDNED and dec_UBSTCOMPL changed neither the signs of the estimated parameters of other regressors nor the statistical characteristics of the estimated models reported with the F test, Shapiro–Wilk test, and Hausman test.

3.5. Robustness Tests

We run robustness tests to check the stability of our models. For this purpose, we construct models with an additional control variable—board size (BOARDSIZE)—which represents the number of non-executive directors on the supervisory board. The results for the three models, AR, BR, and CR, are presented in Table 11.

Table 11. Estimation results of robustness tests.

Regressors	Model AR	Model BR	Model CR
FORMALCOMPL [L1]	−0.089 (0.025) ***		
SUBSTCOMPL [L1]		−0.083 (0.025) ***	
MINCOMPL [L1]			−0.157 (0.033) ***
FILASHA_sq	−0.060 (0.024) **	−0.062 (0.024) **	−0.060 (0.024) **
INSTINV_sq	−0.031 (0.020)	−0.032 (0.020) *	−0.029 (0.020) *
INDUSTINV_sq	−0.036 (0.012) ***	−0.037 (0.012) ***	−0.036 (0.011) ***
CEOSHA	−0.013 (0.003) ***	−0.014 (0.003) ***	0.013 (0.004) ***

Table 11. *Cont.*

Regressors	Model AR	Model BR	Model CR
GOVSHA	−0.007 (0.003) **	−0.007 (0.003) **	−0.008 (0.003) **
ln_ASSETS	−0.211 (0.096) **	−0.210 (0.097) **	−0.208 (0.096) **
DEBT_ON_ASSETS	0.350 (0.205) *	0.333 (0.206) **	0.3569 (0.202) **
ADJ_ROA	0.761 (0.106) ***	0.753 (0.104) *	0.761 (0.104) *
BOARDSIZE	0.015 (0.025)	0.014 (0.025)	0.017 (0.025)
INTERCEPT	1.808 (0.554) ***	1.821 (0.562) ***	1.815 (0.552) ***
N (observations)	1387	1387	1387
n (companies)	155	155	155
Max VIF	2.49	2.51	2.53
R_sq within R_sq between R_sq overall	0.172 0.002 0.007	0.171 0.003 0.006	0.183 0.005 0.006
F test Prob > F	11.96 0	11.85 0	14.76 0
Shapiro–Wilk test z Prob > z	5.120 0	5.060 0	5.220 0
Hausman chi2 test Prob > chi2	106.390 0	97.790 0	79.090 0

Notes: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

As shown in Table 11, the variable of board size does not change the stability of our models. All parameter signs and statistical significances remain stable.

4. Discussion

The objective of this article was to provide an empirical verification of the relationship between corporate governance compliance and company value. With the application of the framework offered by agency theory (Jensen and Meckling 1976; Fama and Jensen 1983), the study tests the main assumption that greater compliance has a positive effect on the market valuation of complying companies. Codes of corporate governance best practice are based on fundamental principles of justice, fairness, and equality (Zattoni and Cuomo 2008) and recommend conformity with a set of provisions of board work, practices of executive compensation, policies of risk management, and standards of transparency (Aguilera et al. 2015). Along with the criticism of a one-size-fits-all approach with national adjustments, codes of best practice reveal conditions in which participants of a community reach a mutual understanding. The concept of flexibility and a voluntary approach to codes of best practice provide space for a dialog to reach consent, in which certain norms and behavior are seen as right or wrong. According to the comply-or-explain rule (Tan 2018), companies are obliged to report

their scope of conformity, which facilitates understanding of both the determinants and performance effects of compliance.

Prior studies indicate the positive effect of compliance related to enhanced investor trust, lower capital cost, and reduced information asymmetry, and they reveal a positive relation between corporate governance conformity and company performance and value (Mazotta and Veltri 2014; Rose 2016; Kaspereit et al. 2017). However, some researchers argue that the impact of corporate governance codes and compliance may be limited in different institutional settings, in particular in the context of concentrated ownership, insufficient investor protection, and emerging governance (Sobhan 2016; Okhmatovskiy 2017). The main focus of corporate governance codes is devoted to solving principal–agent conflicts between shareholders and managers, rather than giving sufficient attention to principal–principal conflicts between majority and minority shareholders (Chen et al. 2011). Thus, in countries of concentrated ownership and emerging governance, the code provisions and compliance with best practice may not result in a higher performance effect (Gherghina 2015) or may even be detrimental to company value (when regarded merely as an extra cost) or fail to elicit investor trust.

We tested the hypotheses of the relationship between compliance and company value compliance, using a unique sample of conformity with board best practice by 155 companies listed on the Warsaw Stock Exchange over a 10-year period. Specifically, we assume that formal compliance with board best practice is negatively associated with firm value (H1) and a that minimum compliance with board best practice is negatively associated with firm value (H2). We hypothesize that investors do not appreciate substantive compliance either and that conformity with board best practice is negatively associated with firm value (H3).

The results of the panel analysis provide support for hypotheses H1 and H2, showing a negative association between formal compliance and firm value and minimum compliance and firm value. In line with our assumption in H3, we obtain partial support for the negative association between substantive compliance and Q. The negative correlation between company value and compliance remains statistically significant for the general measure of substantive compliance (SUBSTCOMPL) and statistically insignificant for decomposed substantive compliance (dec_SUBSTCOMPL), for which we exclude the variable on independent directors (INDNED). We interpret these findings as evidence for a mismatch between code provisions and corporate governance challenges, relating to concentrated ownership and principal–principal conflicts (Chen et al. 2011). Consistent with findings by Bhagat and Black (2002), we do not observe a positive market valuation effect for complying companies. Investors appear not to find compliance with board best practice a convincing solution to possible tensions between majority and minority shareholders (Healy and Palepu 2001; Goncharov et al. 2006), questioning the efficient implementation of board guidelines (Martin 2010).

5. Conclusions

The goal of this study was to test for the link between compliance and company value in a specific context of concentrated ownership and post-transition corporate governance. The results show a negative correlation between compliance with the code provisions on board practice and company value, as measured by Tobin's Q, suggesting that investors do not find the adoption of board practice a plausible solution for the principal–principal conflict in an environment of concentrated ownership.

The study adds to the debate on corporate governance compliance, in general, and its effects on market valuation in emerging and post-transition countries, in particular. For practitioners and policymakers, the results of our analysis deliver important insights into the limitations of code provisions, which are transmitted across countries with differing institutional environments and ownership structures, and results in different agency problems.

We acknowledge the limitations of our research—we focused on board best practice and in one country. Further research should address a wide scope of code provisions and cover a larger sample of companies from different economies. Adding variables to cover the institutional environment, such as

measures of investor protection or rule of law, would aid in understanding the effect of the regulatory context on the efficiency of corporate governance provisions.

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Corporate Governance and Earnings Management in a Nordic Perspective: Evidence from the Oslo Stock Exchange

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Abstract: The purpose of the study is to examine the relation between Nordic corporate governance practices and earnings management. We find that the presence of employee representation on the board and the presence of an audit committee are both practices that reduce the occurrence of earnings management. Moreover, we find that both board independence and share ownership by directors positively affect earnings management, while board activity and directors as majority shareholders show an insignificant relation to earnings management. We contribute to the existing literature on corporate governance and earnings management by providing valuable insight into the Nordic corporate governance approach and its potential in mitigating earnings management.

Keywords: accrual earnings management; corporate governance; Nordic model

1. Introduction

In response to recent accounting scandals in both the US and Europe there has been an increased concern regarding the effectiveness of corporate governance practices. Undoubtedly, the concerns are justified. The case of Enron Corporation in 2001 is a well-known example of the destroying consequences of weak corporate governance. The scandal created an international attention on how to systematically implement improved corporate governance practices to prevent fraud and questionable managing of earnings. Immediate responses were proposed reforms of corporate governance through legislation and improved listing standards (Coffee 2002). This included the US Sarbanes Oxley Act (SOX) in 2002 and the UK Higgs Report and the Smith Report in 2003[1]. The motivation behind our study is thus the implicit assertion that earnings management and weak corporate governance practices are positively related.

The concept of corporate governance is not new. Its need aroused with the separation of ownership and control in public companies (Berle and Means 1932), which, according to Jensen and Meckling (1976), resulted in agency problems. Consequently, the responsibility to present credible financial information and protect shareholders' interests fell on the corporate governance system (Fama and Jensen 1983). As information asymmetry between preparers and users of financial information makes opportunism possible (Beatty and Harris 1999), the guardian role of the board become obvious.

The extent of earnings management could implicate how well the corporate governance practices are in protecting shareholder's interests, since corporate governance has the potential to reduce or even eliminate fraudulent behavior (Man and Wong 2013). This study addresses the triangular

[1] Regarding Norway; the result was the establishment of the Norwegian Corporate Governance Board (NUES) in 2004.

interaction between a company's shareholders, board of directors and management in a Nordic setting. Many prior studies on corporate governance and earnings management have come from countries within a two-tier or one-tier model of corporate governance, such as the US, the UK, Italy. Egypt, Malaysia and China (Al-Jaifi 2017; Beasley 1996; Campa and Donnelly 2014; Karmel and Elbanna 2012; Klein 2002; Liu and Lu 2007; Marchini et al. 2018; Peasnell et al. 2000; Xie et al. 2003) which differentiate from the Nordic corporate governance model in several ways. Lekvall et al. (2014) claim that two key distinctive features of Nordic corporate governance are the powers vested with a shareholder majority to effectively control the company and the entirely nonexecutive board. Norwegian boards are characterized by a high shareholder concentration. Accordingly, instead of turning to the market for corporate control, major owners generally take an active part in the governance of the company. The system thus provides dominating shareholders the motivation to take long-term responsibility for the company. Moreover, Norwegian Public Limited Companies (ASA) are comprised exclusively of nonexecutive officers, except for employee representatives. An important implication of this is the distinction the duties and responsibilities of a strategically and monitoring board and a mere executive management function. Lekvall et al. (2014) argues that although these features may not seem individually unique, together they make a comprehensive system. Its success is shown by the competitiveness of Nordic companies on international markets. In 2013, *The Economist* described the Nordic corporate governance model as "The next supermodel", pointing to Nordic countries clustering at the top of global league tables of everything from economic competitiveness to happiness (The Economist 2013; Lourenco et al. 2018).

Although Nordic countries have been declared role models for their corporate governance systems (The Economist 2013), there have been limited studies exploring the relationship between corporate governance and earnings management in countries within the Nordic model of corporate governance. The aim of this paper is to fill these gaps and provide valuable insight for users of financial statements beyond the Nordic countries. We do find as a contribution that the presence of employee representation on the board reduce earnings management. Moreover, board independence seem positively related to earnings management, contradictory to the findings of other well-known studies (Beasley 1996; Dechow et al. 1996; Peasnell et al. 2000; Klein 2002). We also find the same regarding share ownership by directors, thus indicating that large proportions of minority shareholders on the board could give the directors incentives to pursue higher-risk strategies to generate larger financial returns.

The findings will be of interest for countries following the same triangular interaction between a company's shareholders, board of directors and management. In addition, the study aims to provide increased attention to the potential benefits the Nordic corporate governance approach has on improving earnings quality by mitigating earnings management.

The remainder of this paper is organized as follows. Section 2 provides a review of previous literature and the hypothesis development. The data and methodology are presented in Section 3, while Section 4 presents the empirical results. Finally, Section 5 conclude the paper's findings, included the limitations of the study.

2. Review of Literature and Hypothesis Development

Earnings are the summary measure of firm performance produced under the accrual basis of accounting (Dechow 1994). Healy and Wahlen (1999) provides a commonly cited definition of earnings management:

Earnings management occurs when managers intentionally use judgements in financial reporting and in structuring financial transactions to alter financial reports to mislead some stakeholders about the underlying economic performance of the firm or to influence contractual outcomes that depend on reported accounting numbers.

As the definition points out, firms have two options to manage earnings. First, earnings can be managed through deviations from normal business activities (Xu et al. 2007). The firm could, for example, boost reported profit by cutting down on research and development, selling

assets it would otherwise keep and cutting down on employee development. Deviating from normal business practices to manipulate reported income is defined as real earnings management (Roychowdhury 2006). Second, a firm can alter the level of accruals to obtain the desired level of earnings. Using management judgements in financial reporting is defined as accrual-based earnings management (Healy and Wahlen 1999). Real changes in investment and operating activities are costlier than mere accounting manipulation. It is therefore reasonable to assume that firms have a lower threshold to manipulate earnings through accruals rather than real activities. This study focuses on accrual earnings management only.

Many motivations for earnings management have been examined in the literature. The managerial motives are mixed and include motivations such as maximizing firm value (Beneish 2001), management buyouts (DeAngelo 1986), initial public offerings (IPO's) (Teoh et al. 1998) and meeting the expectations of financial analysts, management, investors and social and political pressure (Payne and Robb 2000; Kasznik 1999; Li and Thibodeau 2019). The essence of earnings manipulation is derived from the flexibility given to management in disclosing their reported earnings (Busirin et al. 2015).

Accounting information is traditionally considered to have a dual role as both informer and steward (Ronen and Yaari 2008). The informative role arises because of investors' need to predict future cash flows and assess the risk of investments. This study will focus on the stewardship role of accounting. The stewardship role of accounting comes from the separation of ownership and management in public firms, resulting in agency problems that could lead to divergence between the interest of shareholders and managers (Jensen and Meckling 1976; Gjesdal 1981). A following control difficulty is information asymmetry. Information asymmetry exists when managers have a more complete set of information about the company than the shareholders, leading to agency costs as the managers have opportunities to promote their own self-interest at the shareholders' expense (Beatty and Harris 1999). Prior studies have found a positive relationship between agency costs and the latitude of earnings management (Beatty and Harris 1999; Man 2019). Corporate governance is thus necessary to align and coordinate the interest of the upper management with those of the shareholders to mitigate the occurrence of earnings management. Fama and Jensen (1983) argue that the board of directors is the highest internal control mechanism responsible for monitoring the actions of top management. Monks and Minow (2008) underline that as the body who governs the firm, it is the board of directors' duty to ensure that the company is run in the long-term interests of the shareholders. While there is no generally accepted definition of corporate governance, it may be defined as a system "consisting of all the people, processes and activities to help ensure stewardship over a company's assets" (Messier et al. 2008).

There is mixed evidence on the effect corporate governance practices has on earnings management. Board characteristics that have been frequently investigated in earnings management literature, such as board independence, board activity and the presence of an audit committee will be included in this study (see Table 1). In addition, directors' share ownership, majority shareholding by directors and the presence of employee representatives will be examined as key elements of the Nordic corporate governance model (see Table 1). Following are some prominent studies reviewed in this regard.

2.1. Board Independence

NUES (2018) recommend that most of the shareholder-elected members of the board should be independent of the company's executive personnel and material business contacts, while at least two of the shareholder-elected members should be independent of the company's main shareholders. Independent directors are chosen in the interest of shareholders, adding value due to their impartial monitoring of business ethics (Rosenstein and Wyatt 1990). Independent board members are associated with effective monitoring (Fama 1980), while nonindependent board members are considered an obstacle to efficient monitoring (Ronen and Yaari 2008). It is assumed that effective monitoring controls earnings management, as suggested in studies investigating board independence and earnings management (Dechow et al. 1996; Beasley 1996; Klein 2002; Peasnell et al. 2005). Haldar et al. (2018)

and Van den Berghe and Baelden (2005) do however point to other important aspects of directors' independence. They argue that the quality of independent directors depends on other factors specific to the directors' character, the firm and its environment. In accordance with prior earnings management literature, the following hypothesis is tested:

Hypothesis 1 (**H1**). *There is a negative relation between board independence and earnings management*.

2.2. Employee Representatives

As stated in the Public Companies Act, the main rule regarding employee representation in Norway is that one third of the directors can be elected by and among the employees. NUES (2018) do not mention any specific recommendations regarding employee representatives since they are considered ordinary members of the board with the same authority and responsibility as the shareholder-elected board members. Literature and prior studies on employee representatives and earnings management is however rare. In Fauver and Fuerst (2006) study on German companies, they argue that employee representatives contribute as informed monitors with detailed operational knowledge that is valuable in board decision-making and supervising. They further conclude that the presence of employee representatives on the board is negatively and significantly related to earnings management. Other studies on monitoring and earnings management have found that better monitoring quality by directors could ultimately help to reduce agency costs induced by either managers or large shareholders (Gul et al. 2002; Peasnell et al. 2005). The importance of operational knowledge is supported in a Chinese study conducted by Chen et al. (2015). They found that the quality of managerial oversight by directors depends significantly on the quality and completeness of the information they receive, stating that directors' monitoring is more effective in a richer information environment. Accordingly, the second hypothesis is:

Hypothesis 2 (**H2**). *There is a negative relation between the presence of employee representatives and earnings management*.

2.3. Share Ownership by Directors

It is difficult to state a clear theoretical prediction about the effect of share ownership by directors on earnings management. From an opportunistic point of view, share ownership by directors could weaken their independence and their effectiveness in monitoring financial reporting (Lin and Hwang 2010). On the other hand, managers of firms with low director ownership are expected to exploit the latitude of accounting standards to ease financial constraints, indicating that higher share ownership by directors will reduce the occurrence of earnings management (Gul et al. 2002). It is also found that directors' shareholdings are associated with smaller increases in information asymmetry (Kanagaretnam et al. 2007), which in turn could reduce agency costs and better prevent the occurrence of earnings management (Beatty and Harris 1999; Man 2019). The theoretical assumptions will also vary depending on the ownership structure. According to NUES (2018), long-term share ownership by directors contributes to create an increased common financial interest between the shareholders and the members of the board. With a majority shareholding in the company, and thus a longer-term ownership perspective, an investor is incentivized to prioritize the company's strategic growth. Further, NUES (2018) emphasize that a short-term ownership perspective may work against the best interest of the company and its shareholders. Prior studies on share ownership by directors and earnings management reflects the inconsistent assumptions. Peasnell et al. (2005) found a positive, though not significant, relation between share ownership by directors and earnings management, while Gul et al. (2002) reported a significantly negative relation. In their meta-analysis, Lin and Hwang (2010) documented no significant relationship. Based on the theoretical predictions and the existing literature, the following two hypotheses have been made:

Hypothesis 3 (H3). *There is a relation between share ownership by directors and earnings management.*

Hypothesis 4 (H4). *There is a negative relation between the percentage of directors as majority shareholders and earnings management.*

2.4. Board Activity

The board activity is measured by the board meeting frequency and is often considered an indicator of the effort put in by the directors. It is generally believed that an active board is more effective in monitoring the management (Ronen and Yaari 2008). Lipton and Lorsch (1992) stress that a widely shared problem among directors is too little time to carry out their duties, pointing out that more frequent board meetings will make directors more willing to perform their duties in line with shareholders' interests. The literature on board activity and earnings management consists of contradictory conclusions. Vafeas (1999) and Xie et al. (2003) find that more frequent board meetings lower the degree of earnings management, while other studies show either a positive relation between board meeting frequency and earnings management (Daghsni et al. 2016) or no relation between them at all (Ahmed 2007). Based on the contradictory literature, the fifth hypothesis is:

Hypothesis 5 (H5). *There is a relation between board meeting frequency and earnings management.*

Table 1. Presentation and description of the corporate governance variables along with the expected impact on earnings management.

Variable	Predicted Sign	Definition
Board Independence	–	The percentage of independent shareholder-elected board members
Employee representatives:	–	dummy variable assigned the value 1 if the board has employee representatives, 0 otherwise
Share ownership by directors	+/–	Number of directors who directly or indirectly holds shares in the company.
Directors as majority shareholders	–	The percentage of directors as majority shareholders
Board activity	+/–	The number of board meetings held during the period
Audit committee	–	Dummy variable that equal 1 if the company has an audit committee, 0 otherwise

2.5. Audit Committee

The Public Companies Act and the Stock Exchange Regulations stipulates whether Norwegian public companies are required to establish an audit committee or not. The members of the audit committee are elected by and among the board members and at least one of the members of the committee must be independent with regards to NUES' (2018) recommendations (Lekvall et al. 2014). According to the Public Companies Act, the audit committee's primary mission is to prepare the supervision of the financial reporting process and monitor the systems for internal control and risk management. The committee should further meet regularly with the firm's external auditor and internal financial managers to produce balanced and accurate reports. Accordingly, audit committees complement existing internal governance practices by improving the monitoring function and reduce agency conflicts (Cai et al. 2015). Prior studies have found a significant relation between earnings management and audit committee practices (Bedard et al. 2004; Wan Mohammad et al. 2016). Klein (2002) found that the existence of an audit committee will reduce earnings management. Similarly,

Dechow et al. (1996) and Purat Nelson and Devi (2013) found that firms manipulating earnings were less likely to have an audit committee. The last hypothesis is formulated as follows:

Hypothesis 6 (H6). *There is a negative relation between the presence of an audit committee and earnings management.*

3. Data and Methodology

3.1. Data And Sample Selection

Our initial dataset consisted of quarterly financial statements from 168 companies listed on the Oslo Stock Exchange in the period 2014 to 2017. Due to difficulties in defining abnormal accruals in the financial service industry, 16 bank and insurance companies were eliminated from the sample. In addition, there is an exclusion of 18 companies that had not been listed for the entire period, 83 firms due to lack of data and 2 firms due to mergers and acquisitions in the period (see Table 2). The financial data was collected through the Thomson Reuters Eikon database, while the corporate governance data was collected from companies' annual reports. If the reports lacked data, it was retrieved directly from the companies through e-mails and phone calls.

Table 2. Sample selection of the companies in the study.

Sample Selection	
Companies listed on the Oslo Stock Exchange 12.31.17	168
– Companies in the financial service industry	16
– Not-continuously listed companies in the period	18
– Companies lost due to lack of data	83
– Companies lost due to mergers and acquisitions	2
= Companies included in the sample	**49**
Initial firm-quarter observations for 2014 to 2017	2688
– Companies in the financial service industry	256
– Not-continuously listed companies in the period	288
– Companies lost due to lack of data	1328
– Companies lost due to mergers and acquisitions	32
= Final sample	**784**

In Das et al.'s (2009) study on quarterly earnings patterns and earnings management, they find that firms performing poorly in interim quarters may attempt to increase earnings in the fourth quarter to achieve a desired annual earnings target. Accordingly, this study used data from quarterly reports in the analyses to catch more of the fluctuations in earnings. Further, interim reports are often unaudited, which allows greater managerial discretion and require less detailed disclosure than annual financial statements (Jeter and Shivakumar 1999). Using quarterly financial data in the analysis could thus increase the likelihood of detecting earnings management.

3.2. Measurement of Earnings Management

In the existing earnings management literature, a commonly used approach for detecting earnings management is by examining accruals. The literature distinguishes between two widely used approaches in defining total accruals: the balance sheet-based approach (Healy 1985; Jones 1991) and the cash flow-based approach (Vinten et al. 2005). The cash flow approach measures accruals directly from the statement of cash flows which mitigate the danger of measurement errors. Consequently, this study used the cash flow approach to define total accruals. The cash flow approach measures total accruals as the difference between the earnings of an entity and its cash flow generated from operating activities. Thus, to calculate total accruals using the cash flow approach the following formula has been used:

$$TA_{it} = NI_{it} - CFO_{it}$$

where TA_{it} = total accruals for company i in quarter t, NI_{it} = net income for company i in quarter t and CFO_{it} = cash flow from operating activities for company i in quarter t.

Total accruals consist of a discretionary component and a nondiscretionary component. Nondiscretionary accruals represent changes in a company's underlying performance, while discretionary accruals represent changes due to management's accounting decisions (Ronen and Yaari 2008). When estimating earnings management, it is the discretionary accruals that are of interest. A fundamental issue is however the challenge of separating the discretionary and nondiscretionary components of earnings (Elgers et al. 2003), since they cannot be directly observed. Several methods have been developed to estimate the discretionary component of accruals. A widely used approach is to benefit regression techniques, where total accruals are regressed on variables that are proxies for normal accruals. Discretionary accruals were thus the unexplained component of total accruals.

Several widely used regression techniques have their origin in the original Jones model from 1991. This study used 2 modified versions of the original model; the Modified Jones model proposed by Dechow et al. (1995) and a performance-matched model introduced by Kothari et al. (2005). The Modified Jones model was designed to eliminate the assumed tendency of the Jones model to measure discretionary accruals with error when discretion was exercised over revenues (Dechow et al. 1995). The modification made from the original Jones model is that changes in revenues are adjusted for the changes in receivables in the event period. When applying the Modified Jones model, the nondiscretionary and the discretionary components of total accruals can be calculated by the following equation (Dechow et al. 1995):

$$\frac{TA_{it}}{A_{it-1}} = \beta_0 + \beta_1 \frac{1}{A_{it-1}} + \beta_2 \frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} + \beta_3 \frac{PPE_{it}}{A_{it-1}} + \varepsilon_{it}. \quad (1)$$

where

TA_{it} = total accruals deflated by lagged total assets for company i in quarter t
A_{it-1} = lagged total assets for company i in quarter t
ΔREV_{it} = changes in total sales deflated by lagged total assets for company i in quarter t
ΔREC_{it} = changes in account receivables deflated by total assets for company i in quarter t
PPE_{it} = net value of property, plant and equipment deflated by lagged total assets for company i in quarter t

Kothari et al.'s (2005) performance matched model is an extended version of the Modified Jones model, where return on assets (ROA) is added as an additional variable. The following equation is used:

$$\frac{TA_{it}}{A_{it-1}} = \beta_0 + \beta_1 \frac{1}{A_{it-1}} + \beta_2 \frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} + \beta_3 \frac{PPE_{it}}{A_{it-1}} + \beta_4 \frac{ROA_{it}}{A_{it-1}} + \varepsilon_{it} \quad (2)$$

where

ROA_{it} = net income after tax deflated by lagged total assets for company i in quarter t

Kothari et al. (2005) claim that economic intuition, empirical evidence and extant models of accruals suggest that accruals are correlated with a firm's present and past performance. Hence, to control for performance on discretionary accruals, ROA is added as a control variable. Further, because of the nonlinear relationship between accruals and performance, Kothari et al. (2005) argue that a performance matched approach is better specified to test discretionary accruals than by using a linear regression-based approach.

In both models the variables are deflated by lagged total assets to control for firm size effect (Healy 1985; DeAngelo 1986) and to mitigate heteroscedasticity in the residuals (White 1980). Further, nondiscretionary accruals are estimated using ordinary least squares (OLS). The prediction from the

OLS estimation in model (1) and model (2) represents nondiscretionary accruals while the residuals represents discretionary accruals. Discretionary accruals can be both positive and negative. In the analysis, the study used the absolute value of discretionary accruals as a proxy for earnings management (as a normal procedure—see Hribar and Nichols (2007) for elaboration). Higher levels of discretionary accruals indicate greater levels of earnings management.

The Modified Jones model (1) showed an explanatory power of 0.1139 (Table A1), while the Kothari model (2) showed an explanatory power of 0.4334 (Table A2). The higher the explanatory power, the closer the estimated regression equation fits the sample data (Brooks 2019). Hence, the measure of discretionary accruals following the Kothari model (2) was used as the dependent variable for the further corporate governance analysis.

3.3. Corporate Governance

After estimating the extent of discretionary accruals, the relation between earnings management and the corporate governance practices was investigated. In the regression, the corporate governance practices represented the following independent variables:

Board independence: referred to the percentage of shareholder-elected directors that were evaluated as independent with respect to the company's executive management, material business contacts and main shareholders.

Employee representatives: referred to the presence of employee representatives or not. The variable was calculated as a dummy variable assigned the value 1 if the board has employee representatives, 0 otherwise.

Share ownership by directors: referred to the percentage of directors who directly or indirectly holds shares in the company. The variable was calculated by scaling the total number of directors who holds shares by total board size.

Directors as majority shareholders: referred to the percentage of directors who directly or indirectly is listed amongst the company's 20 largest shareholders. The variable was calculated by scaling the total number of directors who are majority shareholders by total board size.

Board activity: referred to the total number of meetings held during a year, scaled by quarter. The variable was calculated using the natural logarithm of total board meetings[2].

Audit committee: referred to the presence of an audit committee or not. The variable was calculated as a dummy variable assigned the value 1 if the firm has an audit committee, 0 otherwise.

Earnings management decisions can also be influenced by factors other than the explanatory variables included in this analysis. To control for this and for any spurious relations between board characteristics and earnings management, the control variables firm size, return on assets and return on equity were included.

Firm size: the natural logarithm of total assets was used as a proxy for firm size.

Return on assets: net income divided by total assets was used as a measure for firm performance.

Return on equity: total equity divided by total assets was used as a measure for firm profitability.

To test the hypotheses', the following equation was used:

$$\begin{aligned} \text{absDA}_{it} = \beta_0 + \beta_1(\text{BISE}_{it}) + \beta_2(\text{DER}_{it}) + \beta_3(\text{SOD}_{it}) + \beta_4(\text{MJS}_{it}) + \beta_5(\text{BA}_{it}) \\ + \beta_6(\text{AC}_{it}) + \beta_7(\text{FS}_{it}) + \beta_8(\text{ROA}_{it}) + \beta_9(\text{ROE}_{it}) + \varepsilon_{it} \end{aligned} \quad (3)$$

absDA_{it} = absolute value of discretionary accruals for company i in quarter t

BISE_{it} = board independence for company i in quarter t

DER_{it} = dummy variable that equal 1 if the company has employee representatives on the board, 0 otherwise

[2] The natural logarithm is used to correct for heteroscedasticity (Benoit 2011).

SODit = share ownership by directors for company i in quarter t
MJS_{it} = directors as majority shareholders for company i in quarter t
BA_{it} = board activity for company i in quarter t
AC_{it} = dummy variable that equal 1 if the company has an audit committee, 0 otherwise
FS_{it} = firm size for company i in quarter t
ROA_{it} = return on assets for company i in quarter t
ROE_{it} = return on equity for company i in quarter t

Our study used panel data, featured by exploring the cross-section and time-series data simultaneously. A Hausman test (Table A3), showed that fixed effects estimator was a better fit for the model than the random effects estimator[3]. Moreover, Equation (3) using OLS was estimated. Additional analysis of the residuals from this estimation displayed significant heteroscedasticity. Consequently, the regression using robust standard errors was estimated. In regression estimates, multicollinearity due to a significant linear relationship between the explanatory variables can affect the estimation of the coefficients of the variables, leading to imprecise results. To test the severity of multicollinearity in the data, a correlation matrix and the Variance Inflation Factor (VIF) method was used. According to Brooks (2019), severe multicollinearity is indicated if the correlation between 2 variables exceeds 0.80 and the VIF index exceed 5. The VIF for each explanatory variable was under 5, with a total mean of 1.6. Supported by the correlation matrix, multicollinearity was not a problem to the model. The correlation matrix and VIF index for the variables are reported in the Appendix A (Tables A4 and A5).

4. Empirical Results

4.1. Descriptive Statistics

Table 3 reports descriptive statistics for the sample firms. The absolute value of discretionary accruals has a small mean of 0.03 with a standard deviation of 0.04. The percentage of board independence spans from 0.00 to 1.00, indicating that the sample consists of firms with both 100 percent independent boards and zero percent independent boards. On average the presence of independent shareholder-elected board members is 70 percent. The number of board meetings held by the board of directors is on average 0.95 per quarter[4], while the minimum and maximum number of meetings per quarter is respectively 0.00 and 2.20[5]. Further, the descriptive statistics show that the sample consists of firms with both 100 percent share ownership by directors and zero percent share ownership by directors. The mean of share ownership by directors is 63 percent. With respect to the percentage of directors as majority shareholders, the average is 22 percent. The mean of the dummy variable for employee representatives on the board is 0.46, indicating that 46 percent of the sample firms have boards with presence of employee representatives. The dummy variable referring to the presence of an audit committee shows that 92 percent of the sample firms have an audit committee. Finally, the remaining variables included in the model were control variables for different firm characteristics and were not central to our study.

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[3] The dummy variables concerning employee representation and audit committee are not considered time-invariant explanatory variables. They will therefore not be absorbed by the intercept in the fixed effects model.
[4] This is equivalent to an average $e^{0.95} \approx 2.59$ per quarter.
[5] This is equivalent to a minimum value of $e^{0.00} \approx 1$ per quarter and a maximum value of $e^{2.20} \approx 9$ per quarter.

Table 3. Descriptive statistics for the sample firms.

				Quantiles				
	n	**Mean**	**S.D.**	**Min**	**0.25**	**Mdn**	**0.75**	**Max**
Discretionary accruals	784	0.03	0.04	0.00	0.01	0.02	0.04	0.44
Board independence	784	0.70	0.20	0.00	0.60	0.71	0.80	1.00
Employee representatives	784	0.46	0.50	0.00	0.00	0.00	1.00	1.00
Share ownership by directors	784	0.63	0.22	0.00	0.50	0.63	0.80	1.00
Directors as majority shareholders	784	0.22	0.21	0.00	0.00	0.20	0.33	1.00
Board activity	784	0.95	0.37	0.00	0.69	0.92	1.18	2.20
Audit Committee	784	0.92	0.27	0.00	1.00	1.00	1.00	1.00

4.2. Regression Results

Table 4 reports the results of the multivariate regression analysis on the panel data. The R-square is the coefficient of determination, and the value of 0.204 indicates that 20.4 percent of the variation in discretionary accruals is explained by the regression equation.

If we exclude the corporate governance variables (see Table A6 in the Appendix A), the results vary little to nothing compared to the results in Table 4. The difference between the two models is seen in the quality of the model, where Table 4 shows an r-squared of 0.204 compared to 0.148 in Table A6. This implies that model (3), as shown in Table 4 with the corporate governance variables, has a substantially bigger r-squared, and thus explains more of the variation in the absolute discretionary accruals.

4.2.1. Results Hypothesis 1—Board Independence

The panel regression analysis provides a significantly positive relation between the proportion of independent board members and earnings management, providing evidence that the occurrence of earnings management increases in line with the percentage of board independence. Thus, the results do not coincide with the hypothesis, nor the results of Beasley (1996), Dechow et al. (1996), Peasnell et al. (2005) and Klein (2002). Nevertheless, the result is of interest. The previously mentioned studies are all recognized and well-established in the earnings management literature, yet one could argue that firms, legislations and codes of best practices have changed since the studies were conducted. However, our finding is not strong, so our following comments could be related to the mere absence of a significant result of the hypothesis. Recent changes may imply that the current recommendations regarding independence could benefit from a reconsideration considering today's business environment and the experiences made during the recent decades. Moreover, looking beyond the earnings management literature, the findings may support Van den Berghe and Baelden (2005) argument that it may not be sufficient for good corporate governance to implement a formal standard on board independence alone. They argue that "soft" elements like character, attitude and independence of mind are equally important elements to the concept of independence[6]. Accordingly, as stated in the report of the Conference Board on Corporate Governance Best Practices, "directors must not only be independent according to evolving legislative and stock exchange listing standards, but also independent in thought and action—qualitative independent" (Brancato and Plath 2003).

[6] This argument was also brought to concern by Åse Aulie Michelet on NUES' 2017 annual debate for good corporate governance practices, arguing that for directors to truly be independent they must be able to promote and defend their own opinions (Bjørklund 2017).

4.2.2. Results Hypothesis 2—Employee Representatives

The regression results indicate that employee representation has a direct negative effect on earnings management, as expected in the hypothesis. The finding may be due to several causes. In line with Fauver and Fuerst (2006) analysis on German companies, the result could imply that employee representation provides a credible channel for information to the board of directors. Supported by the findings of Chen et al. (2015), this could improve the quality of managerial monitoring and board decision-making since employee representation provides a richer information environment. Moreover, one could argue that the operational information provided by the employee representatives helps to decrease the control issue of information asymmetry. In line with the findings of Gul et al. (2002), Peasnell et al. (2005) and Beatty and Harris (1999), the assumed increased monitoring quality and decreased information asymmetry brought to the board by employee representation is seemingly effective in mitigating agency costs and earnings management.

Table 4. Regression results of model (3).

Variables	Dependent Variable: Discretionary Accruals (absDA)
Board Independence (BISE)	0.025 *
	(0.014)
Employee Representatives (DER)	−0.011 **
	(0.004)
Share ownership by directors (SOD)	0.020 *
	(0.012)
Directors as majority shareholders (MJS)	−0.012
	(0.020)
Board Activity (BA)	0.016
	(0.009)
Audit Committee (AC)	−0.071 *
	(0.038)
Firm Size (FS)	−0.014 **
	(0.006)
Return on assets (ROA)	−0.100 ***
	(0.037)
Return on equity (ROE)	−0.015 ***
	(0.002)
Constant	0.178 ***
	(0.043)
Observations	784
Number of Identifications	49
R-squared	0.204

Notes: The equation used to test the hypotheses': $\text{absDA}_{it} = \beta_0 + \beta_1(\text{BISE}_{it}) + \beta_2(\text{DER}_{it}) + \beta_3(\text{SOD}_{it}) + \beta_4(\text{MJS}_{it}) + \beta_5(\text{BA}_{it}) + \beta_6(\text{AC}_{it}) + \beta_7(\text{FS}_{it}) + \beta_8(\text{ROA}_{it}) + \beta_9(\text{ROE}_{it}) + \varepsilon_{it}(3)$. ***, ** and * indicate the significance level at 1%, 5% and 10%, respectively (two-tailed). All numbers reported in NOK million. Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.2.3. Results Hypothesis 3 and 4—Share Ownership by Directors

The regression analysis shows a significantly positive relationship between share ownership by directors and earnings management, suggesting a direct positive effect between increasing the percentage of directors who owns shares in the company and the latitude of earnings management. The finding is not in line with the hypothesis, nor the results of Gul et al. (2002). As suggested by Kanagaretnam et al. (2007), directors' shareholdings are associated with smaller increases in information asymmetry, which in turn has the potential to reduce agency costs and thus mitigate the occurrence of earnings management. With respect to the finding, one could therefore argue that there may be other elements of importance when evaluating the effect of directors' shareholdings on earnings management. Supported by Lin and Hwang (2010), the result may provide evidence that directors who own shares in the company are subject to weakened independence and weakened

effectiveness in impartial monitoring, leading to increased agency problems and earnings management. The result is fairly congruent with the findings of Peasnell et al. (2005), who found a positive, though not significant relationship between directors' shareholding and earnings management. It would also be of importance to include the fourth hypothesis in this analysis to more thoroughly assess the assumption. For the fourth hypothesis, the analysis finds a negative, though not significant relation between majority shareholding by directors and earnings management. Even though the result does not support a direct negative effect on earnings management, its implications are of interest. It could imply that majority share ownership gives directors an incentive to prioritize the company's strategic growth. If so, this would help to reduce agency problems related to dissimilar financial interests between the shareholders and the members of the board. The sample data shows that the mean of share ownership by directors and the mean of majority shareholding by directors are respectively 63 percent and 22 percent of the total board size. This implicates that on average 65 percent of the directors who own shares in the company are considered minority share owners with a greater likelihood of a short-term ownership perspective. Given a short-term ownership perspective, they have greater incentives to pursue higher-risk strategies to generate larger financial returns. Combined, these assumptions could implicate that companies with large proportions of minority shareholders on the board manage earnings more frequently. Given these findings, the results corroborate NUES (2018) recommendations regarding directors' long-term and short-term shareholdings.

4.2.4. Results Hypothesis 5—Board Activity

The results of the panel regression suggest a positive, though insignificant relation between board activity and earnings management. This implies that board meeting frequency does not seem to have a direct effect on earnings management, in contradiction to what was expected in the hypothesis and the results of Vafeas (1999), Xie et al. (2003) and Daghsni et al. (2016). The result is however in line with previous studies conducted by Ahmed (2007) and Ahmed (2007). It is worth noticing that the p-value of 0.103 is close to a 10 percent significant level.

4.2.5. Results Hypothesis 6—Audit Committee

Further, the regression analysis points out that an audit committee who supervises the financial reporting and disclosure negatively affects the occurrence of earnings management. This is in line with the hypothesis and the studies conducted by Klein (2002) and Dechow et al. (1996). The finding implies that the audit committee's role in board matters contributes to create trust by securing internal control of financial reporting and that the firm complies with laws and regulations. In addition, one could argue that the regular contact they have with the firm's external auditor could be effective in reducing agency conflicts as they weigh divergent views to produce a more balanced and accurate financial report.

Finally, the control variables behave as expected and are consistent with other earnings management studies (Iqbal et al. 2015; Daghsni et al. 2016). Firm size is found to be negatively related with earnings management, indicating that the occurrence of earnings management is decreasing in line with the size of the firm. The results further show that ROA and ROE negatively affects earnings management, suggesting that earnings management decreases as firm performance and profitability increases. In addition, all control variables are significant.

4.3. More Discussion

We do acknowledge the potential of endogeneity issues in our analysis, as e. g. omitted variables. We are also aware of the important role of firm size in this kind of research, and thus can affect the independent and dependent variables simultaneously—see Coles and Li (2020) for a comprehensive discussion. Moreover, we observe that robustness tests can weaken our findings to some degree, however our main message of the analysis remains.

5. Conclusions

Cited as the next supermodel for corporate governance (The Economist 2013), it is of interest to examine corporate governance practices within the Nordic model of corporate governance. The purpose of this study was to provide insight to better assess the relation between Nordic corporate governance practices and earnings management, and potentially highlight the benefits of the model. The robust multivariate regression analysis under the fixed effect estimator has been used for estimation, while the absolute value of discretionary accruals is used as a proxy for earnings management (Hribar and Nichols 2007).

The presence of employee representation on the board and the presence of an audit committee are both practices that seem to reduce the occurrence of earnings management. The negative relation between the presence of an audit committee and earnings management is already well-established in the earnings management literature (Klein 2002; Dechow et al. 1996), while the findings of employee representation is to some extent new insight. Our findings may suggest that employee representatives provide a credible channel for information, contributing to a richer information environment. This can mitigate agency costs and earnings management and could imply that there are other important aspects of independence that should be taken into consideration to improve the quality of the directors. As for the results regarding share ownership by directors, the findings indicate that large proportions of minority shareholders on the board could give the directors incentives to pursue higher-risk strategies to generate larger financial returns. Finally, board activity and directors as majority shareholders both presented insignificant relations to earnings management. Still, their implications on earnings management may be of interest.

The contribution of this study is not without limitations. First, by using discretionary accruals as a measurement for earnings management one relies solely on proxy measures. Hence, one cannot exclude the possibility that the findings are subject to more natural accounting explanations than earnings management. Second, the relatively small sample size could affect the accuracy of the estimations. Third, our model is not without econometric challenges, and, finally, the corporate governance model may not be enough in capturing the omission of other corporate governance variables. These limitations may constrain the validity of the findings.

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Appendix A

Table A1. The Modified Jones model (1).

Variable	Dependent Variable: Total Accruals
$1/A_{it-1}$	−4.014 ***(0.398)
$\Delta REV_{it} - \Delta REC_{it}$	−0.07(0.037)
PPE_{it}	−0.021 ***(0.07)
Constant	−0.013 ***(0.003)
Observations	784
R-squared	0.117

Notes: The equation for the Modified Jones model developed by Dechow et al. (1995): $\frac{TA_{it}}{A_{it-1}} = \beta_0 + \beta_1 \frac{1}{A_{it-1}} + \beta_2 \frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} + \beta_3 \frac{PPE_{it}}{A_{it-1}} + \varepsilon_{it}(1)$. Standard errors in parentheses, *** $p < 0.01$.

Table A2. The performance matched model (2).

Variables	Dependent Variable: Total Accruals
$1/A_{it-1}$	−0.213
	(0.366)
$\Delta REV_{it} - \Delta REC_{it}$	−0.123 ***
	(0.030)
PPE_{it}	−0.012 **
	(0.006)
ROA^{it}	0.615 ***
	(0.029)
Constant	−0.016 ***
	(0.003)
Observations	784
R-squared	0.436

Notes: The equation for the performance matched model by Kothari et al. (2005): $\frac{TA_{it}}{A_{it-1}} = \beta_0 + \beta_1 \frac{1}{A_{it-1}} + \beta_2 \frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} + \beta_3 \frac{PPE_{it}}{A_{it-1}} + \beta_4 \frac{ROA_{it}}{A_{it-1}} + \varepsilon_{it}$(2). Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$.

Table A3. Hausman test model (3).

Test Summary	Chi-sq. Statistic	Chi-Sq. d.f.	*p*-Value
	143.00	9	0.0000

Notes: Test of H_0: difference in coefficients is not systematic. The random effects estimator is chosen if the *p*-value is > 0.05, and the fixed effect estimator is chosen otherwise.

Table A4. Correlation matrix.

	Abs_DA	BISE	DER	SOD	MJS	BA	AC	FS	ROA	ROE
Abs_DA	1.00									
BISE	−0.02	1.00								
DER	−0.19	0.30	1.00							
SOD	0.03	−0.09	−0.09	1.00						
MJS	−0.01	−0.65	−0.46	0.33	1.00					
BA	−0.04	0.01	0.08	0.08	0.07	1.00				
AC	−0.39	0.11	0.28	−0.28	−0.17	0.11	1.00			
FS	−0.42	0.20	0.41	−0.01	−0.21	0.10	0.51	1.00		
ROA	−0.44	−0.03	0.21	−0.17	−0.08	−0.01	0.36	0.30	1.00	
ROE	−0.21	0.02	0.14	−0.11	−0.10	−0.07	0.10	0.13	0.49	1.00

Notes: According to Brooks (2019) a correlation between two variables that exceeds 0.80 indicates severe multicollinearity. The variables are defined as: abs_DA = absolute value of discretionary accruals, BISE = board independence, DER = employee representatives, SOD = share ownership by directors, MJS = directors as majority shareholders, BA = board activity, AC = audit committee, FS = firm size, ROA = return on assets, ROE = return on equity.

Table A5. Variation inflation factors (VIF).

Variable	VIF	1/VIF
abs_DA	1.47	0.6792
BISE	1.84	0.5438
DER	1.50	0.6686
SOD	1.33	0.7507
MJS	2.42	0.4127
BA	1.07	0.9389
AC	1.65	0.6060
FS	1.70	0.5885
ROA	1.70	0.5870
ROE	1.35	0.7424
Mean VIF	***1.60***	

Notes: According to Brooks (2019) a VIF index over five indicates severe multicollinearity. The variables are defined as: abs_DA = absolute value of discretionary accruals, BISE = board independence, DER = employee representatives, SOD = share ownership by directors, MJS = directors as majority shareholders, BA = board activity, AC = audit committee, FS = firm size, ROA = return on assets, ROE = return on equity.

Table A6. Regression results of model (3) without corporate governance variables.

Variables	Dependent Variable: Discretionary Accruals (absDA)
Firm size (FS)	−0.02 ***
	(0.003)
Return on assets (ROA)	−0.111 ***
	(0.021)
Return on equity (ROE)	−0.011 *
	(0.006)
Constant	0.206 ***
	(0.030)
Observations	784
Number of Identifications	49
R-squared	0.148

Notes: The equation used to test the robustness: $\text{absDA}_{it} = \beta_0 + \beta_1(\text{FS}_{it}) + \beta_2(\text{ROA}_{it}) + \beta_3(\text{ROE}_{it}) + \varepsilon_{it}(3)$. *** and * indicate the significance level at 1% and 10%, respectively (two-tailed). All numbers reported in NOK million. Robust standard errors in parentheses, *** $p < 0.01$, * $p < 0.1$

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