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14 Profitability of Shipping and the Role of Fleet Ownership—North European Company Case Study

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14 Profitability of Shipping and the Role of Fleet Ownership—North European Company Case Study

Ulla Tapaninen and Olli-Pekka Hilmola

14.1 INTRODUCTION

Sustaining profitability in shipping is difficult to achieve in the long term, and its drivers are a major question in the shipping business. Branch and Robarts (2014) identify fleet management as one of the main areas in successful shipping management. In fleet management strategies, there are various issues to be considered, such as markets to serve, fleet capacity, cargoes, revenues, sailing programmes, quality management, surveys and repairs, crew management, ports of call, IT, classification and choice of flag state.

There has been interest in the academic literature concerning whether to own or to charter the tonnage that a shipping company is operating (Meng and Wang, 2011; Park et al., 2018; Tapaninen, 2020; Hiekata et al., 2022). Some companies use a strategy of owning all the vessels they operate, while others only use chartered vessels. In addition, there are shipping companies that do both, owning their basic tonnage and chartering vessels for additional needs. However, the success of the ownership strategy is highly dependent on the level of charter prices and when the vessels are needed (Meng and Wang, 2011; Park et al., 2018).

These maritime phenomena are referred to as maritime fleet size and mix problems (Pantuso et al., 2014; Hiekata et al., 2022). First, we conducted a literature review of the methods. It was found that the specific sub-problem, whether to own or charter the vessels, has received limited attention in the academic literature, in particular when the ownership strategy is related to the financial performance of shipping companies. We also examined key findings of the case of Hanjin Shipping, which previously has been well documented (Shin et al., 2019).

The question of owning or chartering the vessel is very important for shipping companies. When the company owns a vessel, it has more power in developing the operating procedures of the vessels. In chartered vessels, this link is more distant,

as everything must also be agreed with the ship owner. As is shown in the literature review in Section 14.2, there exist theoretical studies of best possible ownership versus chartering strategies, but relevant literature lacks empirical case studies. In the real world, all managerial decisions are more complex than can be modelled with simulation or optimisation methods. Therefore, our empirical long-term case study (1994–2022) can give some insights that cannot be achieved in modelling studies.

The problem of the size of the personnel has received less interest in academic literature (see discussion, for example, in Branch and Robarts (2014) and Tapaninen (2020)). However, lately, as there has taken place a scientific breakthrough in autonomous shipping, the effect of minimising or eliminating crew costs has also received more attention. Furthermore, we will look at the potential of personnel costs in the profitability of a shipping company.

The methodology of the study is based on case study research with triangulation. The case study methodology is well suited for this type of study, where there does not exist enough data for pure statistical analysis. Yin (2009, p. 18) defines a case study as an empirical study investigating a phenomenon in its real-life context. Eisenhard (1989) states that a case study is well suited to studying phenomena that is new or where there does not exist sufficient statistical data, in particular when creating novel theory.

Triangulation means that multiple methods are used to study the research question (Patton, 1999). Triangulation is mainly used in qualitative research, but it's also commonly applied also in quantitative research. In this study we use mixed methods research, where we first study the phenomenon using both qualitative and quantitative data and only thereafter make some statistical analysis to possibly prove our observations. As background we have a literature review supporting the findings.

In this study, the following research questions are studied:

- How did the case company's sales, profit and return on investment (ROI, %) develop in 1994–2022?
- How did financial performance develop as fleet ownership strategy changed?
- What was the role of the amount of ship crew in this process?

According to principles of case study research, we look at the subject from various angles. First, we examine what has been stated in the literature review; then we explain the financial situation where the company has been operating during the time period under study. Then we examine the longitudinal development of major financial key performance indicators (KPIs, e.g., profit and sales). In addition to have more insight in the company, we perform a regression analysis of possible drivers of ROI and its sub-components (profit margin and asset turns). Finally, we draw conclusions and discuss findings and their validity.

In Section 14.2, a literature review is completed of both fleet size and the mix problem as well as the importance of crew costs within shipping. Thereafter, in Section 14.3, we introduce the operating environment of Finnish foreign trade and logistics (the main operating country of the case study shipping company). The examination is longitudinal, and it concerns overall cargo analysis but in addition sub-cargo groups such as ro-ro and ro-pax. Section 14.4 presents a case study from a roro (roll-on/roll-off) shipping company operating Finnish, Swedish and German

routes (pseudonymously called Upsilon in the following). The company is one of the largest shipping companies operating short-sea shipping with ro-ro vessels between Finland and central Europe. The timeframe of this study is 1994–2022, a time when the company's geographical focus and operating model (type of vessels and customers) remained unchanged, but the profitability of the company altered significantly. We look at the reasons for the change and its financial outcomes. Together with these, we try to dive deeper into understanding the drivers of profitability in the observation period within this company by building regression models in Section 14.5. At the end of the research in Section 14.6, we discuss the findings and limitations of the study. In addition, we point out directions for future research.

14.2 LITERATURE REVIEW

A successful shipping business is very much about how to manage a company in changing shipping cycles. Stopford (2009) describes these cycles in three groups: long-term cycles that are driven by changes in world industry; short-term cycles due to changes in the world economy; and seasonal cycles, such as those driven by agriculture. Tapaninen (2020) mentions that the correct timing of ordering, selling and scrapping ships and buying and selling used tonnage is often considered more important than operational decisions (like selling cargo space at the right price). Often companies do not only acquire new ships but also focus on transactions in the second-hand market—sale and purchase activity and processes are an important part of profitability of shipping (Park et al., 2018).

Shipping companies have several ways to deal with demand cycles and other strategic issues. Dulebenets et al. (2021) define the problems a liner shipping company faces by three groups: strategic, tactical and operational. Strategic-level problems are fleet size and mix, alliance strategy and network design. Tactical-level problems are service frequency determination, fleet deployment, sailing speed optimisation and vessel scheduling. Operational-level decisions are cargo booking, cargo routing and vessel rescheduling. Santos et al. (2022) have developed a methodology for short-sea-shipping service design within intermodal transport chains.

Tapaninen (2020) mentions that the size of the crew has an effect on shipping profitability. In principle, a bigger crew translates to a higher cost level for the shipping company. Consequently, there has been a constant tendency to decrease the size of the crew compared to the volumes transported, such as by increasing the size of the vessels. In addition, the number of crew members also depends on how watch keeping is organised, work and free time, the ship's area of operation, type of operation of the vessel, cargo, passengers, maintenance and servicing and safety aspects. Also, the flag state has a big effect on crew costs. Karvonen and Jousilahti (2020) calculated that in the Finnish ro-ro and ro-pax business, where the case study company of this research work operates, the manning costs were 5–8% of total costs.

During recent years, studies of autonomous vessels have been focusing on the importance of the costs of the crew. It has been estimated in various studies that autonomous shipping would decrease the crewing costs. Ghaderi (2019) and Kretschmann et al. (2017) found that short-sea shipping operators can benefit from cost reductions by implementing autonomous technologies, while Hannaford and Hassel

(2021) found that reducing crews and increasing shipboard automation have potentially negative effects on the deck officers, including sensor over-reliance, decreased situational awareness and increased complacency, while providing no reduction in onboard duties or fatigue. However, it should be noted that these studies look at only on the number of crew on board and not the whole personnel of the company.

The objective of maritime fleet size and mix problem (MFSMP) is typically to minimise the total cost of setting up and operating a fleet of a shipping company. The problem has been widely addressed by operations research models. For extensive review of MFSMP problems and algorithms see, for example, Pantuso et al. (2014) and Hoff et al. (2010).

Already half a century ago, Everett et al. (1972) presented the problem of composing the US merchant marine fleet to get the best ship designs and sizes for a fleet of tankers and bulkers supposed to carry 15% of the US foreign trade. In the 1980s, Davies (1983) studied the strategic-level problem of the link between fleet size and profitability, coming to the conclusion that profits and unit costs in liner shipping are highly sensitive to the degree of capacity utilisation. Later, Alizadeh and Nomikos (2007) studied the performance of trading strategies in the sale and purchase market of dry bulk ships. Fusillo (2004) showed that liner shipping fixed capacity brings problems as demand fluctuates.

Hiekata et al. (2022) states that research related to the MFSMP mainly focuses on the design of the overall fleet size and mix of vessel type for a static shipping demand and does not consider fleet change to meet a dynamic demand over time. Once the fleet composition has been determined, it must be updated in response to subsequent changes in demand. The fleet operator needs to make decisions such as buying, chartering and scrapping of vessels.

As Meng and Wang (2011) illustrate, multi-year liner fleet planning is a dynamic activity, and typically, for example, in growing transportation markets, smaller ships are being sold after some usage time, and fewer larger ones are acquired. Based on their study, in the short term, chartering of ships could be reasonable and even cheap, but in the long term, its benefits can be questionable, as the sale of ships often leads to sizeable profits.

Cariou and Wolff (2013) note that even though there are multiple strategies for the MFSMP problem, there are fewer studies on the decision of whether to own or to charter vessels. Liner operators always own a certain number of vessels to meet the minimum requirements of their contract engagements, but they also charter extra tonnage to meet specific market requirements (see also Plomaritou and Papadopoulos, 2019).

D'Agostini et al. (2019) mention chartering provides a more flexible solution, as ships are almost immediately available, and the capital required is usually lower except in low-demand markets, when vessels are sold almost at scrap prices. According to their study, large container shipping lines have very different chartering strategies. Hapag-Lloyd had the lowest share of chartered ships with 37.5% and ZIM the highest with 93.9% of ships on charter.

Cariou (2008) suggests that chartering instead of ordering new vessels provides more flexibility and reduces the initial capital requirement and the delivery time but is more costly in the long run. In addition, Cariou and Wolff (2013) name several

advantages of chartering vessels instead of owning them: First, it reduces the debt-leverage ratio. Second, chartering offers the possibility of allocation of resources to other activities, like door-to-door services. Third, it secures future slot-costs that are pre-established in the charter party. Fourth, chartering provides indirect access to ship funds, leasing or partnership structures. Finally, it is a way for a company to benchmark its owned vessel performance with those of chartered vessels.

Bhonsle (2022) states even more advantages and disadvantages when it is more appropriate to charter or to own the fleet a company is operating. The advantages of owning are, for example, control of vessel long-term utilisation and maintenance, lower operating expenses and better cash flow as well as better long-term planning. The disadvantages of owning are higher capital need and possible interest burden and risk of high fixed costs when there is a lack of cargo. On the contrary, Bhonsle (2022) states that the advantages of chartering are minimal capital expenditures, vessels can be deployed into service very rapidly after demand increases, avoiding long construction time and having an option to return vessels in case of a downturn in the market.

However, the disadvantages of chartering are higher operative cash outflows and potential problems regarding maintenance, and, in case of high demand, it will be difficult to find appropriate tonnage to charter, leaving carriers unable to deploy adequate capacity, resulting in revenue losses and missing the chance to take advantage of cyclical upturns.

Finally, Cariou and Wolff (2013) mention that there is a lack of studies that connect shipping companies' chartering decisions with financial performance. The issue is, of course, very complicated, as there are multiple choices that have an influence on the financial performance of a shipping company.

In shipping, there have been decades of success as well as expansion, and then decades of declining markets. When markets are on a favourable path, new capacity is needed, and even fewer efficient shipping companies produce sufficient profits. However, in declining markets, capacity needs to meet demand, and it should be as efficient as possible. For example, in 1970s liquid bulk shipping (oil) was booming and offered shipping capacity was high. However, it took more than two decades that oil tanker fleet was at same level as it was in the year 1980 (Lun et al., 2013). So, a lot of fleets were simply removed from the markets (by scrapping).

Similar problems persisted in shipping after the global financial crisis (GFC) in 2008 and in the decade of 2010–2019. For example, container shipping companies ordered ever larger ships prior to the GFC, when demand was continuously increasing. These orders were not cancelled, and ship size and efficiency had major importance in container shipping strategy in 2010–2020. Smaller ships, still totally functional, were just removed from markets and scrapped as they were not economically competitive. In container shipping markets, growth of supply (ships) was larger than growth in demand during the years 2012–15 as well as in 2018–20 (United Nations, 2021). Only in 2010, as the global market recovered from the GFC, was demand clearly larger than ship supply growth.

An example of this container shipping crisis was Hanjin Shipping. The company went bankrupt in the autumn of 2016 (Shin et al., 2019). Hanjin operated mostly in the container shipping segment and was one of the top 10 companies in this industry (in 2015 Hanjin was the eighth largest with market share of 3.1%; United Nations,

2016). After the GFC it decided to charter larger vessels to keep its position and market share. In the depressed freight rates, this was financially less beneficial, as charter rates were too high for a low-cost strategy. As declining and low-cost emphasis markets in container shipping persisted longer than a few years, it was evident that this charter strategy led to financial difficulties. Eventually, bankruptcy was caused by an insufficient amount of working capital.

14.3 FOREIGN TRADE AND ITS LOGISTICS IN FINLAND

Finland is almost entirely dependent on maritime transport. In 2022, 92.5% of the Finnish foreign trade of goods was carried out by sea (Finnish Customs, 2024a). In principle, only Russia’s and some Commonwealth of Independent States (CIS) countries’ goods trade was also carried out by road or rail. The Russian military invasion of Ukraine in February 2022 changed this, and land-based modes have significantly lost volume. Not only has pure Russian trade serving land-based modes been hurt, but indirect effects have also taken place. During the COVID-19 pandemic, Chinese container trains connecting Finland were growing substantially but have now completely disappeared (e.g., Hilmola & Li, 2023).

Before the global financial crisis of 2008–2009 there was an almost constant predictable increase in Finnish maritime transport, which can be seen in Figure 14.1 (with some notable decreases, like in 1975, 1995 and 2005). After the GFC, Finnish total maritime transport has not been constantly growing any more but has rather varied between 82 and 104 million tons. The highest volume could be detected in the year 2018, and thereafter the country has faced a continuous decline in sea port

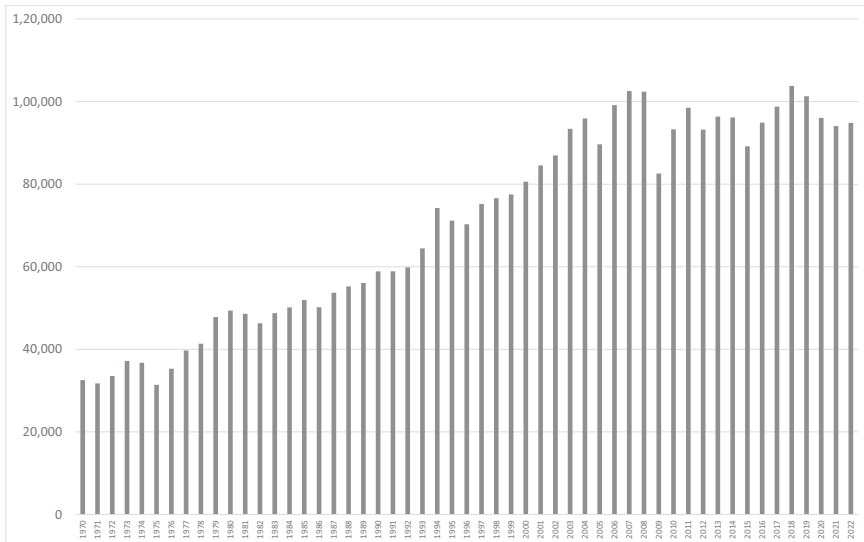


FIGURE 14.1 Overall sea port handling of Finland during 1970–2022 ('000 tons).
 Source (data): Statistics Finland (2024a).

handling (only to recover slightly in 2022). Overall, this means that Finnish tied shipping market has clearly matured after GFC. In this environment, revenue growth has been difficult to obtain. This also has its implications for the general profitability of actors of this sector. Both partly answer our research question 1 of the study.

Finland has been going through major transformations in the recent decades. Lower-value production exports still hold significance, but their volumes are not growing any longer. In higher-valued goods, changes have been rather significant and constant—these goods are not seen in large amounts (calculated in tons) in transport statistics. Moreover, the share of service export has reached to 27% of total exports in value, and cargo export is only 63% in value—hence, seaborne exports are only 55% of total exports from Finland in value. The country is also part of the European Union, and the debt crises of last decade have also affected its economy and consumption development.

In 2021, 11.4 million tons (12%) of Finnish foreign trade was carried in containers. Trucks and trailers (that are the main cargo groups of the case study company of this study)—are carried on ro-ro or ro-pax vessels or passenger-car ferries, in total 16.6 million tons (18% of Finnish foreign trade). In the recent two decades, trucks and semi-trailers (see Figure 14.2) in shorter maritime routes, particularly between Estonia and Finland, have shown consistent growth.

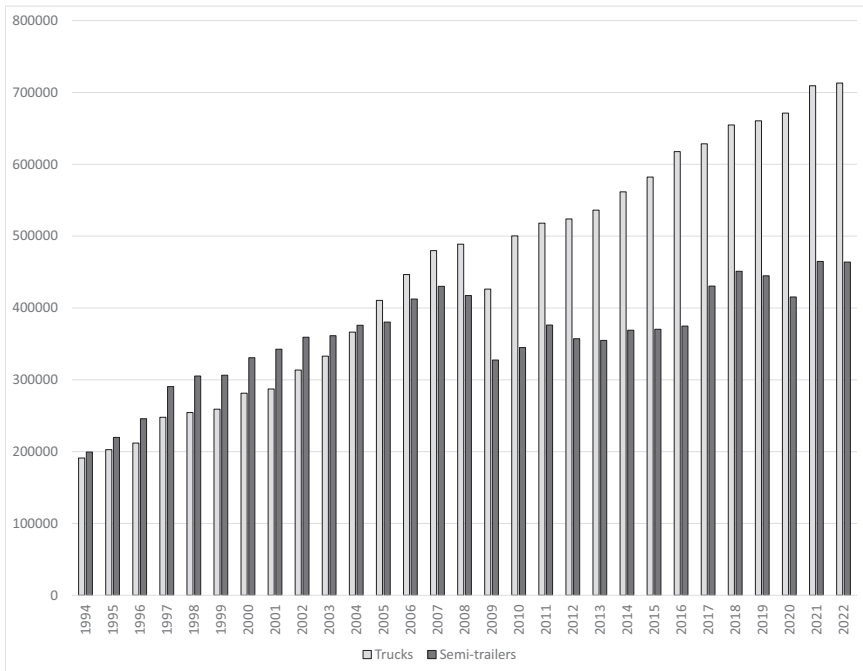


FIGURE 14.2 Number of trucks with semi-trailers (“trucks”) and solely semi-trailers handled through Finnish sea ports during period of 1994–2021.

Source (data): Statistics Finland (2024b) and own research.

14.4 CASE STUDY: LONGITUDINAL FINANCIAL RESULTS OF A SHIPPING COMPANY

In this study, we focus on a North European shipping company, pseudonymously named Upsilon. The company has been (during the years under study) in a stable situation in terms of geographical focus and trade volumes, but there have been significant changes in the ownership of the vessels and the number of personnel. In this study, we look at the effect of these two factors on the profitability of the company.

Upsilon has been one of the most successful shipping companies in Finland. It has operated in the last 30 years practically in the same geographical area: Finland–Germany, Finland–Sweden and some lines to North Sea (Finland–UK, The Netherlands and Belgium), the same vessel types (ro-ro/ro-pax vessels) and with the same customer base. The customer base has been Finnish export of break bulk (mainly forestry products) and export and import of trucks and trailers with consumer goods and industrial raw materials. The company has not been operating in fast-growing Finland-Estonia truck traffic enabled by a short sea route. Therefore, Upsilon has been positioned in mature markets, where further growth has been difficult to obtain after the GFC (the basis for research question 1 of the study).

The company was established in 1947 mainly to serve the Finnish export of forest products to the United States, UK and Western Europe. From the late 1960s onwards, the shipping company concentrated on ro-ro vessels. The paper industry and its export remained the main focus. In imports, it transported trailers and lorries carrying consumer goods and industrial products.

In 1986 a new daughter company was founded to carry cargoes between Finland and Sweden. In 1989 the company decided to separate their cargo-carrying operations from passenger operations.

During 2007 a larger international shipping company became the largest owner of Upsilon and expressed interest in purchasing the entire company. However, this took a number of years to materialise: In late 2015 the full acquisition was completed.

Even though the operations and net turnover of Upsilon have been quite stable since 1997 (Figure 14.3), the company's financial performance and profitability presented by return on investment have changed tremendously during the observation period of 1994–2022 (Figure 14.4). From Figure 14.3, it can be seen that net sales have fluctuated between slightly below 500 (years before 1998, 2009, 2016 and 2020) and nearly 750 million euros, with peaks in 2005, 2008 and 2022. The highest revenues took place just before the GFC and show a slight downward trend in the entire observation period until 2022.

The change of ROI-% was due to the high prices of chartered tonnage; Figure 14.5 shows the development of the owned and chartered number of vessels. A rapid decline of revenues in 2009 (nearly one third was lost in one year) resulted in declines of ROI-% (Figure 14.4).

Even if the turn in 2009 was rather rapid and deep, it could be said that ROI was in a declining state from 2006 onwards, when the ROI level was 9.9 %, which eventually declined to -1.7 % in 2009. The decline for the worse actually started earlier than 2008, when the ROI was already as low as 2.9 %. It could be estimated that the ROI had a clear cycle from a high level to lows, starting in the late 1990s and ending in 2009.

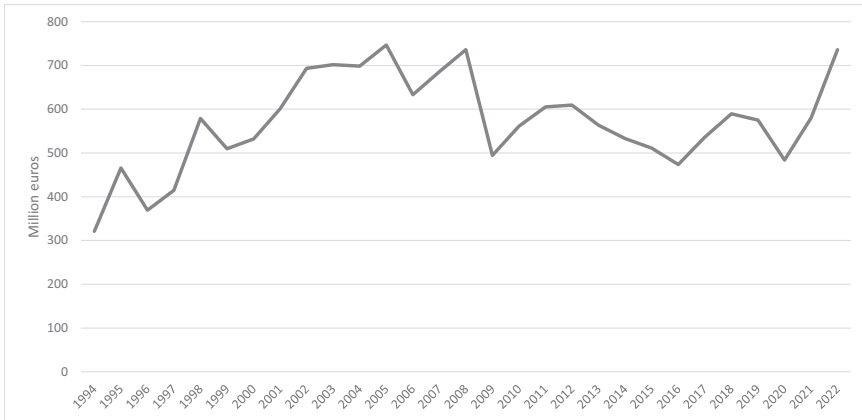


FIGURE 14.3 Annual sales (net turnover) of the case study company during years 1994–2022.

Source (data): annual reports.

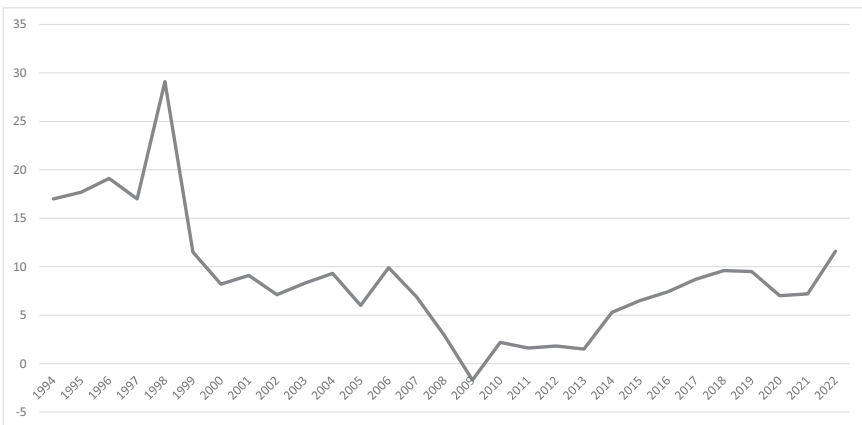


FIGURE 14.4 Return on investment development of the case study company during 1994–2022.

Source (data): annual reports.

In 2007, the case study company changed its strategy from a mixture of ship chartering and ownership to just pure ship ownership. Figure 14.5 shows that starting in 2009, the number of chartered vessels decreased tremendously. However, it took five years before the ROI increased to 5% or higher (Figure 14.4), but of course some improvement was seen from 2010 onwards. This illustrates well that, with a delay, profitability started to improve in maturing markets due to fleet ownership strategy change. Earlier in the era of growth (prior to the GFC and especially in the 1990s), fleet ownership was based on both owning vessels but also on large-scale chartering and resulted in high profitability then. This partly answers our research question 2.

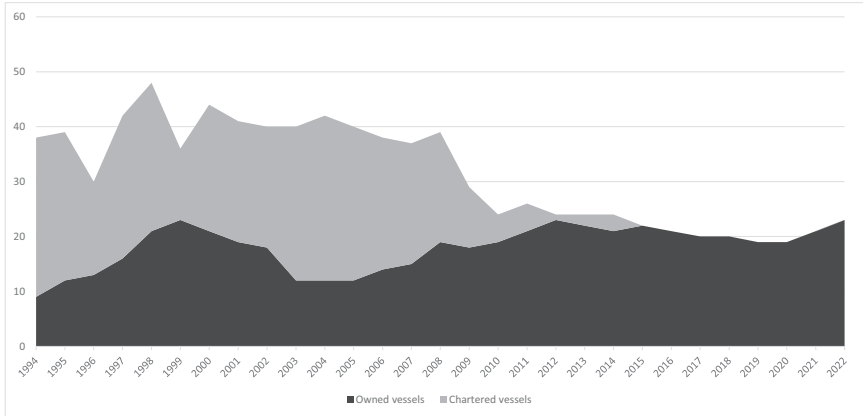


FIGURE 14.5 Number and ownership of vessels in the case study company's fleet during years 1994–2022 (ro-ro/ro-pax vessels only in this chart).

Source (data): annual reports.

The change in vessel ownership strategy was significant: In 2000 the share of chartered vessels was somewhat above half (see Figure 14.5). Starting from 2015, there were no chartered vessels at all. The case study company's (from 2015) annual report highlighted the strategic shift, which required a decade to be completed and needed an investment of 1 billion EUR. The company stressed that they want to own their vessels and charters are not used at all. The charter market was described in the annual report as volatile, and these vessels did not always serve the purpose and needs of customers on a cost-efficient basis. This was also in line with the owner's strategy of maximising vessel transport capacity to achieve economies of scale and scope and the maximum environmental benefits at the same time (Haralambides, 2013).

The strategy change had implications for two components of the ROI formula—asset turns, referring to a company's sales relative to the value of its assets (Figure 14.6), and profit-loss margin (%), referring to profit or loss compared with sales (Figure 14.7). As a company concentrates more in the ownership of its used assets, typically relative margins improve, and asset turns decline. As Figure 14.6 illustrates, the asset turns of Upsilon were at the level of 0.6–0.8 at the beginning of observation period and in the heights of chartering. With the new strategy (favouring ownership), asset turns declined to a level of 0.4–0.5.

This shipping company has today more of its own capital than external debt in its assets. This has an upside. Profit margins (%) have improved a lot (see Figure 14.7)—in recent years, they have reached the level of 15%, which is substantially higher than what the situation was at the beginning of the century. Ownership of vessels saves costs in the profit and loss statement, as excessive premiums are not paid from charters to other organisations. This has been especially beneficial in times after the GFC, as interest rates were very low until 2022. Similarly, with profitability, improvements in profit margins needed time after the fleet ownership strategy changed (Figure 14.7). There is clearly a time delay factor with the fleet decision being made and its effect on profit margin (note research question 2).

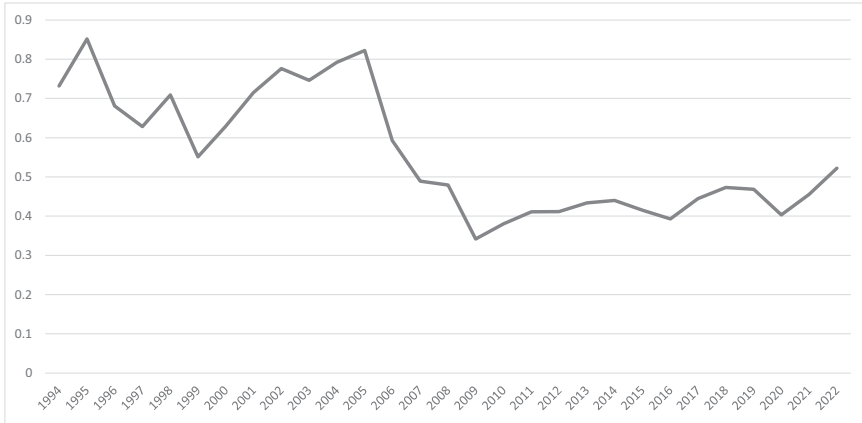


FIGURE 14.6 Asset turns of the case study company (sales/assets) during years 1994–2022.

Source (data): annual reports.

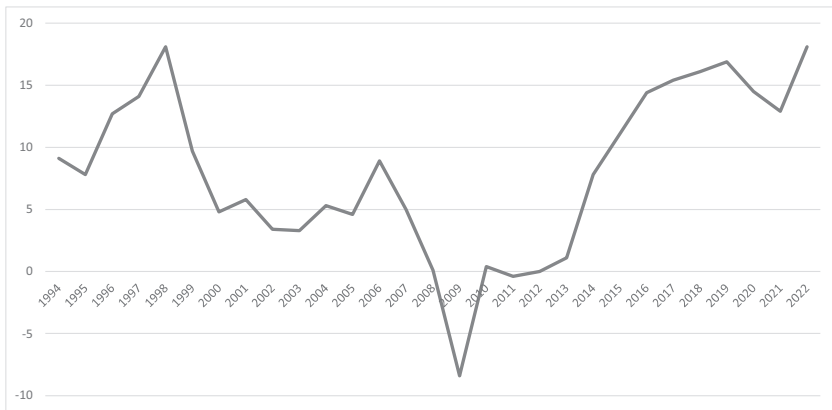


FIGURE 14.7 Net profit-loss (%) of the case study company during years 1994–2022.

Source (data): annual reports

What is often overlooked in a vessel owning strategy within the literature is the fit, efficiency and productivity of the fleet in overall operations. When analysing the number of employees (entire shipping company) and in addition sea personnel, it is clear that a new strategy involves a decreased number of sea personnel (see Figure 14.8), and revenues per employee are higher. This is mainly due to decreasing the number of vessels and increasing vessel sizes.

The total number of Upsilon’s employees increased up to the GFC and has thereafter clearly been on a declining path. The number of sea personnel in turn increased up to 2012, and after that it has been in a slight decline. In the five-year period of 2005–2009, revenues per employee (all, not only sea personnel) were around 0.29 million EUR, while within the five-year period of 2017–2021, the revenue per

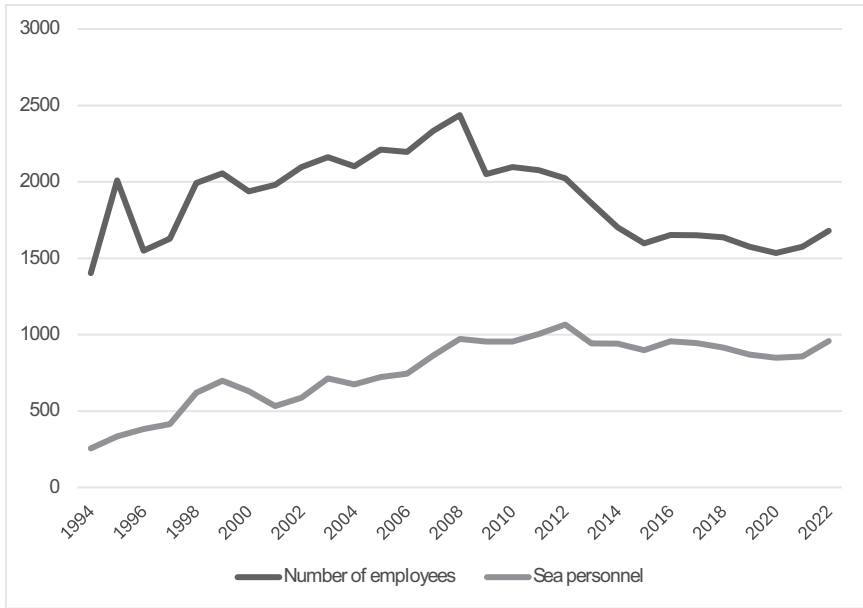


FIGURE 14.8 Number of employees and sea personnel of the case study company during 1994–2022.

Source (data): annual reports.

employee increased to 0.35 million EUR (18.5% increase). The figures are not totally justifiable, as it is not known whether the chartered vessels were bareboat or voyage charters. It should be noted that as the number of vessels has decreased, their size has considerably grown, allowing fewer crew members per cargo ton transported (note research question 3 of the study).

14.5 REGRESSION MODELLING

According to case study research methodology and triangulation requirement, we looked at this case from various angles and with several methods. In this section we look at statistical analysis of the case study company, based on the data presented previously.

We developed regression models with the data of 1994–2022 to analyse what the drivers of profitability (ROI-%) were. In Appendix A, we analyse first regressors for ROI-%, then for two main components of ROI, profit-loss (%) margin and asset turns.

As dependent and independent variables are so interconnected, it should be noted that the used regression models contain possible multicollinearity issues. For example, chartered vessel data has a positive correlation with the number of employees (0.473) and a negative correlation with the amount of owned vessels (−0.73). The number of sea personnel is positively correlated with owned vessels (0.657). In some research works, the correlation coefficient threshold for multicollinearity of independent variables is 0.7 (Sy et al., 2017; Derbali and Jamel, 2018), while in others it has been 0.8 (Shrestha, 2020). So, multicollinearity could be an issue in these presented regression models, as it is in the area of the threshold.

In these models, we found that statistically significant drivers for higher ROI-% were both number of employees (the lower the number, the better the ROI) and number of chartered vessels (the higher the amount, the better the ROI). Owned vessels were rather close to statistical significance ($p = 0.056$ vs. 0.05), also indicating that a higher number of own vessels would result in a higher ROI. In general, one vessel adds around 0.6% units to ROI (chartered co-efficient higher than owned). This is a rather high ROI increase and illustrates well the critical decision of the amount of fleet in a shipping company in particular demand circumstances. However, it should be noted that adding 35 employees (co-efficient -0.0175) more will have the same-sized effect as adding a new vessel. Thus, this is negative. So, it is vital that larger-scale operations be efficient and even more efficient than what the already existing fleet offers.

In profit-loss (%) margin, number of employees was the single factor with statistical significance (the lower the amount, the better the margins; co-efficient -0.019). In asset turns, chartered vessels were analysed to be drivers (positive but small co-efficient, 0.007), where the number of sea personnel was negative (very small co-efficient, -0.0003).

These results highlight two issues: the importance of employee productivity (not only sea personnel but the entire shipping company) and the role of chartered vessels in building high profitability performance. This brings a very important finding to our discussion. ROI-% was at high levels with chartered strategy during the years 1994–2007. This is mostly because the era could be characterised as a high economic boom in shipping (in the markets of Upsilon). However, due to the GFC the situation became very difficult in 2008–2009, and strategic change was needed to tackle the crisis as overall markets matured.

After 2015, with the entire ownership of vessels, ROI-% is again at high levels in 2015–2022, as it was in the latter part of high-performance period (not nearly as high as in the 1990s, which is in a class of its own). However, at this time, the high ROI-% is based on lower workforce and therefore higher employee productivity. In the time of a transition out of charters, it could be said that the case study company was in a mixed state, where chartered vessels were still used, and the number of employees was in decline. Thus, this did not prove to produce high ROI-%. However, the role of personnel should be seen in a larger context, and an examination should concern the entire shipping company. In Upsilon, all personnel costs have been in recent years (2018–2022) somewhat above 15%, as they were in 2009–2010 at the level of 20% or higher. As said, labour productivity is a critical part of a shipping company's profitability. The amount of labour was affecting all three regression models. Our research question 3 was tied to the number of sea personnel and their role—it seems that it has a direct effect on asset turns, but number of employees should rather be seen on a total basis concerning the entire shipping company (it directly affects profitability).

Our research question 2 concerned the role of fleet ownership change and its impact on profitability. Regression modelling results indicate that the amount of owned vessels possibly has a direct link to profitability (nearly statistically significant regressor). A regression model also had a statistically significant driver of chartered vessels—this overall indicates that ownership strategy is linked to profitability and should be fit for a particular business environment. After the GFC, revenue growth has been more difficult to achieve.

14.6 CONCLUDING DISCUSSION

In this research, we have examined how the profitability of a roro shipping company serving North European markets has changed in roughly three decades of time and compared its strategy of owning vs. chartering vessels. We have relied on the information given by the annual reports; no inside knowledge or information has been available.

While answering research questions, first we notice that the company's sales (Figure 14.3) have varied during the years 1994–2022 between 321 million euros and 746 million euros. However, the difference in profit (Figure 14.7) was between –8.4% and 18.1% and the ROI-% between –1.7% and 29.1%. This comparison shows us that the variation in profit and losses is not only dependent on sales of marine traffic but also on other factors.

The next research question is based on the first one. If and when the profit and ROI-% are not mainly dependent on sales, what are the other factors that influence profit? Figure 14.5 shows that before the difficult years starting in 2007, the number of chartered vessels was high. Unfortunately, the full data of vessel hires was not publicly available for researchers. However, it could be seen that when the ownership strategy of the company changed from chartering to fully owning the vessels, the financial situation also improved considerably (but with a time delay). Owning vessels seems to be associated with mature markets.

As vessel hires are only one of the factors affecting the financial performance of shipping companies, we have also included a study of sea personnel (Figure 14.8). This shows that the number of employees in the company has remained at a constant level since 2008. It should be noted that these are only the employees under the company's own payroll. The seafarers who worked in the chartered vessels were not always included in this figure—depending on the terms of chartering. This information was not available.

To have further understanding of the changes, we also developed regression models with the data of 1994–2022 to analyse what the drivers of profitability (ROI-%) were. In these models, we found that statistically significant drivers for higher ROI-% were both the number of employees (the lower the number, the better the ROI) and the number of chartered vessels (the higher the amount, the better the ROI). The market position and turnover of the case study company have been quite stable during the years. However, the profitability of the company disappeared in 2008–09 due to high vessel hires and decreasing volumes. After that the company made a total change in its strategy to own vessels, the profitability of the case study company has risen significantly. In other words, the strategy of the company relying on chartered tonnage was not robust in turbulent financial and market conditions. Therefore, it is not surprising to find that the number of owned vessels was a nearly statistically significant positive driver of profitability too.

The regression model argues that decisive action concerning chartered and owned vessels would lead to much higher ROI-% than what was achieved. This supports the idea that vessel ownership strategy needs to be clear—it could either be solely owned vessels or in a model where charters play a significant role. However, this argument would require more analysis with several companies to have statistical value.

There are some problems in this study that should be taken into account when examining results. First of all, the data is acquired from the annual reports, and no other

sources were used. This results in limitations in the understanding of the company situation. In addition, the company has been also operating in some feeder-container transport, small-tonnage transport and port operations in addition to ro-ro/ro-pax operations. The financial impact of these operations is in the financial figures of the study, but their effect has not been analysed. The port operations business was around 15% at the start of the century, and during the years it decreased to the level of 4% in 2020. Finally, the share of ro-pax business has been growing slightly, so there is a need for more personnel to serve passengers, and that increases the crew headcount. Therefore, the results of this study should be seen as indicative. Deeper analysis of these operations and their impact on company profitability would bring more value to this study.

This case adds value to the present state of literature: how the company owned/charter decision can be a significant issue in profitability, not just arising from the selling of old fleets to second-hand markets (Meng and Wang, 2011; Park et al., 2018). This study supports the findings of Ghaderi (2019) and Kretschmann et al. (2017) that short-sea shipping operators can benefit from cost reductions by reducing personnel if the vessels are under the control of the company itself. This chapter can be used as teaching material in studies of maritime economics and logistics, showing students the effect of major strategic decisions made by shipping company executives. In particular, we suggest using this research when executives of companies have a background in other business areas and start working in shipping and do not have experience in the cyclic nature and capital intensiveness of the shipping business.

Similarly, this chapter gives insight for policy makers about the fundamentals of the shipping business. It shows how dependent shipping companies are on investment decisions made at the right time. In particular, this is important now, when shipping companies are facing difficult times, when tightening environmental regulations change the business environment and force companies to make new types of investment decisions (see, e.g., Tapaninen and Palu, 2022; Laasma et al., 2022).

Finally, the research methodology of this research was a case study, which adds novelty to the academic literature in areas that cannot be studied by other methods. However, this brings the major weakness of the method: The results cannot be directly applied to all application areas. Therefore, this study should be continued by collecting similar data from several shipping companies and analysing how well these results can be applied to the shipping sector.

As further studies, we would recommend carrying out similar studies with more cases to see the effect of the charter/own decision as well as size of the crew on long-term profitability.

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APPENDIX A

REGRESSION MODELS FROM POSSIBLE DRIVERS OF PROFITABILITY
(ROI, %), PROFIT-LOSS MARGIN (%), AND ASSET TURNS

ROI (%)

Regression Statistics

Multiple <i>R</i>	0.7728
<i>R</i> Square	0.5972
Adjusted <i>R</i> Square	0.5489
Standard Error	4.2715
Observations	29

ANOVA

	df	SS	MS	F	Significance F
Regression	3	676.3876	225.4625	12.3568	3.76137E-05
Residual	25	456.1503	18.2460		
Total	28	1132.5379			

	Coefficients	Standard Error	t Stat	P-value
Intercept	22.6788	7.5005	3.0237	0.006
Number of employees	-0.0175	0.0035	-4.9395	4.36E-05
Owned vessels	0.6311	0.3149	2.0041	0.056
Chartered vessels	0.5916	0.1201	4.9245	4.53E-05

Profit-loss margin (%)

Regression Statistics

Multiple <i>R</i>	0.6866
<i>R</i> Square	0.4714
Adjusted <i>R</i> Square	0.4080
Standard Error	5.1248
Observations	29

ANOVA

	df	SS	MS	F	Significance F
Regression	3	585.5928	195.1976	7.4322	0.0010
Residual	25	656.5948	26.2638		
Total	28	1242.1876			

	Coefficients	Standard Error	t Stat	P-value
Intercept	33.1863	8.9988	3.6879	0.0011
Number of employees	-0.0190	0.0043	-4.4788	0.0001
Owned vessels	0.4488	0.3778	1.1880	0.2460
Chartered vessels	0.2035	0.1441	1.4119	0.1703

Asset turns**Regression Statistics**

Multiple <i>R</i>	0.8899
<i>R</i> Square	0.7919
Adjusted <i>R</i> Square	0.7758
Standard Error	0.0733
Observations	29

ANOVA

	df	SS	MS	F	Significance F
Regression	2	0.5311	0.2656	49.4569	1.37631E-09
Residual	26	0.1396	0.0054		
Total	28	0.6707			

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.6902	0.0907	7.6137	4.42 E-08
Chartered vessels	0.0070	0.0017	4.0463	0.0004
Sea personnel	-0.0003	0.0001	-3.1523	0.0041