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Financial and economic performance of Finnish seaports – restructuring and pandemic impacts

Abstract
In very recent years, the COVID-19 pandemic has hit the Finnish ports as it has done all the ports around the globe. This paper provides an analysis on how the COVID-19 affected the financial and economic performance of Finnish port companies. The port data comprised financial statement data from 18 seaports. The ports were categorized according to their ownership, size, and lines of business. Even if the ports' turnover was definitely dropped because of pandemic, the ports were able to maintain their profitability, liquidity and solidity reasonably well. Some port features, such as type of traffic, contributed to ports' financial resilience, whereas other factors, such as size, had lesser impact.
Keywords: *port performance, financial analysis, COVID-19, Finland, QCA*

1. Introduction

As the marine ports are a significant component and a channel for providing various services to the global economic system, their performance has been investigated through diverse approaches. Mlambo (2021) assessed and tested the port performance with the relationship of the trade performance, while Munim and Schramm (2018) investigated 91 countries' seaports to find how improving the quality of port infrastructure contributes to better logistics performance which leads to higher seaborne trade and higher economic growth.

According to Palthe et al. (2018), transport costs and times along the transport chain are dominant factors for port competitiveness in cases from Europe.

Ports in Finland have historically been municipality-owned entities. A major restructuring took place in 2010-2015 when most municipality-owned enterprises (MOE) were restructured as municipality-owned limited companies (MOC). There are still a few private ports that mainly serve as a hub for major industrial facilities. These ports are privately-owned limited companies (POC).

Before the restructuring, ports had a good financial and economic performance track record. This allowed MOEs to de facto offer extra cash flow to their owners, i.e., the cities and municipalities (Leviäkangas et al. 2015; Rönty et al. 2011). Since the restructuring, there has been no extensive investigation of how the ports' financial and economic performance has developed.

In very recent years, the COVID-19 pandemic has hit the Finnish ports as it has done all the ports around the globe. According to Finnish Port Association (2021), the port of Hamina-Kotka processed 1.5 million shipping containers in 2020, showing a decrease of over 7% compared with the preceding year 2019.

Figure 1. Finnish ports (both sea and inland waterways); source: World Port Source (note: the size categorization is changed later for this paper)

OECD (2022) reported that because of pandemic international trade plunged in 2020 but recovered sharply in 2021. While total trade flows have recovered to pre-pandemic levels, trade impacts across specific goods, services and trade partners are highly diverse, creating pressures on specific sectors and supply chains.

2. Objectives of This Paper

This paper provides answers to the following research questions:

- How has the financial and economic performance of Finnish ports developed after the restructuring in 2015 and onwards?
- How has COVID-19 affected the performance?
- Are there any port strategies or characteristics that seem to explain performance differences, e.g., type of port, size, or specialization?

The reasoning behind these research questions springs from the still quite recent restructuring process, the impacts of which on ports' performance are uncovered. Also, the exact impact of the pandemic shock is an open question: it has been perceived but not explicitly assessed in terms of key financial ratios. What remains completely an open issue is if there are any observable differences in performance between different types of ports.

3. Data and Methodology

3.1 Data sources

Strictly empirical data was used in this research. The primary sources can be regarded as reliable as possible for the purpose of research and analysis. The qualitative part of the analysis is done when port attributes are translated into logical variables.

The data sources used in this research were as follows:

- For the aggregate economic analysis, the national accounts indicators (turnover and other indicators for SIC code 52221) are used (see Figure 2). National accounts data is openly available via StatFinn databases (www.stat.fi).
- For more detailed ratios the annual reports of the ports are analyzed and a high-resolution picture of the financial performance is formed (e.g. profit, solvency, capital structure). The data was obtained from the Finnish Patent and Registration Agency (www.prh.fi) via their online services, after acquiring permissions to access the databases.
- The relevance of the type of port in financial and economic performance is assessed using Qualitative Content Analysis and Boolean algebra. Crisp sets of indicators describing port types are

defined in order to show how the port type is contributing to performance. Crisp set indicators include characteristics such as size, specialization, and location.

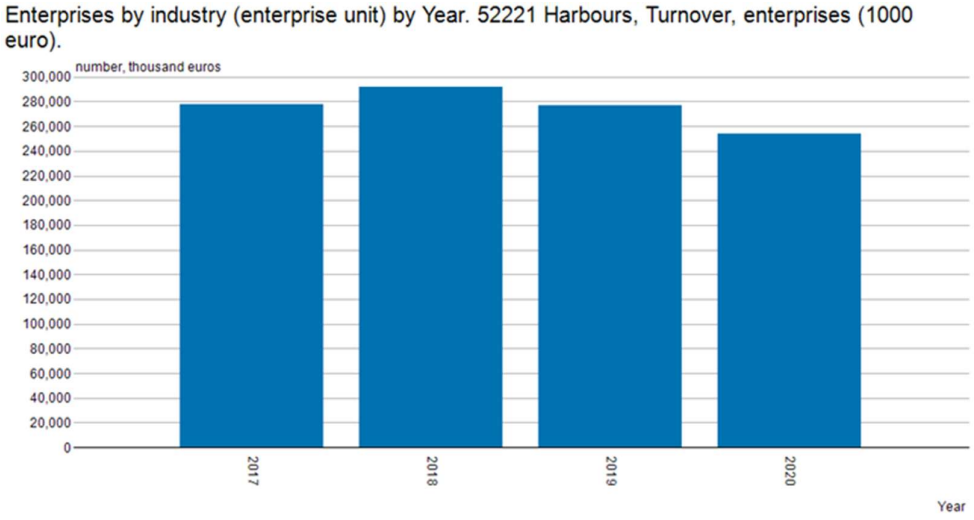

Figure 2. Aggregate turnover of Finnish ports, including inland ports (source: StatFin, www.stat.fi)

3.2 Generalized financial statements

The income statements of the ports were generalized so that they became comparable. This meant simplification and aggregation of statement data. The statements were aggregated and simplified according to Table 1.

Table 1. Port companies' income statement and balance sheet format used in the analysis

INCOME STATEMENT	**BALANCE SHEET**	
Turnover	ASSETS	
+ other income	Fixed assets	
- materials & services	Current assets	
- salaries & personnel	LIABILITIES	
- depreciations	Equity	
- other expenses	Debt	Long-term debt
= Profit margin		Short-term debt
+ financing gains & dividends		
- interest payments & financing expenses		
= Profit before taxes		
- taxes		
= Profit after taxes		

All financial statements covered at least the years 2015 – 2021, but although some statements were available already from 2011 onwards, only the data

from 2015 onwards was used.

3.3 Financial key ratios and variables

The financial ratios that were calculated for the analysis were divided into the following categories, as shown below table (Table 2):

Table 2. Financial key figures used in the analysis

PROFITABILITY	
Profit / Turnover (%)	Profit margin
LIQUIDITY	
Current Assets / Short-Term Debt	Current assets to short-term debt ratio
SOLIDITY	
Equity / Debt	Equity-to-debt ratio
PRODUCTIVITY	
Salaries / Turnover (%)	Labor intensity (inverse of labor productivity)
Fixed Assets / Turnover	Capital intensity (inverse of capital productivity)

The idea with selected ratios is that they are relative numbers and thus more easily comparable between port companies. Using absolute figures is more prone to bias when doing comparisons between entities of different sizes and characteristics. Also, both inflationary and deflationary effects are mitigated. One port company's statement was reported in Swedish crowns – also this problem was overcome by using relative ratios without currency rate conversions.

3.4 Port data

The port data comprised altogether 18 sea ports located on the coast of Finland. The list of included ports and their characteristics is shown in the below table, classifying ownership, size, primary line-of-business (LOB), specialization, freight flow direction, and main type of freight. Most of the ports included in the analysis were members of the Finnish Port Association (www.finnishports.fi). Only the data of legal entities was available, but these ports comprise the most ports in Finland. Only a few ports that belonged to large industrial entities (for example, ports in Tornio and Sköldvik) were missing from the data set, so the coverage of data can be considered good.

The size of the ports was divided in a relative sense so that the five largest ports in terms of turnover in 2019 were assessed as large (L), the following six as medium size (M), and the remaining seven as small (S). The type of business focus (passenger, freight, or combined) was done based on volume figures in 2019 (authors' judgment). Multipurpose vs. single-purpose variable refers to whether the port was mainly serving one or few industrial entities (e.g., a steel or paper manufacturing plant) or whether the port

traffic was serving a mix of cargo and/or passenger flows. Some ports were more oriented towards exporting or importing, while others' traffic was more balanced. Finally, also the freight type was assessed, if it was mainly bulk or unitized cargo in containers and/or trailers. The bulk cargo included also break-bulk, project deliveries, and other non-unitized cargo.

Table 3. Ports included in the analysis

Port company1	**Ownership: Public (city, municipality), Private (P, Pr)**	**Size2 (L, M, S)**	**Primary LOB3: Passenger, Freight, Both (P, F, PF)**	**Specialisation4: Multipurpose, Single-purpose (MP, SP)**	**Freight direction3: Exp., Imp., Both (E, I, EI)**	**Freight main type: Bulk5, Unitised, (trailer, container), Both (B, U, BU)**
Hamina-Kotka	P	L	F	MP	E	BU
Hanko	P	L	F	MP	EI	U
Helsinki	P	L	PF	MP	EI	U
Inkoo	Pr	L	F	SP	EI	B
Kalajoki	P	S	F	MP	E	B
Kaskinen	P	S	F	SP	EI	B
Kemi	P	M	F	SP	E	B
Kokkola	P	L	F	MP	E	BU
Naantali	P	M	PF	MP	I	BU
Oulu	P	M	F	SP	EI	BU
Pietarsaari	P	S	F	SP	E	B
Pori	P	M	F	MP	EI	B
Raahe	P	M	F	SP	I	B
Rauma	P	M	F	MP	E	BU
Tolkkinen	Pr	S	F	MP	EI	B
Turku	P	L	PF	MP	EI	U
Uusi-kaupunki	P	S	F	MP	EI	BU
Vaasa	P	S	PF	MP	I	B

1Port location usually also indicates the company name (e.g. 'Port of Hanko Ltd.').
Port of Tolkkinen is located in the City of Porvoo.
Port of Vaasa is part of the Swedish port group Kvarkenhamnar AB, yet 50% is owned by the city of Vaasa. Kvarkenhamnar in turn is owned by Swedish municipalities/cities.
Port in Inkoo is owned and operated by Inkoo Shipping Ltd.
Port of Raahe is an adjunct to steel manufacturer SSAB Ltd. operated port.
2Ports with a turnover of more than 12 MEUR in 2019 are considered as large (L), ports with a turnover of less than 5 MEUR as small (S); in between belong the medium-sized (M) ports.
3Based on Finnish Transport Agency (2018). Ports with less than 1/3 of their freight volumes in the export or import category were considered as mainly import or export ports, respectively.
4Based on ports' annual reports from 2019.
5Bulk also includes project deliveries, break-bulk, or other non-unitized cargo

3.5 Qualitative Comparative Analysis

In this study, the authors also used Qualitative Comparative Analysis (QCA) to analyze and interpret the finish port data. In 1987, Charles Ragin introduced QCA (Ragin, C.C., 1987) to answer the social research questions. Since that, it has been widely used by researchers as a research approach to answer social issues and behaviors of qualitative nature (Rihoux, 2008). QCA can predict outcome models with smaller cases/populations which attracted the attention of researchers (Rihoux, 2008); (Rihoux, 2009). It also helps in a meaningful interpretation of the conditions presented in the outcome model. Initially, a truth table (0 or 1) was developed for all 18-port data against the six conditions as follows

- Port ownership (PO): the port with public ownership is treated as 1 while others are replaced as 0.
- Turnover/port size (TO): Ports with turnover greater than 5 MEUR are categorized as 1 while turnover less than 5 MEUR is defined as 0.
- Line of business (LOB): The ports which are handling freight are defined as 1 while others are 0.
- Port specialization (SP): if the port is used for multipurpose then it is labeled as 1 while single-purpose ports are labeled as 0.
- Freight direction (FD): The ports which are handling both imports and exports are categorized as 1 while single direction ports (only import or export) are categorized as 0.
- Freight type (FT): Ports carrying bulk freight are defined as 1 while ports carrying unitized freight are categorized as 0

The crisp set truth table was developed using the definitions mentioned above. There are three outcome parameters used including turnover difference (TOD), profit ratio (PR), and labor intensity (LI). The differences of the respective parameter before and after covid was calculated and used for the analysis. The overall average of the TOD was -10.1%, the ports with TOD > -10% are defined as 1 while the ports with TOD less than -10% are 0. The ports with positive PR are defined as 1 while negative PR is defined as 0. Finally, the ports with LI decreased after COVID is categorized as 1 while others are categorized as 0. The Qualitative Content Analysis was done using the fsQCA tool with the truth table for the three outcome parameters (TOD, PR, LI). The FsQCA tool uses the Quine-McCluskey algorithm (Ragin, 2016) and consistency of the model is the main criteria to refine and accept outcome models.

4. Results and Findings

4.1 The aggregate key figures for 2013-2020 – before and after the restructuring

The aggregate level key figures were collected from the national accounts since the detailed data on public entities before corporatization was practically unavailable, due to varying practices in accounting and maintaining the public records in municipalities and cities.

Before the restructuring and corporatization, the cities and municipalities were able to withdraw substantial dividends from their port entities, and the ports' significance to the local public economy was significant, also in the sense of direct cash income (Leviäkangas et al. 2011, Leviäkangas et al. 2015).

Table 4. Ports' key figures from national accounts for 2013-2020; note R denoting restructuring process completed and P denoting first actual year of pandemic (WHO declared a pandemic in January 2020)

Data from national accounts for 2013-2020 (TOL 2008*, 52221 Ports, legal units)								
Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
			R				P	
Number of legal units	44	40	52	52	52	50	59	75
Turnover €1000	244 763	244 442	249 954	263 056	278 064	291 495	276 704	254 227
Staff person-years	779	666	681	704	680	678	589	624
Sum of salaries €1000	17 094	16 916	33 684	33 713	34 287	34 353	31 053	32 968
*TOL 2008 is the national industry classification, following the standards of the International Standard Classification of All Economic Activities (ISIC) according to United Nations								

The restructuring resulted in that former municipality port entities that were legally governed under municipality administration had to be restructured as limited liability companies, thus increasing the number of legal entities. The number of legal entities grew from 40 to 52 between 2014 and 2015 (Table 4).

Basically, this restructuring made the ports independent from the direct municipality control. What remained for the municipalities to exercise power over the port companies was limited to the role of shareholding (which as such enables a significant amount of power). With shareholding, the legislation applied to ports was also changed so that standard corporate law became prevalent. The experiences of this change have not been formally analyzed.

The number of personnel somewhat decreased since not all the former municipality civil service employees were transferred to port company entities. However, and interestingly, the sum of salaries increased drastically, and in fact, doubled after the restructuring was completed in 2015. Between 2014 and 2015 the salaries per staff person-year increased from 25.4 kEUR to 49.5 kEUR, in practice doubling.

The turnover of ports in turn remained quite a stable showing that after restructuring and corporatization the business remained by and large as usual. The conclusion is that exceptional cash transfers from port entities to the municipality or city treasury were at least partly translated into higher incomes for the port staff.

4.2 Financial analysis before and after the pandemic

4.2.1 Turnover decline, but resilience in profitability

The ports lost a significant share of their turnover due to the pandemic. The average annual growth rate trajectory for the ports before the covid outbreak was about 8% from 2016 - 2018. When WHO declared officially the pandemic in early 2019 and much of the traffic started facing multiple difficulties, the turnovers rapidly declined. Figure 3 shows the analyzed 18 ports' growth rate changes before and after the pandemic. After-pandemic growth rate declined to -10% from the before-pandemic rate of 8%. However, some ports were able to keep the positive turnover trajectory despite the obvious drop, but that was the case concerning only a few.

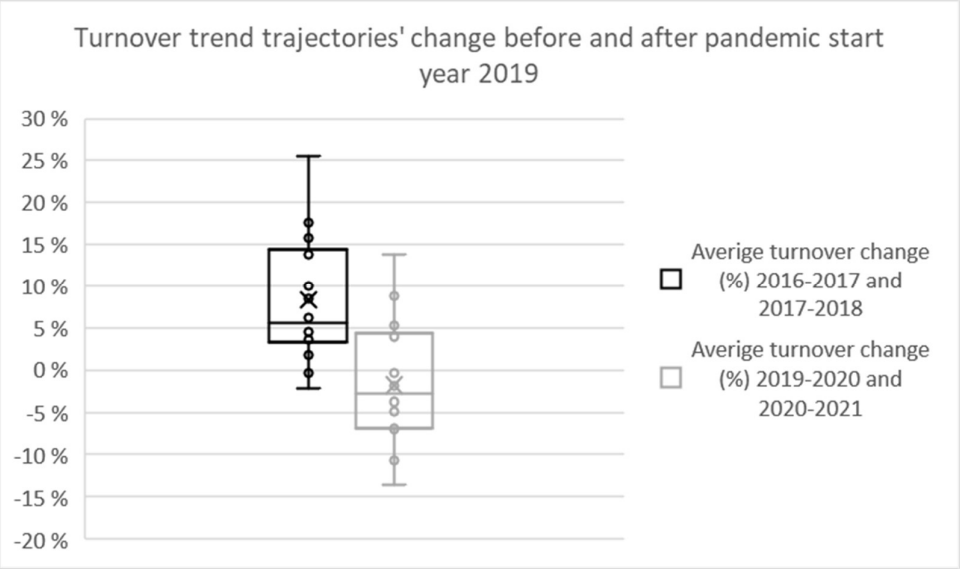

Figure 3. Turnover trend change due to pandemic

Taking a look at which type of ports seemed to have the most resilience in maintaining the level of turnover, some weak indications may be found. The turnover change severity is visualized in Figure 4 showing which type of ports (size, type of traffic, specialization). One would have expected that especially ports that carried also passengers, would have been among those suffering most as travel restrictions and restriction recommendations took force. However, only the largest passenger port – Helsinki – seemed to experience a severe turnover decline. The other ports' passenger volumes were more modest, yet rather significant in terms of business. For example, the Port of Turku survived the drop in passenger volumes surprisingly well.

Another interesting feature is the observation that import-focused ports seem to have had more resilience against pandemic shock. Figure 4 shows

clearly that above the 'upper divide' line three out of the four ports are import-oriented, and no other import ports are below the upper divide, where ports are only slightly having a negative turnover growth, or the growth rate is even positive. One possible explanation is that Finland as a country survived the pandemic reasonably well and was able to keep import volumes despite the pandemic shock.

What is also somewhat surprising is the observation that ports with more balanced traffic were not performing any better than export-oriented ports. In fact, the picture indicates the opposite. Single-purpose export ports were not the most resilient, but not the worst either. Only one small export port is below the 'lower divide' that marks a -15% negative average turnover change for 2019-2020 and 2020-2021. Most of these ports belong to the middle group between the upper and lower divides that mark the differences between resilient and vulnerable ports.

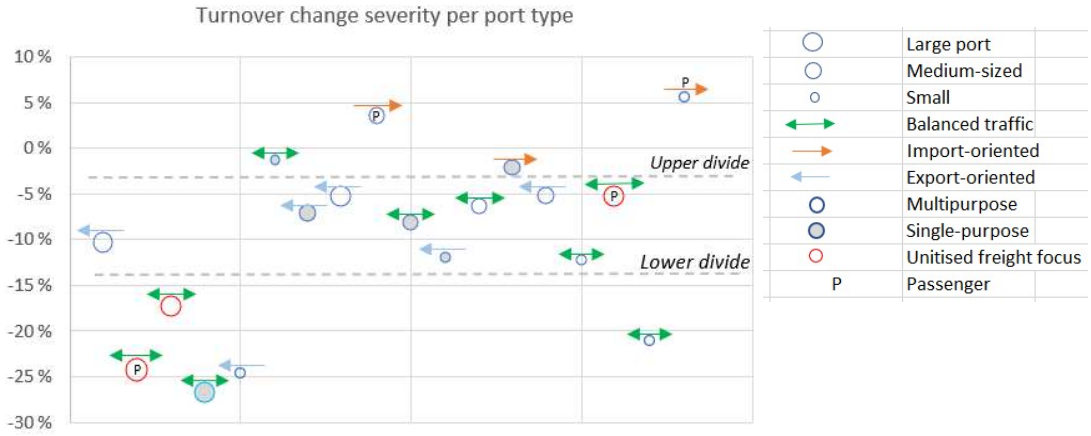

Figure 4. Turnover severity in different types of ports

Profitability measurement revealed likewise some interesting facts. Despite the drops in turnovers, the profitability of the ports seemed much less affected. Figure 5 shows the profit margins (profit per turnover) for 2015 – 2021. The average profit margin was between 8% - 10% before the pandemic hit and dropped somewhat after 2019. However, the drop was not as severe as one would have expected, only a few percentage points to about 6% and yet staying on the positive side on average. The band between the minimum and maximum profit margin figures widened, however, and more cases of severe losses were observed. Only one port out of 18 was making a loss, i.e. having a negative profit margin, in 2018, whereas in 2020 the number had increased to seven and recovered to three in 2021. Therefore,

it is fair to claim that the profitability of the ports was resilient and even the recovery appears to have been rapid. On the other hand, some ports were still diving in terms of profitability in 2021, and there was no recovery. This is visible in Figure 5 showing that the worst-case profit margins went below -20%.

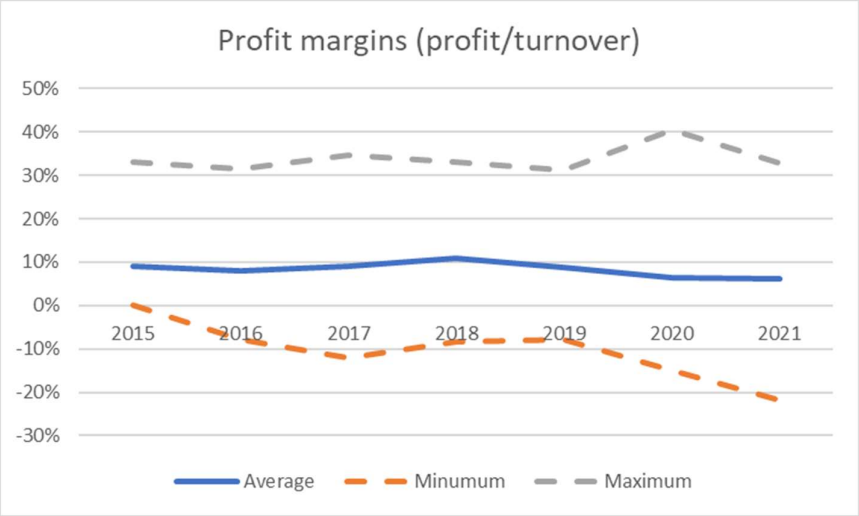

Figure 5. Profitability resilience

4.2.2 Liquidity and solidity

Liquidity was measured as a ratio of current assets to short-term debt. This ratio approximates the traditional current ratio but is a simplified version of it. It indicates how large a share of short-term debt liabilities is covered by liquid or easily cashable assets. The higher the ratio, the better the port company's liquidity position. The obvious ex-ante assumption is that the pandemic has weakened the companies' liquidity.

When observing the ratios for 2015-2021 it becomes clear that the pandemic has had very little impact, if at all, on ports' liquidity position. The analyzed ratios have remained stable and there is no clear observable trend or discontinuity over time. Some ports in fact strengthened their liquidity as a result of public owners' liquidity capital infusion.

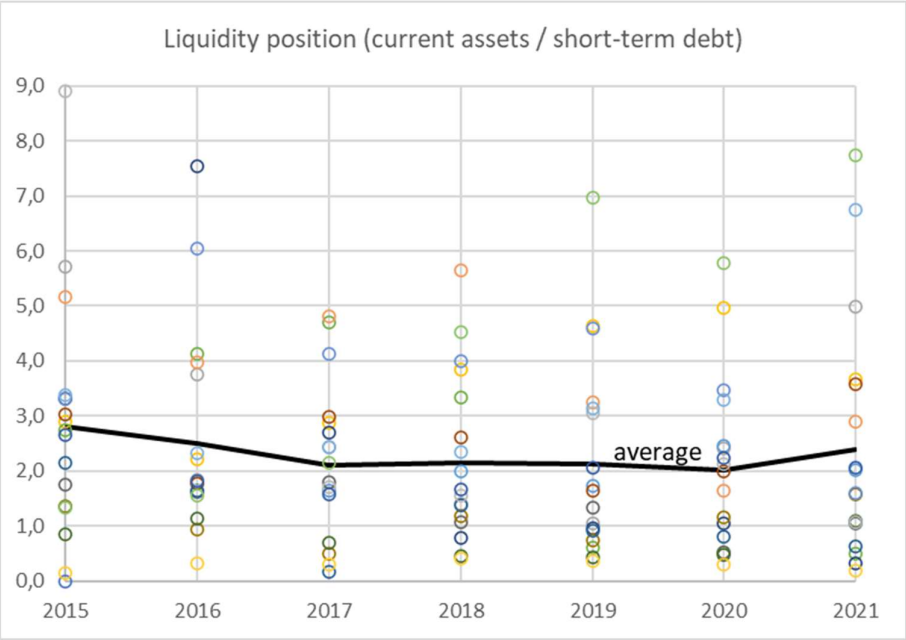

Figure 6. Ports' liquidity position for 2015-2021

There was a slight decline in liquidity position after the restructuring, however, from 2015 to 2017, the pandemic effect is not observable.

Solidity was assessed by the traditional equity to debt ratio. This ratio simply indicates to what extent the capital base of the port company rests on owners' equity or debt investors' lent capital. For a ratio of 1, the amount of equity is equal to the amount of debt, i.e., the company is financed 50% by debt.

There was no observable change in solidity when looking at average ratios across the data set. However, there were a few cases where solidity was quite radically increased. Without digging into the details of annual statement documents it is hard to speculate why this took place, excluding the prospective capital infusions from shareholders. It is not entirely excluded either, that the almost excessive solidity increase might have been an over-reaction of the shareholders. This phenomenon is visible in the below figure.

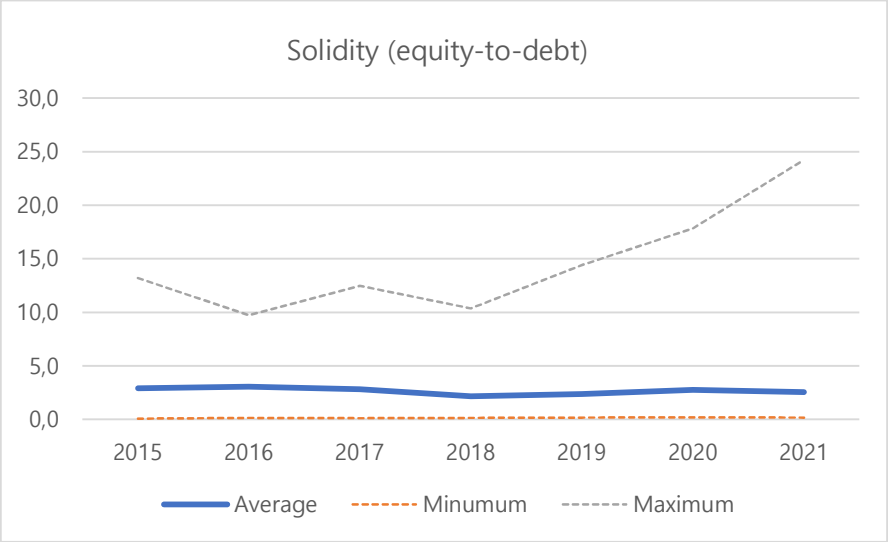

Figure 7. Solidity of port companies; annual average, maximum and minimum ratios for 2015-2021

4.2.3 Productivity

Productivity was measured from two sides: labor intensity and capital intensity. Labor intensity was indicated by the amount of salaries and personnel costs divided by turnover. Basically, this ratio tells what the slice of salaries is taken from turnover. The inverse of labor intensity is labor productivity so these can be used interchangeably. Some of the ports were extremely labor intensive whereas some were much less so. The band between the minimum and maximum values varied from 5% to more than 30%.

After the restructuring of ports, there seems to have been a steady decrease in labor intensity, but there is no visible pandemic shock effect. This is a bit surprising since the turnovers did drop because of COVID. Thus, there are grounds to reason that the workforce, either through their headcount numbers or through their salaries, has been adjusted to fit the new situation. There were practically no cases of individual ports where labor intensity had been significantly changed due to COVID. There were cases where changes were clear and even radical, but these were trends over time rather than changes before and after 2019.

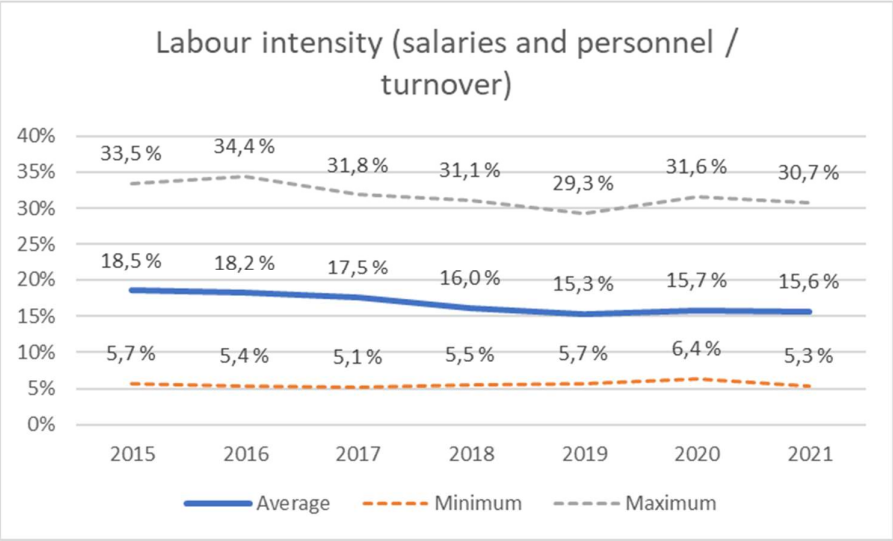

Figure 8. Labor intensity

Capital productivity was measured indirectly as capital intensity since the concepts are inverses. Fixed assets per turnover were applied as an indicator of capital intensity. It demonstrates what is the magnitude of deployed fixed asset capital (machines, buildings, infrastructure) needed to generate the turnover. Low capital intensity means a better return on capital ceteris paribus. Higher ratios mean that large amounts of money are tied into fixed assets.

The data shows that there might have been a slight increase in capital intensity due to COVID. However, this is a direct consequence of declined turnovers as it is unlikely that the asset base of port companies would have had time to react to the pandemic situation. Therefore, the existing assets remain in the numerator of this ratio while the denominator decreases.

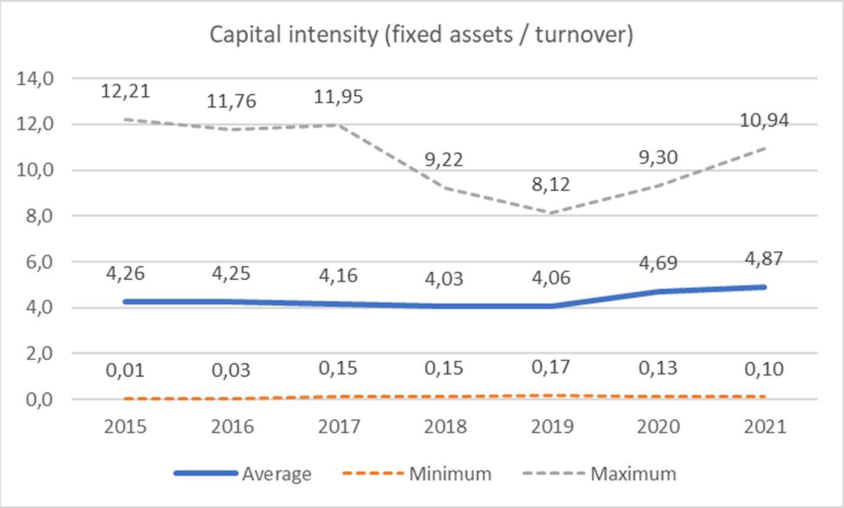

Figure 9. Capital intensity

4.3 Qualitative Content Analysis

Table 5 presents the result of the QCA analysis with three outcome models. The first model TOD consists of five recipes with the overall consistency of 1. Public port ownership (PO) and bulk freight type (FT) are the conditions that are dominant among the ports that were less affected in terms of TOD after COVID. However, port specialization (SP) seemed to have the least impact on the outcome model TOD.

The second model presents the port features leading to better than average profit margins after COVID. This model has altogether six recipes with a consistency of 1. Freight direction and freight type have dominancy among the factors that lead to better than average profit margins. However, PO (public ownership) and TO (port size) are the factors that do have not much comparative influence on the outcome of the PR model.

Table 5. QCA Analysis with outcome models and recipes

TOD = f (PO, TO, LOB, SP, FD, FT)	PR = f (PO, TO, LOB, SP, FD, FT)	LI = f (PO, TO, LOB, SP, FD, FT)
PO*~LOB*SP*FT	PO*~LOB*SP*FT	PO*~TO*LOB*~FD*FT
PO*TO*LOB*~SP*FT	PO*~TO*LOB*~SP*FT	PO*TO*~LOB*SP*FT
PO*LOB*~SP*FD*FT	~PO*TO*LOB*FD*FT	TO*LOB*~SP*FD*FT
PO*TO*LOB*FD*FT	~PO*LOB*SP*FD*FT	-
PO*TO*SP*FD*FT	PO*TO*SP*FD*FT	-
-	TO*LOB*SP*FD*FT	-
Consistency: 1	Consistency: 1	Consistency: 1

The third model presents the difference in labor intensity (LI) before and after COVID. The decrease in labor intensity means at the same time increase in the labor productivity of ports. This model consists of three recipes with the overall consistency of 1. FT is the factor that has the highest influence in reducing the LI while PO, LOB, and TO (medium and large port size) are the factor with considerably impact on the outcome. SP is the only factor with minimum impact on the outcome.

5. Summary and Conclusion

Even if the ports' turnover was definitely dropped because of pandemic, the Finnish ports were able to maintain their profitability, liquidity and solidity reasonably well. In some cases, there was an obvious capital infusion by the owners to support the ports over COVID-19 crisis, there was an observable resilience that not only maintained the business almost intact but moreover recovered from the pandemic shock very quickly. These conclusions were clearly supported by realized financial ratios derived from official annual

statements.

The Qualitative Content Analysis was done using crips sets of data describing port size, ownership, and type of traffic. The results conclude that public port ownership (PO), a port that handles both import and export rather than only import or export (FD), and ports handling bulk freight as compared to unitized freight (FT) contributed to port's financial resilience. Turnover, profit, and labor intensity changed less in these ports compared to the whole data set. However, the ports with import traffic only were among the least affected ports in terms of turnover impacts, so the results were in this sense somewhat mixed. A very clear 'success factor characteristics set' was not identifiable as such.

Ports handling specific materials or mixed materials like steel, paper, etc. (SP) have less impact on all three models' outcomes. In other words, these were not the ports having better than average financial resilience.

The restructuring impact analysis, which was done first, pointed out that there were not too many observable impacts on ports' business after former public entities were corporatized into limited liability companies (still by and large owned by public owners, i.e. cities and municipalities). The main observable impact was the increase of salaries per employee. In fact, the salaries per employee almost doubled right after corporatization. Whether this be an impact of 'free market' or a signal of change in social contracts from public administration safety to the risky world of corporate business, remains to be further researched.

6. Implications for Research and Policy

Finland is often claimed to have too many seaports, with limited economic scale and strength. Looking at how different ports were able to withstand the pandemic shock and recover from it, it is easier to see strength and resilience rather than vulnerability and weakness, at least in the light of annual financial statement data. It would therefore be worthwhile to consider whether the obvious diversified national port architecture is in fact to be endorsed rather than criticized.

An international comparison between ports should be done following the lines of this research. That would reveal if for example port size or types have something in common in terms of resilience and exposure. Also, after so much port privatization it would be interesting to see how ownership seems to have affected ports' resilience to economic shocks. The empirical data is now available.

Finally, port companies are just actor and stakeholder group in maritime

logistics. There are other actors such as stevedoring, forwarders, warehousing, port operations and shipping lines. Understanding how each of these businesses have been affected would be worth further research.

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