Turun yliopisto
University of Turku

FINLAND STATE OF LOGISTICS 2016

Tomi Solakivi, Lauri Ojala, Sini Laari, Harri Lorentz,
Juuso Töyli, Jarmo Malmsten, Ninni Lehtinen, Elina Ojala

TURUN KAUPPAKORKEAKOULUN JULKAISUJA | SARJA E:1:2017

Abbreviations

3PL	Third Party Logistics
GDP	Gross domestic product
EU	European Union
IATA	International Air Transport Association
IMO	International Maritime Organization
Medium-sized enterprise	Here defined as a company with a turnover between 10-50 million euros per year
FSoL 2014	Finland State of Logistics 2014
FSoL 2016	Finland State of Logistics 2016
LSCI	Liner Shipping Connectivity Index
LPI	Logistics Performance Index
Micro enterprise	Here defined as a company with a turnover below 2 million euros per year
NUTS	Nomenclature des Unités Territoriales Statistiques, nomenclature of territorial units for statistics used by the EU
SECA	Sulphur Emission Control Area by IMO
Small enterprise	Here defined as a company with a turnover between 2-10 million euros per year
PMI	Purchasing Managers' Index
Ro-ro traffic	Roll-on/roll-off traffic, transport of goods with vessels where the cargo is rolled on and off through ramps located in stern, bow or sides
Large enterprise	Here defined as a company with a turnover over 50 million euros per year
TEN-T	Trans-European Transport Network
TOL	Standard industrial classification used by Statistics Finland
UNCTAD	United Nations Conference of Trade and Development
WEF	World Economic Forum

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 SUMMARY

Finland was ranked 15th in World Bank's Logistics Performance Index LPI 2016, which measures logistics performance in international trade. Finland's ranking improved somewhat from the year 2014, when the country was ranked 24th, but was lower than Finland's best placement in 2012, when Finland was ranked 3rd (World Bank 2014; 2016).

The assessments of Finland's performance in different components of the LPI were to a great extent in line with the evaluations by Finnish respondents in Finland State of Logistics 2016 survey. The biggest difference between the data collected in Finland and the international assessments of the LPI lies in the quality of transport infrastructure, which Finnish respondents criticize significantly more than international evaluations.

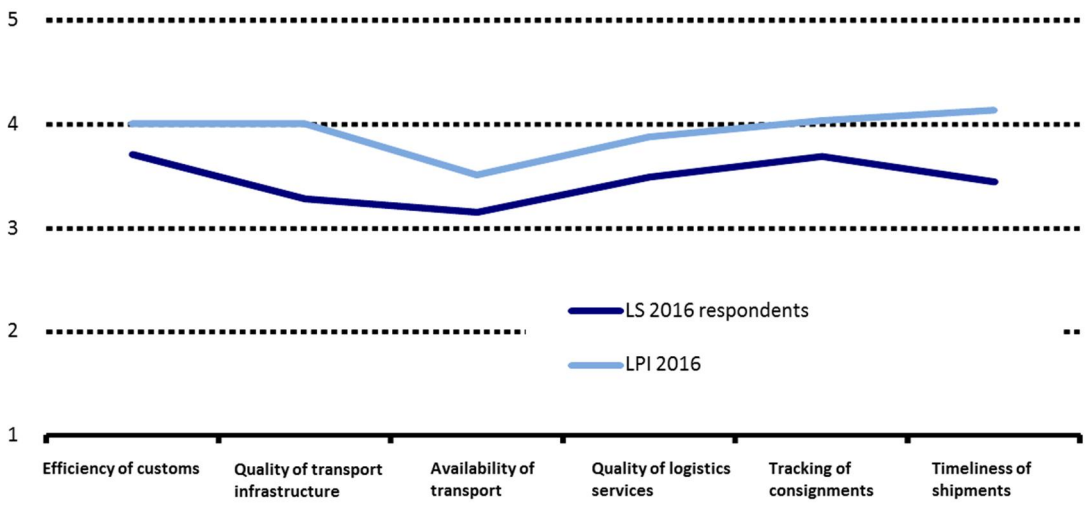

Figure 1 Finland's scores in Logistics Performance Index 2016 and the evaluations of the same components by over 1 100 Finnish respondents in 2016 (Minimum = 1, Maximum = 5)

Since 2006, Finland State of Logistics reports have studied companies' opinion on operational preconditions of the municipality they are located in. Finnish companies have been most critical about their operational preconditions in relation to competitors and about transport and logistics infrastructure. Throughout the period under review, companies located in South Finland, particularly in Helsinki-Uusimaa region, Southwest Finland and Pirkanmaa

region, have been the most satisfied with the operating preconditions, whereas companies located in East and West Finland have been the most critical.

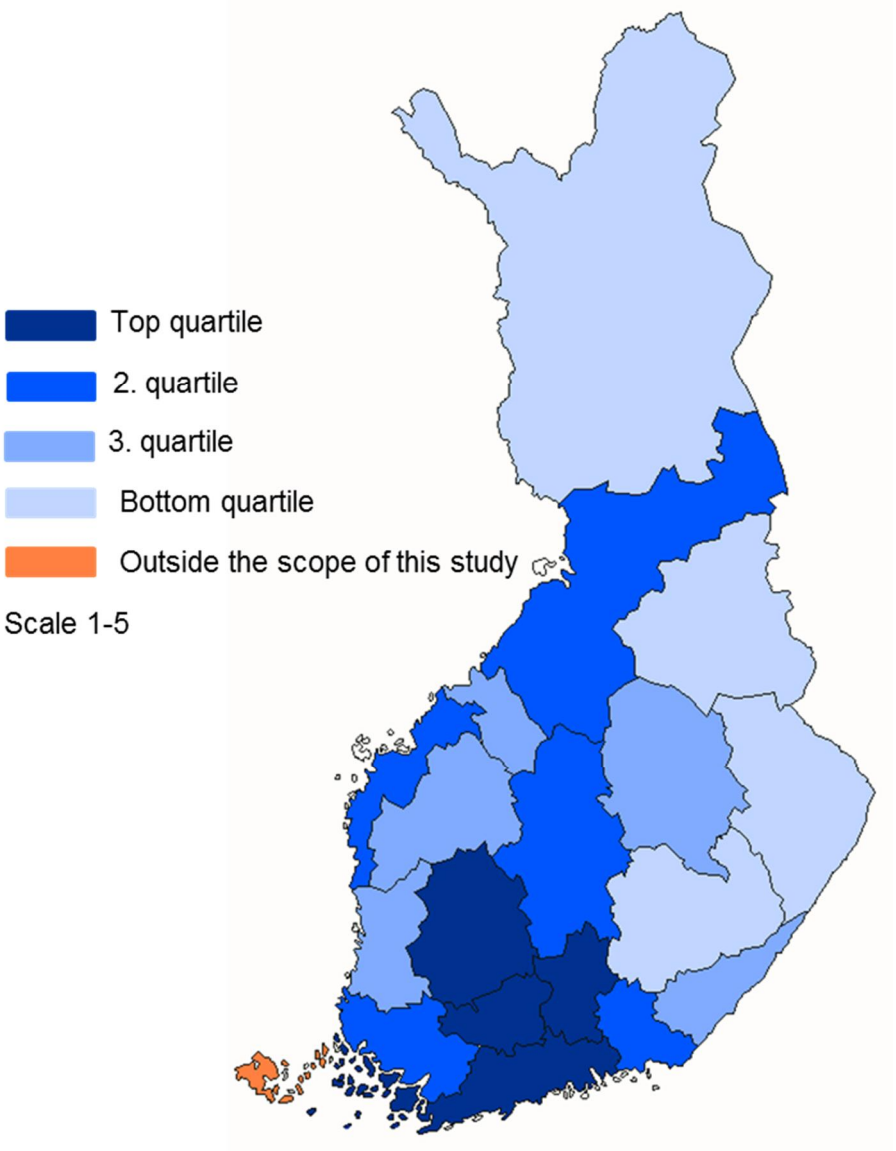

Figure 2 Companies' opinions on operational preconditions in the municipality where the company is located by regions, combination of the dimensions regarding a) business in general b) location of production facilities c) efficiency of logistics d) transport infrastructure e) location of competitors

Also this time, the companies situated in Helsinki-Uusimaa, Pirkanmaa and Häme region were the most satisfied with the operational preconditions of their location. In the latest survey, the firms operating in Finland Proper were included in the most satisfied quartile, whereas in 2014, they were among the second most satisfied. The most negative assessments of the operating

preconditions were given by the firms operating in North Karelia, Kainuu, South Savonia and Lapland.

Respondents of the 2016 survey ranked the quality of the transport infrastructure somewhat higher than in 2014. However, the assessments in general and in relation to the technical conditions of infrastructure in particular remain substantially negative. On a scale of 1 to 5, the national average was 2.55 (2.33 in 2014).

It seems that the differences in the quality of the transport infrastructure between different parts of the country, which were visible already in 2014, still exist. For example, in relation to technical conditions of roads, Finland Proper, Helsinki-Uusimaa and Pirkanmaa region were among the highest ranking quintile, but the assessments on infrastructure capacity remain more negative. Similarly, Ostrobothnia for example, is placed among the second lowest quintile in relation to transport infrastructure but in the highest quintile in terms of capacity and connections.

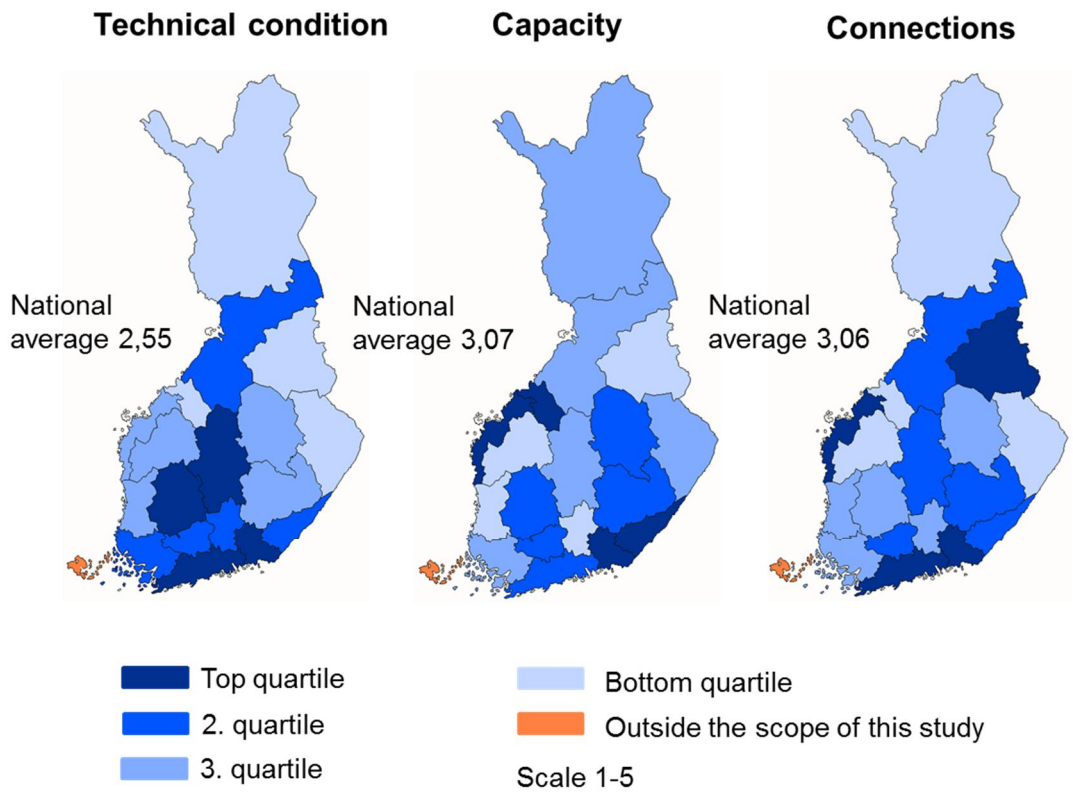

Figure 3 Logistics companies' assessments of the quality of the transport infrastructure by regions

The share of logistics costs in firms' turnover has been increasing since 2009 and the same trend seems to continue in 2015. Logistics costs weighted by the

company turnover and industry turnover were on average 13.9% of the turnover in 2015 (13.4% in 2013).

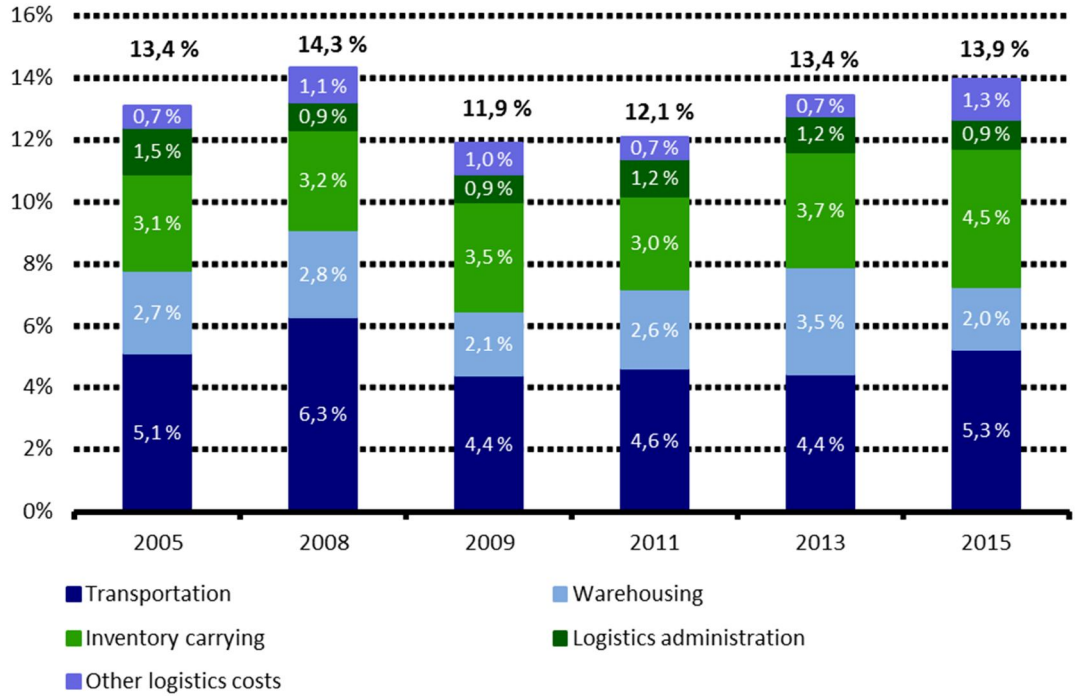

Figure 4 The share of logistics costs in manufacturing and retail weighted by the company and industry turnover in 2005-2015

Transport costs form the single most important cost component; in 2015, the share was on average 5.3% of companies' turnover, which was 0.9 percentage points more than in 2013. This is slightly surprising because many indicators affecting transport costs, such as truck traffic costs, have been more likely decreasing than increasing. Another component of the logistics costs of which the share has increased is inventory carrying costs. This finding combined with the growth of the share of transport costs is interesting because traditionally, it has been considered that there is a trade-off between transport costs and inventory carrying costs. One possible explanation for this is that companies have increased their stock to respond to already realized or expected rise in transport costs.

Increased costs could be explained by the distribution of different modes of transport used by Finnish companies. Figure 5 presents manufacturing companies' distribution of transport costs by mode of transport grouped by company's level of internationalization. Majority of the transport costs of companies operating mainly in the domestic market is caused by domestic road transport. As for export companies and especially international companies,

more than half of their transport costs are related to international marine transport. The cost of marine transport has recently been affected by several factors. The prices of sea freight and marine fuel have been low for some time due to global demand. However, the price per tonne for fuel that complies with the SECA (Sulphur Emission Control Area) requirements is USD 200 more expensive than for regular fuel.

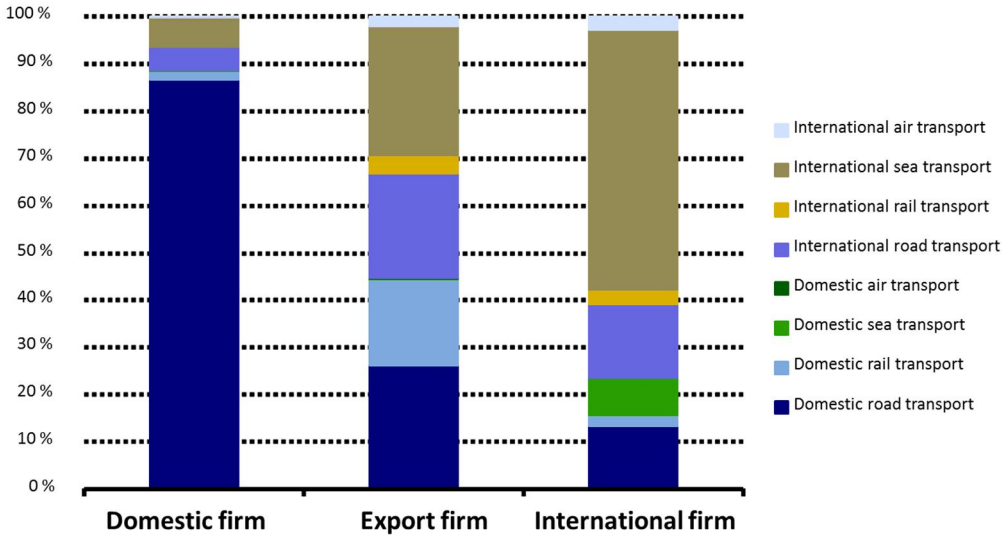

Figure 5 Distribution of transport costs in manufacturing by mode of transport and by company's level of internationalization[1] in 2015

Logistics costs in trade and manufacturing were 37 billion euros in 2015 (37.8 billion euros in 2013) of which 23.5 billion were directed to Finland. In relation to the Finnish gross national product, logistics costs of trade and manufacturing were 11.2% in 2015 (in 2013, the share was about 11.4%).

[1] Domestic firm: more than 90% of sales are directed to the domestic market. Export firm: more than 10% of the sales are exports. International firm: production abroad.

Table 1 Logistics costs of trade and manufacturing firms operating in Finland in relation to gross national product (State of Logistics reports (FSoL) of the Finnish Ministry of Transport and Communications of the years 1993, 1997, 2001, 2006, 2009, 2010 and 2012; Solakivi et al. 2015, Statistics Finland 2016)

	1990	1995	2000	2005	2008	2009	2011	2013	2015
Logistics costs in manufacturing and trade, € billion (old calculation method)	13,7	13,3	18,0	26,4	34,7	29,9			
Logistics costs in manufacturing and trade, € billion (current calculation method) including international operations				29,2	40,1	34,7	33,1	37,8	37,0
GDP in current prices, € billion	89,3	96,0	132,1	157,3	184,2	171,3	191,6	201,3	209,1
Share of foreign subsidiaries in Finnish companies' turnover		20,3%	42,6%	46,5%	49,6%	49,6%	50,0%	39,2%	36,5 %
Logistics costs in relation to the GDP (old calculation method)	17-18%	14-15%	14-15%	17 %	19 %	17,5%			
Logistics costs in manufacturing and trade in € billions for Finland only	13,7	10,6	10,3	15,6	20,2	17,5	16,6	22,9	23,4
Logistics costs in relation to the GDP (current calculation method)	12,2 %*	11,1 %*	7,8 %*	9,9 %	10,9 %	10,2 %	8,6 %	11,4 %	11,2 %

* method for calculating the costs was changed

Even though the share of logistics costs in companies' turnover sems to be growing based on the survey, logistics costs in relation to gross domestic product seem to have stabilized at slightly over 11%. This can be explained by the fact that nominal gross domestic product has increased but manufacturing turnover in particular has not been able to stand the pace neither in Finland nor abroad.

Table 2 Logistics and transport costs of trade and manufacturing firms operating in Finland, time series from 1990 onwards at year 2015 prices (FSol of the years 1993, 1997, 2001, 2006, 2009, 2010 and 2012, Solakivi et al. 2015)

Key indicator/year of comparison	1990	1995	2000	2005	2008	2009	2011	2013	2015
Logistics costs (€ billion), manufacturing and trade (including international operations)	20,9*	18,1*	22,7 *	34,6	43,8	37,9	34,5	37,8	37,0
Logistics costs, turnover share	11.0%	10.3%	10.2%	13,1 %	14,3 %	11,9 %	12,1 %	13,4 %	13,9 %
Transportation costs, turnover share	4.8%	4.7%	4.5%	5.0%	6.3%	4.4%	4,6 %	4,4 %	5,3 %

* Old calculation method

According to the survey results, the value of logistics services bought in the market by companies in manufacturing (including construction) and trade was about 9.3 billion euros in 2015. This figure excludes logistics costs of the public sector (government, municipalities and other public corporations) due to the lack of available data. When these costs are taken into account, the volume of logistics services acquired from the market is more likely to be 9-10 billion euros.

Client companies produced logistics services for their own use worth around 7 billion euros in 2015. In addition to this, inventory carrying costs, which are typically included in firms' logistics costs, account for a large share of the costs, reaching to 7.3 billion euros.

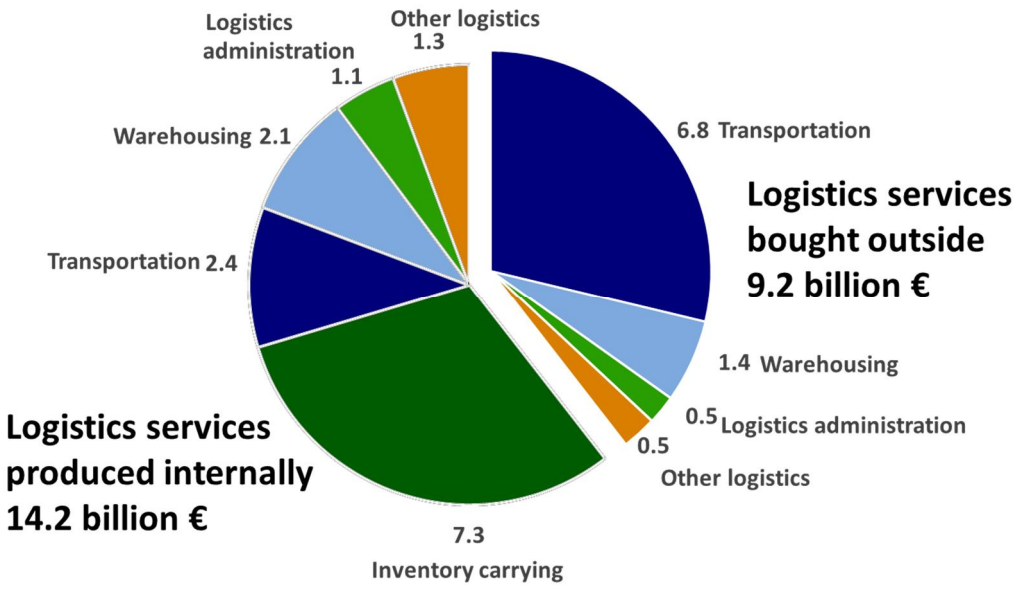

Figure 6 Logistics services produced internally and acquired from the market by companies in 2015 based on the Finland State of Logistics survey 2016

Digitalisation and digital applications are expected to significantly change operations in the society, economy and businesses already in the near future. However, Finnish firms estimate that the integration of digital applications into their activities will happen quite conservatively. When companies were asked to estimate which digital applicactions they will use in 2020, the replies included most often different services based on cloud services and mobile applications as well as real-time tracking of the supply chain. Over 60% of manufacturing firms also estimated that internet of things will be used in their operations in 2020.

Figure 7 Manufacturing and trade industry companies' estimation of which digital applications will be used in their operations in 2020, percentage of the respondents

Around 80% of companies in the field of trade estimate that electronic commerce will be used as one of their sales channels in 2020. Over 60% of companies in trade and 40% in manufacturing also believe that big data analytics will be used.

By contrast, 3D printing, which has lately been brought up often in the public discussion, seems still to be waiting for a real breakthrough in the field of business operations, at least according to Finnish companies. Slightly above 20% of the manufacturing firms estimated that they will use 3D printing in 2020.

The development of logistics companies, and especially of the transport market, has been fluctuating. The general market developments and previously formed overcapacity in the industry still affect the market and the business of individual companies. In terms of business performance, the development has been fluctuating in the past years (Figure 8).

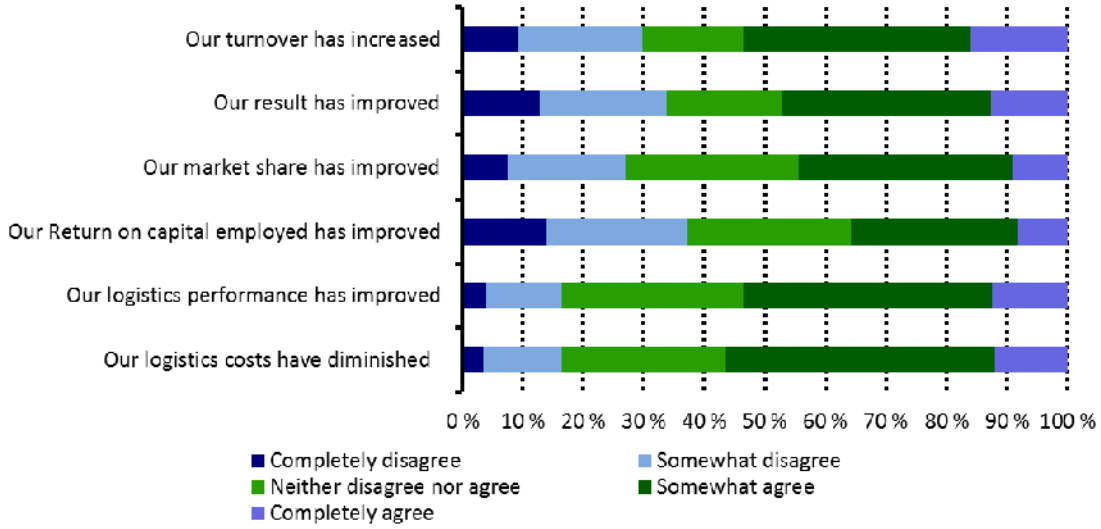

Figure 8 Logistics companies' estimation on the development of the business and logistical performance in the past 2 years, answers were given in the spring 2016

Around half of the logistics companies that replied to the survey estimated that the development of their business performance (turnover, result etc.) was positive during the past 2 years. In contrast, slightly less than 40% of the logistics companies estimated that the development was not so positive.

In addition to general market conditions, companies' performance also depends on different factors related to company's internal efficiency. As for transport companies, these factors include issues concerning for example filling rate and empty running. Figure 9 illustrates road transport companies' average vehicle use in hours grouped by the company size. It seems that the company size clearly correlates with the average hours used for transport, and thus large firms are able to enjoy higher efficiency compared with smaller firms.

In addition, changes in the legislation concerning the transport sector can have an effect on the profitability of the firms operating in the field. It was requested that this report take a stand on a possible future legislative change in the field of transport and on its effects on the functioning of the market as well as of individual companies. One of the changes investigated was the deregulation of cabotage in the national level, upon which the Finnish Parliament decided earlier in 2016.

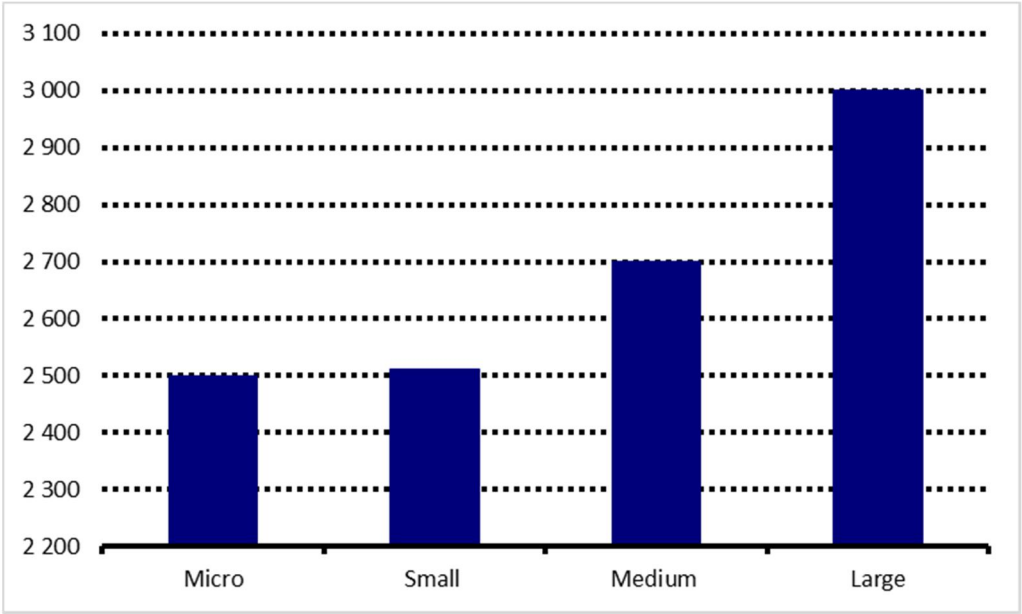

Figure 9 Average capacity utilization of road transport companies in hours per year in 2015

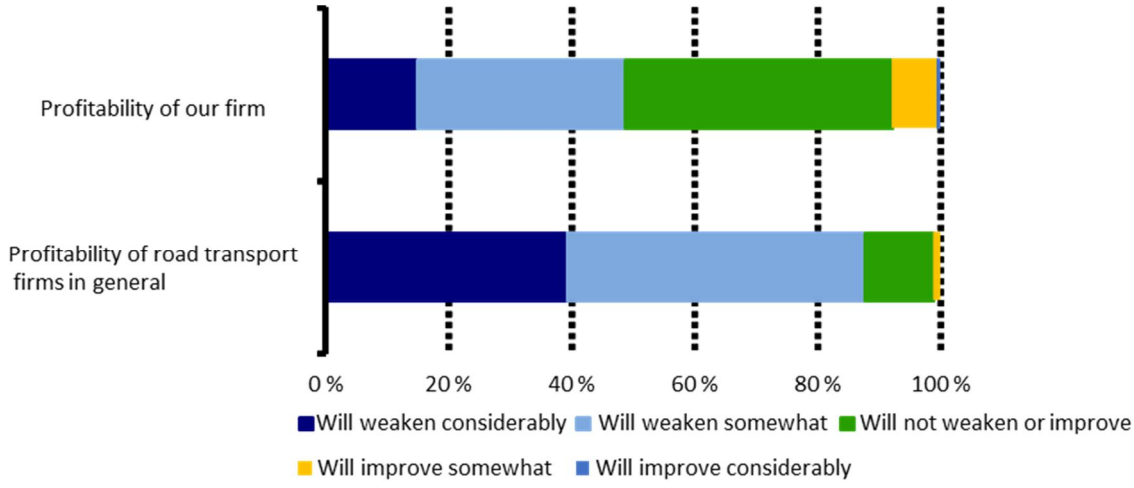

Figure 10 Road transport companies' evaluation on the effects of the national deregulation of the cabotage on the profitability of road transport companies in general and on their own profitability

Respondents estimated that the changes in legislation on cabotage would affect the transport sector and domestic transport in general substantially more than their own firm (Figure 10).

2 REALIZATION OF THE REPORT

2.1 Assignment

The state of logistics in Finland and its future prospects have been studied regularly for over 20 years. The Finnish Ministry of Traffic and Communications commissioned the first national Finland State of Logistics report in 1992. The present, already ninth national report on the state of logistics in Finland is a result of the cooperation between the School of Economics at the University of Turku and the Finnish Transport Agency. Like the previous five Finland State of Logistics reports, this report was carried out by a research team in Operations and Supply Chain Management subject of the Turku School of Economics at the University of Turku. The research for the reports has been realized in the same way since 2006, which enable comparisons between several time series dating back to the year 2005. The logistics costs can be compared as far as the beginning of the 1990s. Regarding the costs in particular, the time series available are unique in terms of length and topics covered.

2.2 Division of Tasks in the Research Team

The project manager D.Sc. Tomi Solakivi was in charge of conducting the report under the supervision of professor Lauri Ojala. Solakivi also realized the online survey. Student Ninni Lehtinen worked as a research assistant in the project. The gathering and processing of data for the research was conducted by Solakivi and Lehtinen. Other parts were carried out by D.Sc. Harri Lorentz, D.Sc., D.Eng. Juuso Töyli and D.Sc. Sini Laari. The maps used in the report were drawn up by Ph.D. Jarmo Malmsten. Finland State of Logistics report observes the following topics analyzed mainly by the researchers shown in brackets after each topic: economic operational environment (Ninni Lehtinen), Finland’s national logistics performance (Tomi Solakivi), logistics operational environment (Tomi Solakivi and Jarmo Malmsten), condition of transport infrastructure (Tomi Solakivi), strategies of the firms (Harri Lorentz and Sini Laari), location decisions of Finnish firms (Harri Lorentz and Jarmo Malmsten), logistics outsourcing and demand of logistics services (Tomi Solakivi), transport market regulation (Tomi Solakivi), digitalisation (Tomi Solakivi), international logistics markets (Tomi Solakivi), size of logistics market in

Finland (Tomi Solakivi and Lauri Ojala), national and firm level logistics costs (Tomi Solakivi), logistics performance indicators (Tomi Solakivi and Juuso Töyli) and environmental performance of Finnish firms (Sini Laari).

2.3 Target Group and Data Sample

Like in previous reports, the main industries observed in Finland State of Logistics 2016 include Finnish manufacturing firms (including construction), firms in the field of trade and firms offering logistics services. In addition to these, firms offering consulting services in logistics as well as respondents working in logistics education and research were grouped in their own categories. The data was collected with online surveys between April and May 2016.

The survey consisted of 23-25 sections depending on the main field of operation concerned. The questionnaire was shorter for consultants and teaching staff than for other respondent groups and concentrated mainly on regional operational preconditions. Also this year, the survey was formulated in such a way that it remains comparable with the most important sections of previous reports.

The request to participate in the survey was sent to 24 708 people. In order to ensure the coverage of the survey, hundred largest companies of each main field of operation were contacted beforehand by phone. Out of the surveys sent, altogether 1762 surveys were returned to the sender and, thus the target population was 22 946 respondents. For the success of the survey, it was crucial to obtain personal e-mails from following organizations: Finnish Association of Purchasing and Logistics LOGY, Federation of Finnish Enterprises as well as Finnish Transport and Logistics SKAL.

1 146 answers were accepted and thus, the response rate for the entire survey was 5.0% when micro enterprises were included. However, regarding medium-sized and large enterprises in particular, the response rate was remarkably high. The response rate of the survey used in this report can be compared with other surveys conducted globally in the same field. Wagner ja Kemmerling (2010) have collected data from 229 scientific articles of which the results are based on surveys. Typically, the bigger the group of respondents the survey is sent to, the lower the response rate (Kuvio 11).

For surveys that were sent to less than 100 people, response rates up to over 90% have been reached, whereas with already a group of few thousands of respondent candidates the response rates have been only less than 20%. Figure 11 presents the response rate of the Finland State of Logistics report compared with the data collected by Wagner and Kemmerling (2010). As can be seen from

figure 11, the response rate of the Finland State of Logistics survey is in line with those of other surveys conducted in the field. The target group and number of respondents, on the other hand, are high compared with other surveys.

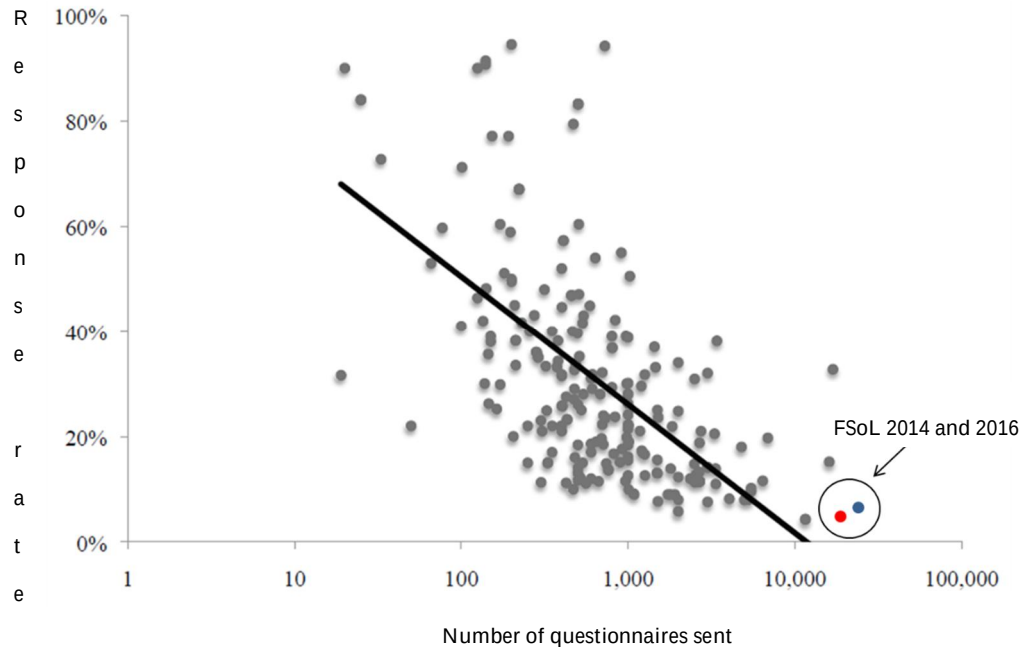

Figure 11 The response rates of FSoL 2014 and FSoL 2016 compared with the data collected by Wagner and Kemmerling (2010)

The survey was conducted so that each recipient received a personal link to the online survey system Webropol. Two weeks later, non-respondents were sent a reminder and a second reminder again two weeks after this. 33.2% (381) of the respondents represent manufacturing and construction, 11.9% (137) trade, 45.7% (524) logistics services, 5.6% (65) consulting and 3.4% (39) education.

The number of respondents of this year's report is significantly smaller than in 2014. Especially the number of responses from the trade industry firms is considerably lower than before, which questions the representativeness of the survey and its comparability with previous reports. When respondents are observed more carefully, it can be stated that the decrease in the number of respondents is the most visible in the group of the smallest firms, especially micro enterprises operating in trade. Despite the lower number of respondents, survey respondents remain very well comparable with regards to middle-sized and large enterprises.

The survey data has been grouped in this report by industry, firm size, and in some cases by level of internationalization. Also other background variables

have been used in the classification when their use has been relevant for the analysis.

The classification of enterprises by their size follows the European Union's definition of micro as well as small and medium-sized enterprises regarding the turnover as follows:

- Large enterprises: over 50 million euros
- Middle-sized enterprises: 10-50 million euros
- Small enterprises: 2-10 million euros
- Micro enterprises: 0-2 million euros

Table 3 Respondent companies of FSoL 2016 by industry type and company size

Size category	Manufacturing and construction	Trade	Logistics service provider	Consultancy	Teaching and research	Total
Micro	136	80	390	40		646
Small	89	23	70	13		195
Medium	55	15	31	4		105
Large	101	19	33	8		161
Size category not enquired	0	0	0	0	39	39
Total	381	137	524	65	39	1146

Table 4 Respondent companies of FSoL 2016 by industry type since 2006

	Manufacturing and construction	Trade	Logistics service provider	Consultancy	Teaching and research	Total
2016	381	137	524	65	39	1146
2014	504	398	617	64	148	1731
2012	875	773	684	121	279	2732
2010	570	435	545	102	161	1813
2009	996	794	915			2705
2006	985	788	482			2255

The definition of the European Commission also includes limits for staff headcount and balance sheet total but in the context of conducting this report, it was decided that enterprises can be classified with enough precision by using turnover only. The distribution of the respondent companies grouped by the background variables is presented in Table 3. The distribution of respondent companies by industry type is shown in Table 4 Respondent companies of FSoL 2016 by industry type since 2006

3 BUSINESS CONTEXT OF FINLAND STATE OF LOGISTICS REPORTS

3.1 Development of Turnover in Manufacturing, Trade as well as Transport and Storage in Finland

The industry turnover of transport and storage has been relatively stable since 2006 (Figure 14). In 2014, the turnover of transport and storage was over 23 billion euros. The development in manufacturing turnover has been nearly parallel with the trade turnover since 2006. During the period under review, the manufacturing turnover was about 20-40 million euros higher than that of trade.

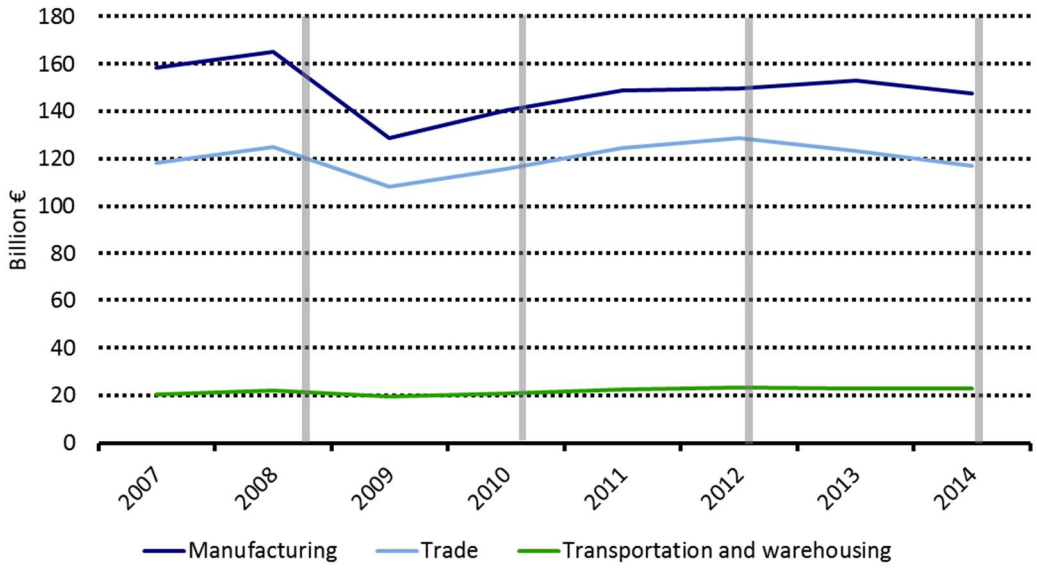

Figure 12 Turnover development in manufacturing, trade as well as transport and storage 2007-2014 in billion euros (Statistics Finland 2014a; Statistics Finland 2015a); Bars mark the years when Finland State of Logistics report was conducted after 2008

In 2009, turnovers in manufacturing and trade were hit harder by the economic crisis that started in 2008. The manufacturing turnover has not recovered to pre-crisis levels, whereas the turnover in transport and storage exceeded the pre-crisis level already in 2010. The trade turnover surpassed the pre-crisis level (about 125 billion euros) for the first time in 2012 when the

turnover reached 129 billion euros. After that however, the trade turnover has declined and was about 117 billion euros in 2014.

3.2 Macroeconomic Indicators

In assessing the business environment at the time of writing the reports, it makes sense to observe national accounts information and key indicators. Figure 13 presents the change in some key indicators of the economy compared with the corresponding quarter of the previous year in years 2000-2014. In the first quarter of 2014, the change was negative in all indicators apart from total consumption, which rose 0.8% from the corresponding quarter of the previous year.

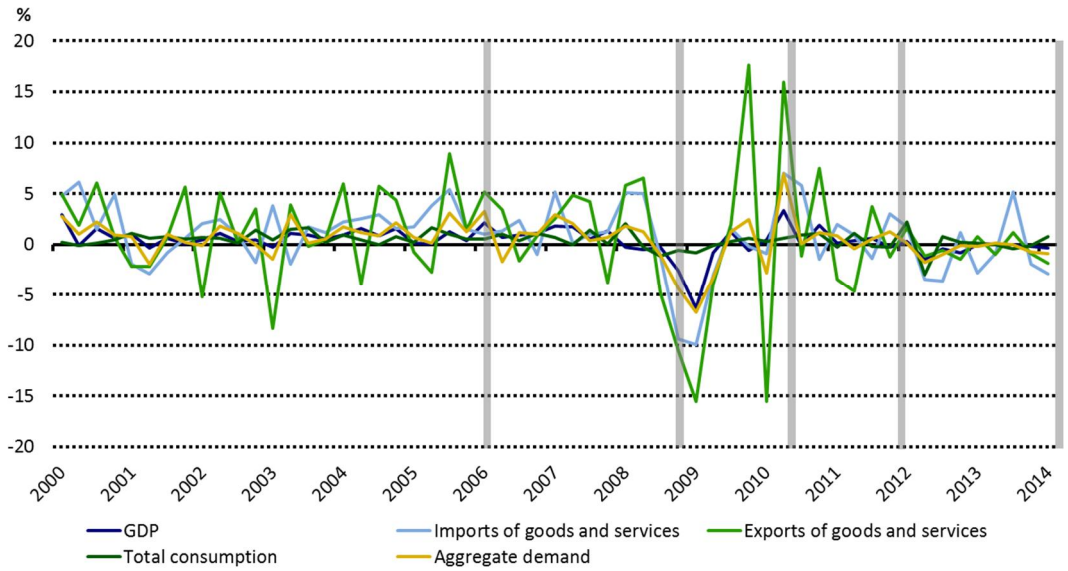

Figure 13 The percentage change in national accounts indicators from the corresponding quarter of the previous year 2000-2014 (Statistics Finland 2016a); Bars mark the years when Finland State of Logistics reports were conducted starting from 2006

In 2015, the Finnish GDP increased 0.4% from the previous year after 3 years of downturn. In the first half of the year 2015, the GDP growth was accounted for the increase in exports and consumption. During the third quarter, the decrease in exports and investments changed the direction of the GDP downwards. The GDP turned up again in the last quarter of the year when investments increased and private consumption and exports grew somewhat. (Statistics Finland 2016b.)

The trade deficit has been considerably volatile in recent years. In 2014, the trade deficit was 1 796 million euros, whereas the deficit should be only 427 million euros in 2015 according to advance information. (Statistics Finland 2016c). Comparisons between different years are complicated by the timing of large individual deliveries, especially delivery of ships.

3.3 Effect of Internationalization of Finnish Companies on the Logistics Market

The stage of internationalization of the trade and industry affects companies' logistical solutions and the demand of logistics services. The more business operations the company has outside Finland, the more logistics services it buys and produces outside national borders.

The share of foreign subsidiaries' turnover in the Finnish companies' turnover increased considerably between 1996 and 2008. In 1996, the share of subsidiaries' turnover was only 20.3%. Before the economic crisis in 2008, the share peaked at 54.3%. In 2014, the turnover of Finnish companies' subsidiaries operating abroad was about 385 billion euros, which represented only 35.7% of Finnish firms' turnover.

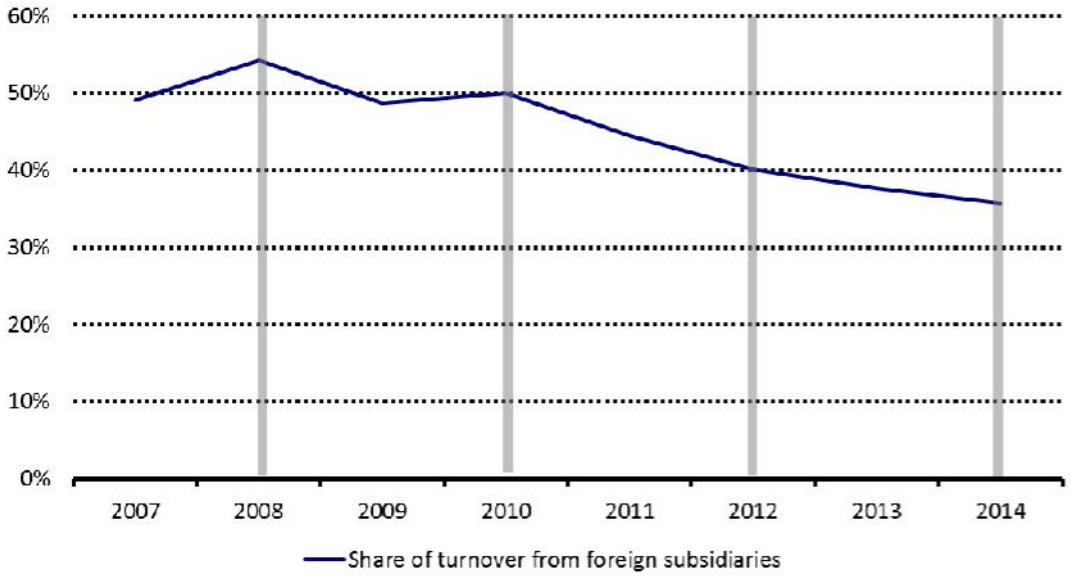

Figure 14 Foreign subsidiaries' share in Finnish companies' turnover 2007-2014 (Statistics Finland 2009; Statistics Finland 2010; Statistics Finland 2011; Statistics Finland 2014b; Statistics Finland 2015b; Statistics Finland 2016d); The bars mark the years when Finland State of Logistics reports were conducted starting from 2008

The subsidiaries' share of the turnover in Finnish companies' turnover affects the allocation of logistics costs because logistics costs are presented in percentages of the turnover in Finland State of Logistics reports. By slightly simplifying, it can be assumed that in 2014, around 65% of the logistics costs estimated by the company was allocated to domestic consumption and trade. Thus, the growth of the share of domestic production also influences the size of logistics costs in relation to the gross domestic product.

4 LOGISTICS MARKET IN FINLAND

This chapter deals with the current state of the logistics market in Finland and its future prospects. The size and structure of the logistics market is evaluated in the chapter based on statistics and reports compiled from different sources. In addition, the chapter covers Finnish companies assesments of the development of the logistics market from the point of view of outsourcing.

4.1 Transport Sector in the National Accounts of Finland

4.1.1 Development of Added Value in the Transport Sector

Transport and supporting industries employ around 10% of all the employed in Finland and their share of the Finnish economy is around 10% (Liikennejärjestelmä.fi 2016). According to Statistics Finland, the combined turnover of Finnish transport and logistics companies (including passenger transport) in 2014 was about 22.5 billion euros and the field employed around 147 000 people in 22 500 firms in 2012 (EU transport in figures 2015).

In the national accounts system, transport and storage are classified as one standard industrial category, on which the information is collected following international statistics standards. In other industries, transport and storage that support the main industry, such as trade and manufacturing, and that are not treated as separate industries, are classified based on the main industry (for example trade and manufacturing). Figure 15 illustrates transport sector’s value added calculated based on the Standard Industrial Classification TOL 2008. In 2015, the total value added of the transport sector was about 9.5 billion euros.

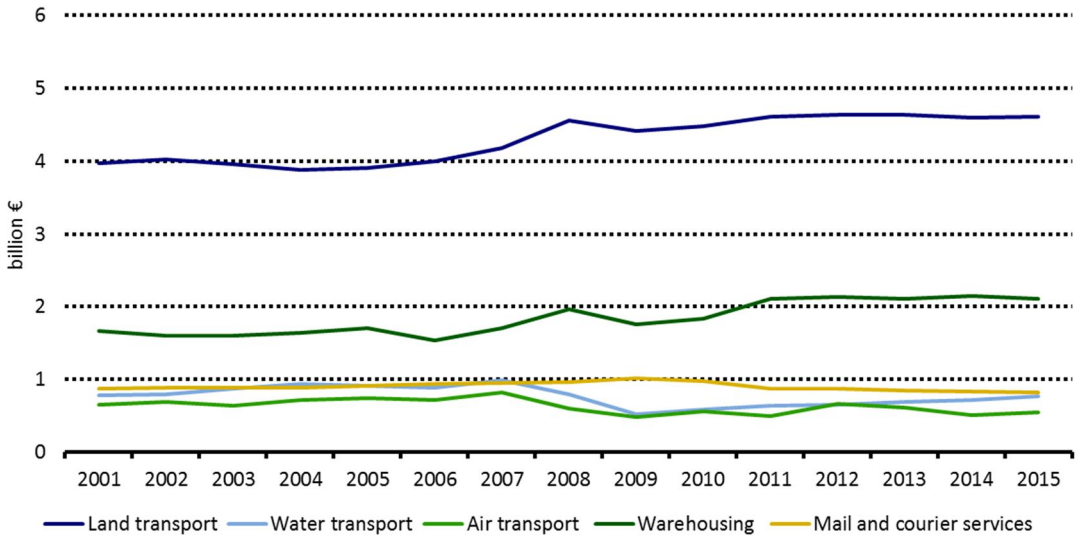

Figure 15 The gross value added of the transport sector and supporting activities in Finland 2001-2015 according to TOL 2008 (in billions of euros in current prices including the public sector) (Statistics Finland 2016f)

4.1.2 Foreign Trade in Services in the Transport Sector

Recording logistics services used outside Finland in the Finnish national accounts depends for example on tradepartners' agreement on transport and storage costs. Similarly, for example practices of the foreign production and distribution unit, such as transfer pricing between units located in different countries, affect registering of the value added. On the other hand, the transit traffic through Finland is mainly recorded in its national accounts even though goods never cross the customs border. Majority of transport services are accounted for sea freight costs as well as stowage costs, port charges, fairway dues and pilot's fees paid by ships. Income from seafreight consists of Finnish shipping companies' income from foreign goods transport. Corresponding expenses include sea freight fees paid to foreign carriers. A significant part of the total transport income is the income from foreign passengers, which is divided into sea transport income and air transport income. The corresponding expenses entail payments made to foreign transport companies. (Bank of Finland 2016.)

Sea freight has traditionally shown a considerable deficit due to the fact that most goods are imported to Finland by sea (Bank of Finland 2016). The balance of trade (difference between expenses and income) in transport services and freight traffic is shown in Figure 16.

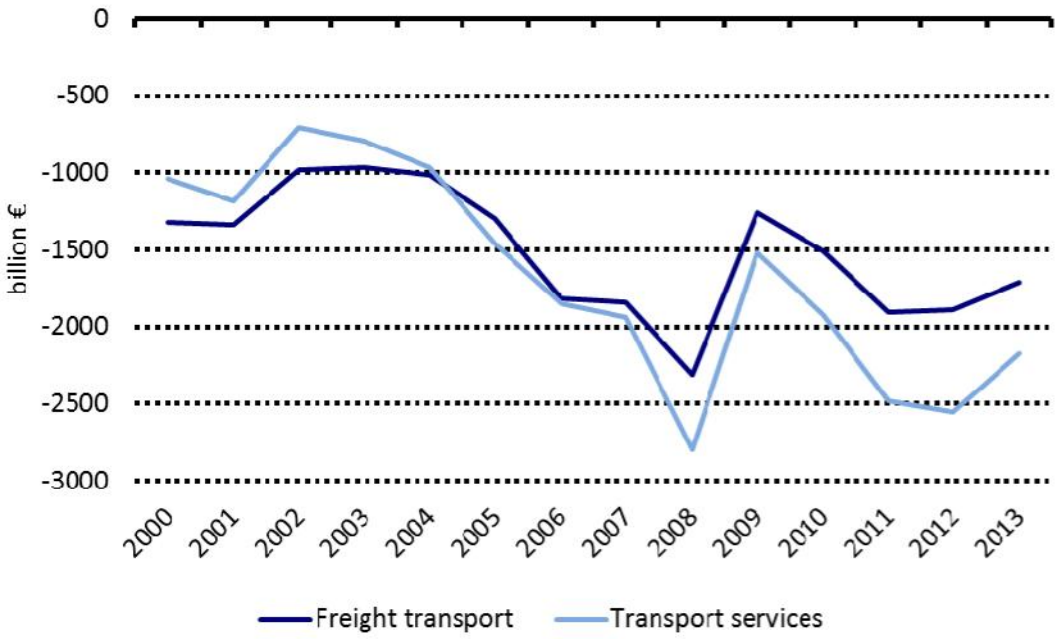

Figure 16 The balance of payments of Finnish foreign trade transport services and freight forwarding (difference between income and expenses) (millions of euros in 2000-2013, at current prices) (Bank of Finland 2016)

Due to the intangible nature of services, their foreign trade booking practice differs somewhat from that of goods trade. The figures of the year 2008 (Figure 16) reveal that the foreign trade of transport services showed a deficit of 2.8 billion euros for transport services and 2.3 billion euros for freight forwarding. In 2009, the situation was very different as the deficit in transport services decreased to 1.5 billion euros and the deficit for freight forwarding to 1.3 billion euros. In 2012, the deficit for transport services was again over 2.5 billion euros. This resulted from the fact that the strong growth in goods imports continued in 2011 and the growth in exports decreased at the same time.

The import of transport services decreased slightly in 2013 due to weak domestic demand, which is also visible in the decrese of deficit in the balance of payments. Import of transport services, which is closely related to goods import, increased and export of transport services decreased from the previous year. The growth of the freight forwarding deficit was more moderate.

Table 5 depicts balance of foreign trade in transport services by modes of transport in 2006-2015. It shows that the deficit in transport services is mainly caused by the deficit in sea transport. Air transport is the only transport mode showing a surplus. For methodological reasons, the data concerning the time before the year 2006 are not completely comparable. In addition, the data concerning other transport are not very accurate before the year 2014.

Table 5 The balance of payments for Finnish transport services by transport modes in 2006-2015 in millions of euros in current prices. Information concerning the year 2015 is preliminary information (Statistics Finland 2016g).

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Transport	-1749	-1843	-2661	-1475	-1895	-2455	-2505	-2635	-2529	-2349
... of which sea transport	-1740	-1606	-2075	-1127	-1438	-1771	-1775	-1983	-1836	-1720
... of which freight	-1842	-1720	-2169	-1195	-1517	-1872	-1866	-1974	-1895	-1779
... of which passenger traffic	94	98	103	91	99	100	98	52	91	91
... of which other than freight or passenger traffic	8	15	-9	-22	-20	1	-7	-61	-32	-32
... of which air transport	344	265	55	96	293	208	284	311	338	207
... of which passenger traffic	29	-122	-143	-59	8	-33	-20	5	-4	-23
... of which air freight	271	353	310	262	287	356	363	436	469	485
... of which other than freight or passenger traffic	45	34	-112	-107	-2	-115	-59	-130	-127	-255
... of which other transport	-440	-600	-779	-483	-768	-915	-1060	-1128	-1105	-916
... of which road	-	-95	-122	-68	-85	-102	-97	-89	-1023	-909
... of which rail	-440	-505	-658	-414	-683	-813	-963	-1039	-82	-8

Table 6 depicts the balance of trade for transport services of the year 2011 in Finland and other Nordic countries as well as Germany. It can be seen from the table that especially Denmark, and Maersk group in particular, Norway (sea transport) and Sweden (sea and road transport) are important net exporters of transport services. For example, the share of freight and logistics services of all services export in Denmark is 54% and in Norway 27.8%, whereas in Finland, the share is only 4.4%. This reflects the fact that Finland lacks national enterprises that would occupy an important share of the international market for a certain logistics service, which is not the case in other Nordic countries.

Table 6 Balance of payments for services in Finland and in peer countries in 2011 in million USD (UN Comtrade 2016, Eurostat 2016)

year. 2011 million USD	Finland	Sweden	Denmark	Norway	Germany
EXPORTS OF SERVICES	27 074	66 012	66 262	39 319	250 263
Exports of transport services	3 285	10 436	40 376	16 216	57 286
... of which freight and logistics services	1 197	5 950	35 756	10 935	33 710
Freight and logistics services from exports of services, %	4,4	9,0	54,0	27,8	13,5
Exportsof freight and logistics services % of GDP	0,6	1,5	14,5	3,1	1,2
IMPORTS OF SERVICES	26 902	50 545	60 068	43 899	284 283
Imports of transport services	6 492	7 537	30 779	8 923	69 234
... of which freight and logistics services	4 846	3 045	15 253	2 225	30 649
Freight and logistics services from imports of services, %	18,0	6,0	25,4	5,1	10,8
Imports of freight and logistics services % of GDP	2,5	0,8	6,2	0,6	1,1
BALANCE OF PAYMENTS FOR SERVICES	172	15 466	6 194	-4 579	-34 019
Balance of payments for transport services	-3 207	2 900	9 596	7 293	-11 948
... of which balance of freight and logistics services	-3 649	2 906	20 503	8 710	3 061
GDP nominal prices, million USD	196 869	404 946	246 075	358 248	2 703 120

4.2 Size of the Logistics Market and Total Logistics Costs in Finland

It is difficult to give an estimation of a single numerical value for determining the size of the logistics market in Finland. The issues that make estimating hard have been discussed in Chapter 2.8 and the following issues are considered most essential:

- ”Logistics” or ”logistics industry” is not a statistical unit of its own.
- Companies do not have an established definition for logistics.
- Users of logistics produce services for their own use also themselves.
- Logistics costs is not an established accounting term.

When estimating the size of the logistics market, the value of services acquired from the market should be separated from the total costs of logistics operations. The latter contain trade and manufacturing (including construction) services produced by the companies with their own personnel and equipment. The size of the logistics market and the total costs have been observed based on both available data and results of the Finland State of Logistics survey in the following sections.

4.2.1 Size of the Logistics Market in Finland based on Statistical Data

According to the most recent statistics on added value in the transport sector (Statistics Finland 2016f; Figure 15), the transport market in Finland accounted for 9.5 billion euros in 2015. This figure includes also the service production related to passenger transport. It is estimated that transport of goods, cargo handling and other logistics services alone cover 7.5 billion euros of the total. The balance of services indicate that transport services (including passenger traffic and service production between third countries) bought abroad accounted for around 2.3 billion euros more than transport services exported from Finland.

The value added by freight transport and logistics in Finland (around 7.5 billion euros) combined with the balance of trade in these services gives a rough statistical estimation of the magnitude of logistics services bought in the market. The figure also includes services provided inhouse by trade and manufacturing in cases where services were provided by separate logistics companies owned by the same company. According to the statistics, the logistics market (outside services) in Finland accounted for 9-10 billion euros.

4.2.2 Size of the Logistics Market in Finland based on the results of Finland State of Logistics Survey

In this report, the size of the logistics market has been evaluated in the same way as in Finland State of Logistics report of the year 2014. The survey respondents of trade and manufacturing industries were asked the percentage share of logistics costs in the turnover. In addition, the respondents estimated the degree of outsourcing for different logistics services. By combining these two datasets, it was possible to estimate the distribution of logistics costs between different cost elements and between inhouse and outside services. According to the survey, the value of logistics services bought from the market by manufacturing (including construction) and trade was about 9.3 billion euros. This figure exludes logistics costs of the public sector (state, municipalities and other public corporations) of which there is no similar data available. Thus, the volume of logistics services acquired from the market is more likely to be 9-10 billion euros.

Customer firms produced logistics services for their own needs worth approximately 7 billion euros in 2015. In addition, inventory carrying costs, which are typically included in firms' logistics costs, is a considerable cost item, approximately 7.3 billion euros.

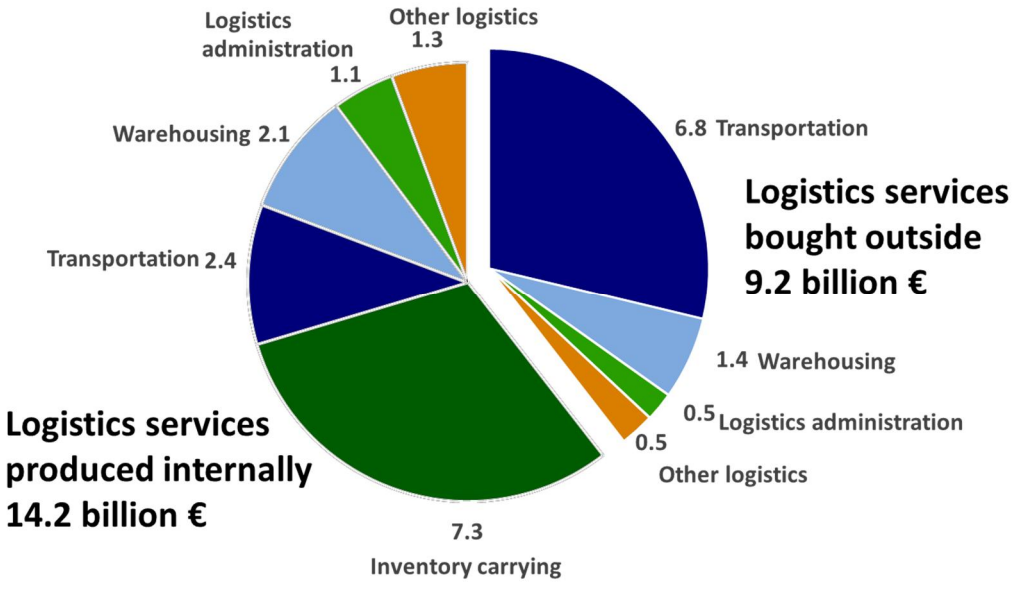

Figure 17 Logistics services produced in-house and outsourced logistics services in 2015 according to FSoL 2016 survey

The total value of internally-produced logistics and inventory carrying costs in Finland in 2015 was 14.1 billion €, which is approximately 1.6 times bigger than the value of logistics services purchased from the market (Figure 17).

Within Finland, the logistics costs amount to approximately 23 billion euros in total. This figure has also been used in this survey, when evaluating the logistics costs in relation to the Finnish GDP. In 2013, 23 billion euros would equal 11.4% of Finland's GDP. The estimate is quite close to the approximation of Kille, Schwemmer and Reichenauer (2014) approximation (22.3 billion euros in 2012) included in a review of the European logistics market.

The data collected in the State of Logistics survey also covers Finnish firms' foreign operations that are relatively abundant. The share of total logistics costs (incl. costs of outsourced and internally produced logistics as well as inventory carrying costs) in the total turnover of Finnish firms was 37.8 billion euros according to the survey. This also includes firms' foreign operations.

5 OPERATING CONDITIONS OF LOGISTICS IN FINLAND

5.1 Some Key Indicators of International Competitiveness for Finland

Finland is ranked quite high in several comparisons that measure international competitiveness (Table 7). For example, in World Bank's Doing Business Index Finland was ranked number 10 among 189 countries in 2016. Doing Business ranking is conducted mainly with national interviews and assesses general preconditions and obstacles for doing business. (Doing Business 2016.)

United Nations Conference on Trade and Development (UNCTAD) Liner Shipping Connectivity Index (LSCI) depicts countries' connectivity to container line traffic. Index ranking is assigned in relation to the score of the country that was ranked the highest in 2004. With the score of 9.64 Finland was ranked the 86th among 157 countries in 2016. China was at the top place with the score 167.48. When interpreting the index, it has to be taken into consideration that the database does not include information on ro-ro traffic. For this reason, Finland and few other countries that rely heavily on ro-ro traffic (such as Norway and Ireland) were ranked low.

Logistics Performance Index (LPI) published by the World Bank compares countries from the point of view of logistics performance. The set of indicators consists of six components, including customs and other border formalities, transport and information technology infrastructure, traceability of consignments and on-time deliveries. In 2016, Finland was ranked the 15th out of 160 countries. While interpreting the results, it should be noted that this ranking, which is based on the survey data collected from logistics professionals, is from the statistical point of view more like an approximate than an exact score.

The Enabling Trade Index (ETI) by World Economic Forum (WEF) assesses foreign trade performance based on seven pillars, which each include several indicators. The pillars evaluate for example domestic and foreign market access as well as availability and use of information technology. In addition to the WEF's own survey data, previously collected survey data and statistics related to foreign trade transport, border crossing and customs operations have been used in the comparison. The ETI Index also uses information from LPI and LSCI indicators that have already been presented above. In 2014, Finland was

ranked 5th among 138 countries in the ETI comparison. (World Economic Forum 2014a; 2014b.)

The WEF publishes also Global Competitiveness Index. In 2015-2016, Finland's score was 5.5 (on a scale of 1 to 7) and it was ranked 8th among 140 countries. The index is based on 12 pillars, which include for example health and primary education, performance of economic and social insititutions as well as innovation. (World Economic Forum 2015.)

Table 7 Finland and some peer countries in international rankings of competitiveness and logistics performance

		Finland	Sweden	Germany	Estonia	Poland	Russia	Countries included
Logistics Performance Index	2014	24	6	1	39	31	90	160
	2016	15	3	1	38	33	99	160
Liner Shipping Connectivity	2015	88	20	6	123	25	33	157
Index	2016	86	22	7	121	27	36	157
Enabling Trade Index	2012	6	4	13	26	48	112	132
	2014	5	9	10	28	45	105	138
Doing Business	2015	9	11	14	17	32	62	189
	2016	10	8	15	16	25	51	189
Global Competitiveness	2014-2015	4	10	5	29	43	54	144
Index	2015-2016	8	9	4	30	41	45	140
World Competitiveness	2015	20	9	10	31	33	45	61
Yearbook	2016	20	5	12	31	33	44	61
KOF Index if Globalization	2015	10	6	27	24	23	53	207
	2016	11	8	27	26	23	45	207
Corruption Perceptions	2014	3	4	12	26	35	136	175
Index	2015	2	3	10	23	62	29	168
Social Progress Index	2015	7	2	14	23	27	71	133
	2016	1	6	15	23	30	75	133

2015 KOF Index of Globalization; 2016 KOF Index of Globalization; Doing Business 2015; Doing Business 2016; IMD 2016; Social Progress Imperative 2015; Social Progress Imperative 2016; Transparency International (2014); Transparency International (2015); UNCTADstat 2016b; World Bank 2014; World Bank 2016; World Economic Forum 2012; World Economic Forum 2014a; World Economic Forum 2014b; World Economic Forum 2015

Finland's performance was weaker in World Competitiveness Yearbook by Swiss IMD, which ranks the countries based on competitiveness. The ranking evaluates economic performance, infrastructure as well as efficiency of administration and businesses. In 2016, the ranking covered 61 countries, among which Finland was ranked 20th. (IMD 2016.)

KOF Swiss Economic Institute publishes KOF Index of Globalization (KOF 2015; 2016), which measures globalization on three dimensions: economic, political and social. Economic dimension measures trade and investment flows, political dimension political cooperation between countries and social dimension sharing of information and ideas. The scale of the index is 1-100. In KOF Index of Globalization 2016, Finland was ranked 11th among 207 countries receiving an index score of 85.47. On the economic dimension, Finland was

ranked 17th, on the political dimension 21st and the social dimension 17th. The Netherlands was placed at the top place receiving an index score of 90.70.

Corruption Perceptions Index produced by Transparency International is based on professionals' opinions and measures perceived levels of public sector corruption on a scale of 0-100. Level zero indicates highly corrupt and hundred nearly corrupt-free. The 2015 comparison covered 168 countries, of which Finland was ranked the 2nd scoring 90. The first place was given to Denmark, which received a score of 91. (Transparency International 2015.)

Social Progress Index is produced by Social Progress Imperative. Index focuses on three components: basic human needs, foundations of wellbeing and opportunity. Countries are given points on a scale of 0-100 on each area, hundred being the highest score. The index score is calulated as an average of all three components. Finland was at the top place in 2016 with an index score of 90.09. (Social progress imperative 2015; 2016.)

In addition to indicators presented above, there exists several other indicators for assessing logistics performance. For example, EU Transport Scoreboard compares the quality of transport in the EU countries based on indicators grouped into 4 different categories. Indicators include among others quality of infrastructure for different modes of transport, completion of TEN-T core network and number of road fatalities. The latest EU Transport Scoreboard was released on October 27, 2016 (EU Transport Scoreboard 2016).

Finland was ranked among the top five countries on several indicators of the EU Transport Scoreboard 2016. For example, Finland was ranked the best in "Hours spent in road congestion annually". Based on the comparison, in Finland a driver who commutes 30 kilometers 220 days annually spent on average slightly less than 20 hours in road congestion in 2015.

5.2 Finland in the Global Logistics Performance Index

In 2016, Finland was ranked 15th in World Bank's Logistics Performance Index, which measures logistics performance of foreign trade. Finland's placing was somewhat higher than in 2014, when the country was placed 24th, but lower than its best placing as 3rd in 2012. Like in previous years, the evaluations of Finland's performance in different components were very similar to assessments provided by Finnish respondents in FSoL 2016. The biggest difference between the survey data collected in Finland and the international assessments of the LPI was that the Finnnish respondents' opinion on the quality of transport infrastructure was considerably more critical. Figure 18 presents rankings of Finland and few peer countries in LPI 2016 for overall ranking and for the different components of the index.

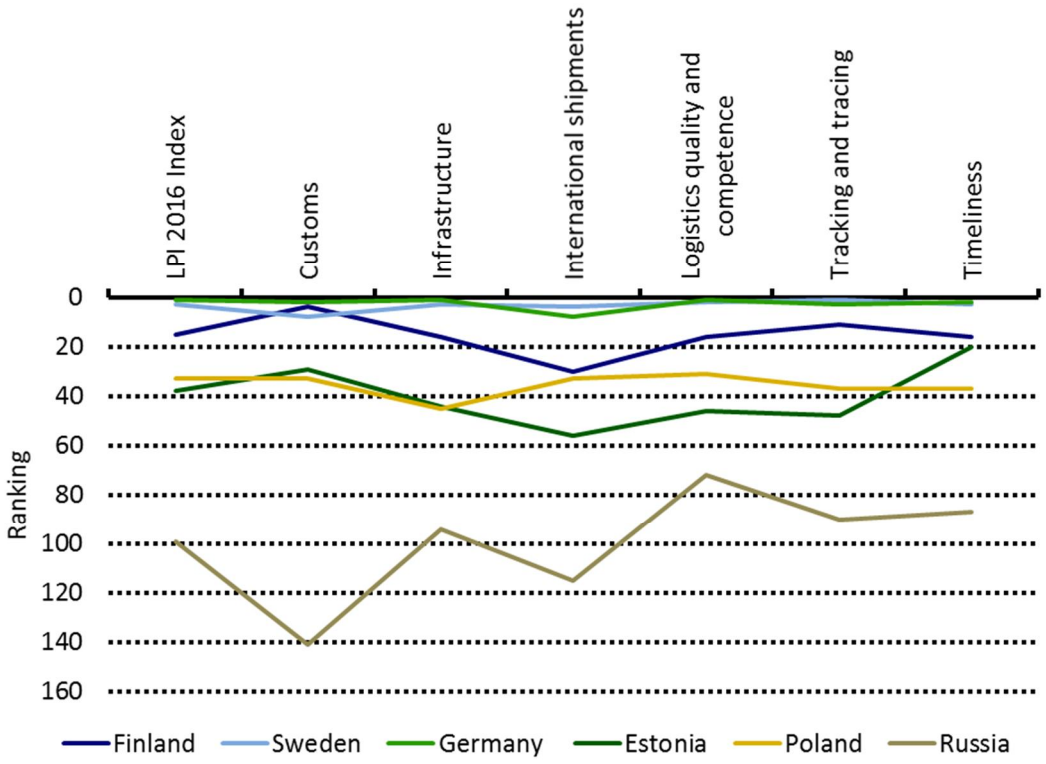

Figure 18 The overall ranking and its components of Finland and some peer countries in Logistics Performance Index 2016. The figures indicate rankings among 160 countries (World Bank 2016)

Germany and Sweden performed better than Finland in both the overall index and in most of its components. In customs efficiency, Finland was estimated to perform better than Sweden. In contrast, Estonia, Poland and Russia performed worse in the index components.

5.3 Results of Finland State of Logistics 2016 based on the LPI Indicators

Finnish companies seem to have convergent opinions on Finland's performance in different components of the LPI. According to manufacturing and trade as well as logistics companies, Finland's performance is highest in customs efficiency and tracking of shipments (Figure 18). Differences between different industries are the most visible in respondents' attitudes towards transport infrastructure and availability of transport. Logistics companies are the most critical towards the quality of infrastructure in Finland, whereas manufacturing and trade firms towards the availability of transport. Teachers and consultants working in the field of logistics are more positive about the logistics

performance in Finland than representatives of manufacturing, trade and logistics companies.

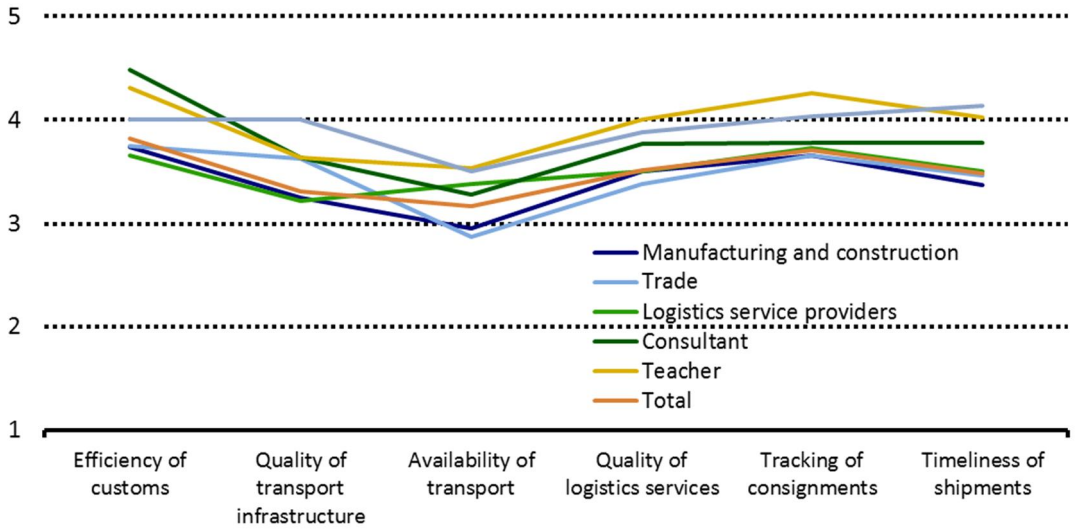

Figure 19 Finland's scores in Logistics Performance Index 2016 and assessments of the same components by over 1 100 Finnish respondents in 2016 (Minimum = 1, Maximum= 5)

Finland has received similar scores for its logistical performance in the LPI index indicators already for several years. Figure 20 presents Finnish respondents' evaluations of the LPI components in 2010-2016. Assessments of almost all components have in practice remained the same. As for the customs efficiency, the assessments have somewhat improved between 2010 and 2016.

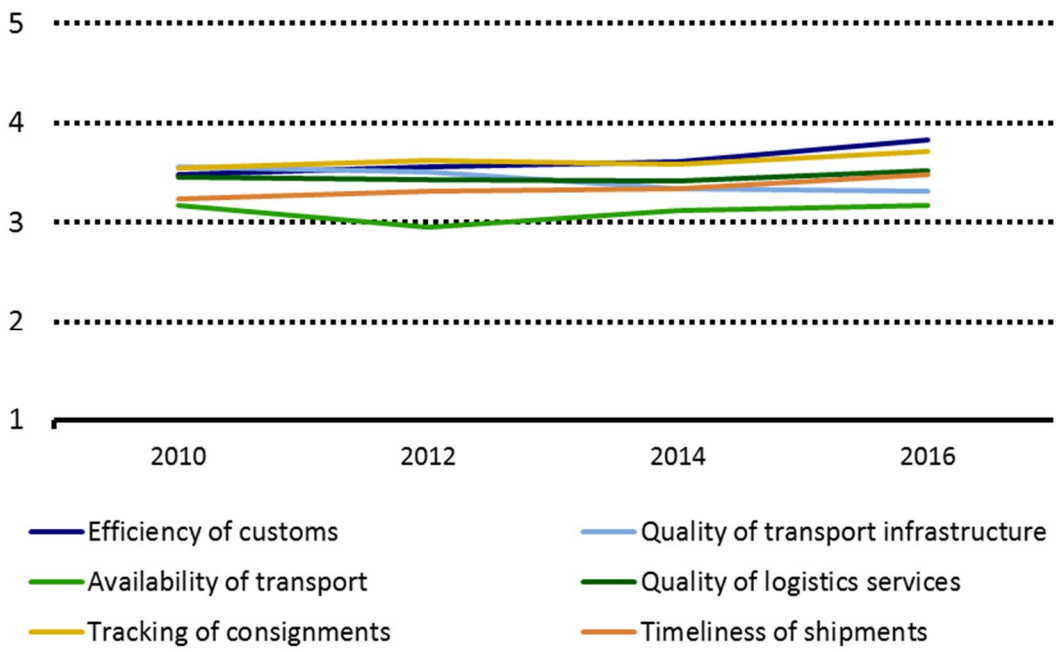

Figure 20 Finnish respondents' assessments of the components of Logistics Performance Index in 2010, 2012, 2014 and 2016 (Minimum = 1, Maximum = 5)

5.4 Importance of Location in Logistics and Business Activities

In the same way as in FSoL 2014, firms' views on operating conditions in their location are observed at NUTS 2 level, which in Finland include the following regions: Helsinki-Uusimaa, South Finland, West Finland, North and East Finland as well as Åland. In line with the previous reports, operating conditions are studied through five different dimensions, which are:

- general business perspective
- location of production
- logistics performance/efficiency
- transport infrastructure
- location of competitors

Figure 21 presents a time series of the averages of all the responses in 2006-2016. It can be seen from the figure that Finnish firms' assessments on local operational preconditions has remained very similar for already a decade. In 2006, the average of all the responses and of all above mentioned dimensions was 3.56, while in 2016, it was 3.60 (1 = Very poor, 5 = Excellent).

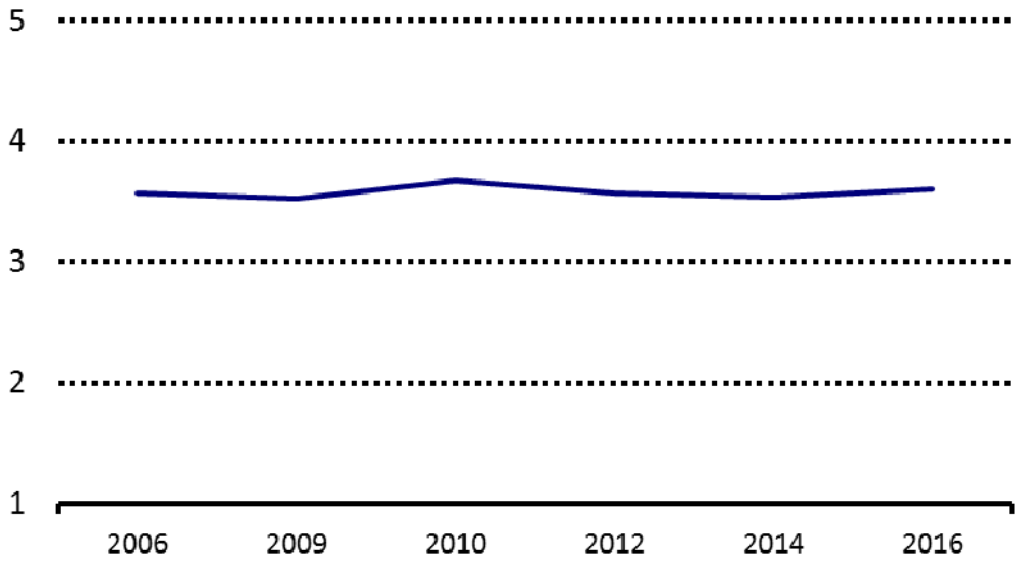

Figure 21 Respondents' assessment of local operational preconditions for the company 2006-2016. The five dimensions are combined in the assessment (1 = Very poor, 5 = Excellent)

From figure 22 it can be seen that the NUTS 2 regions are ranked in the same order based on their operational preconditions in all five dimensions.

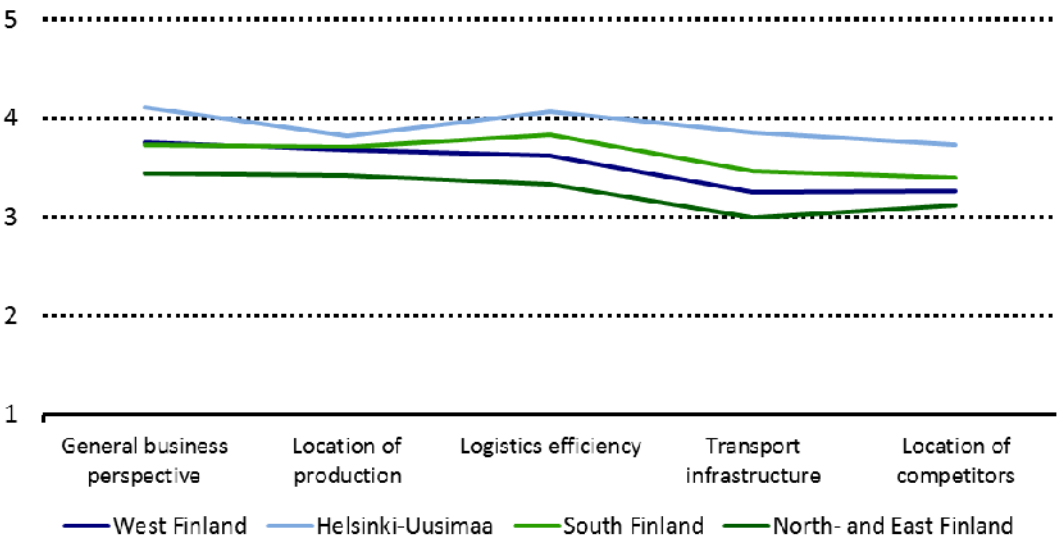

Figure 22 Firms' assessments of logistical conditions by regions (NUTS 2 level) in the spring 2016; N=1,042 (1 = Very poor, 5 = Excellent)

Helsinki-Uusimaa performs best in all dimensions of operational preconditions and North and East Finland worst. West Finland and South Finland are estimated to be equally good when it comes to general business perspective. As for other dimensions however, the respondents in South Finland valued the operational preconditions in their region higher than the companies in West Finland. Respondents give the weakest score for location of competitors and the best for general business perspective.

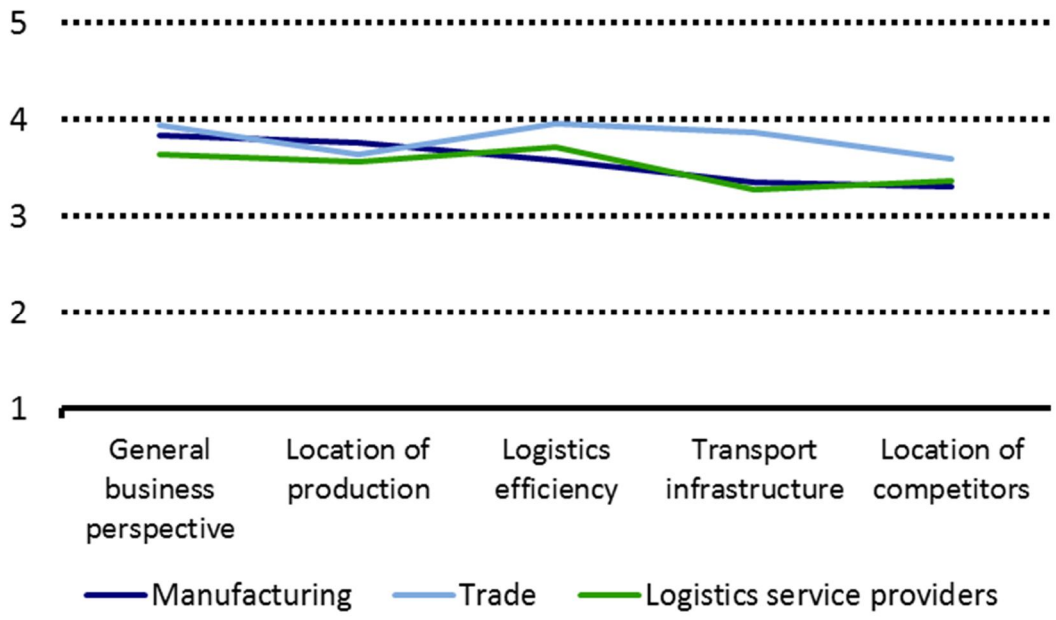

Figure 23 Firms' assessments of logistical operating preconditions by industry in the spring 2014, N = 1,042 (1 = Very poor, 5 = Excellent)

The difference between the regions (NUTS 2) is smallest in location of production and largest in transport infrastructure.

Figure 23 describes assessments of firms in different industries on local operational preconditions. Out of all respondents, the manufacturing industry representatives value operational preconditions related to location of production highest but in other dimensions, trade industry firms are the most satisfied. Logistics companies estimate their operational preconditions poorest in terms of general business perspective, location of production/activities and transport infrastructure. Manufacturing companies in turn give the lowest score to operational preconditions in relation to logistics performance and location of competitors.

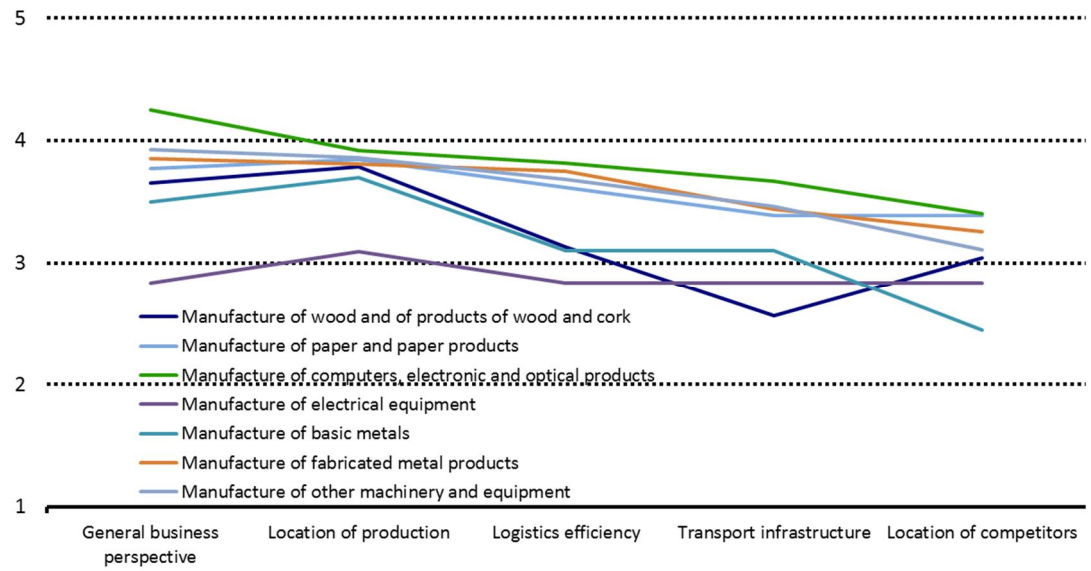

Figure 24 Firms' assessments on local operational preconditions related to logistics in some main industries in 2016 (1 = Very poor, 5 = Excellent)

5.5 Digitalisation as a Driver for Change in Business and Logistics

Digitalisation has lately become one of the most important phenomena shaping the future. Despite the great attention paid to digitalisation, its definition and thus, the changes it can bring about have remained unclear. This study aimed to investigate the spread of digitalisation now and in the near future by enquiring responding organizations to which extent they use different digital applications in their business currently and estimate to use them in 2020. Figure 25 depicts manufacturing industry respondents' views on which applications they use in their business now and estimate to use in 2020.

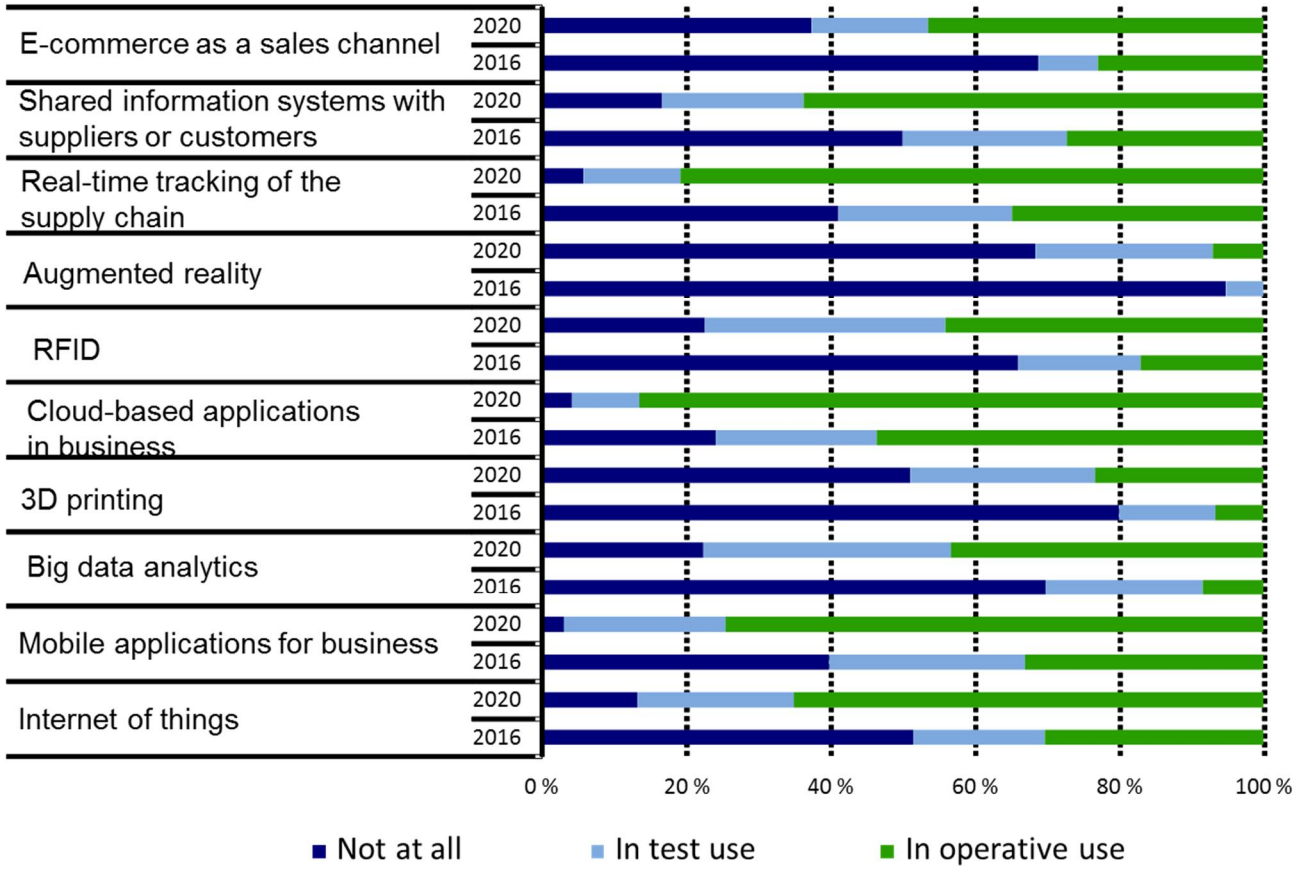

Figure 25 Manufacturing firms' estimations on the use of different applications related to digitalisation now and in 2020

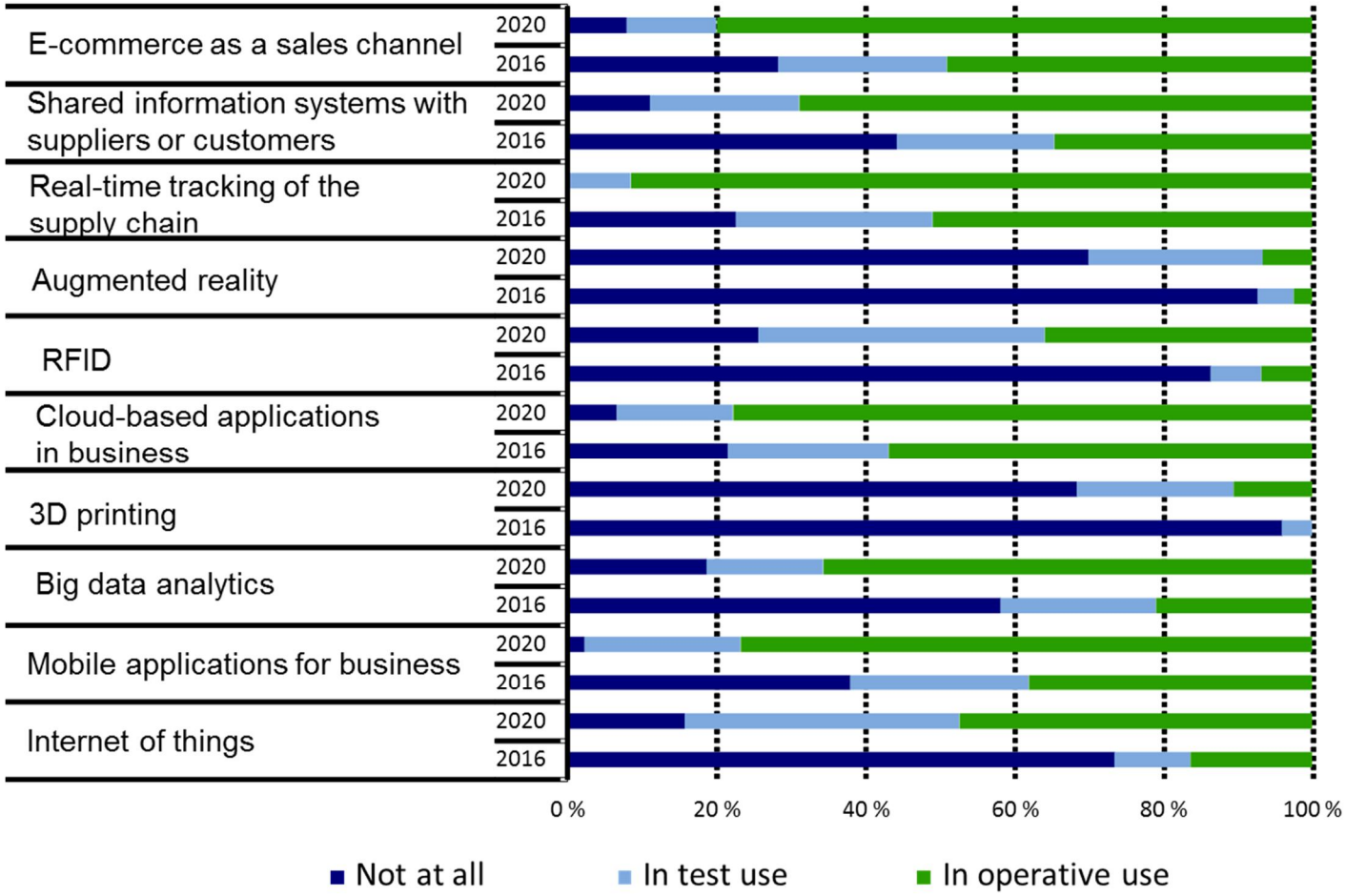

Figure 26 Trade industry firms' estimations on the use of different applications related to digitalisation now and in 2020

Nowadays, different cloud-based applications were the most often used by manufacturing firms, of which 54% use them in their operations. In addition, 22% of the respondents are currently testing cloud services. Other applications that are common in operational use include real-time tracking of the supply chain (35%), mobile applications for business and internet of things (30%). Applications that companies use in their operations the least are augmented reality (0%), 3D printing (6.7%) and Big Data analytics (8.4%).

Even though part of the applications of digitalisation are used very little or their use is still in the testing phase, respondents estimate that for many applications, the situation will change rapidly. It is estimated that cloud services would be in operational use in more than 85% of the manufacturing industry companies by 2020 and real-time tracking of the supply chain in more than 80%, which would indicate a 40-percentage point increase in five years. It is expected as well that for example the operational use of Big Data analytics would increase more than 30 percentage points, and thus 43% of manufacturing firms would use it in their operations. According to the survey, the least used applications in 2020 would be 3D printing (23%) and augmented reality (7%). Figure 26 depicts corresponding results for trade industry companies.

Currently, the most commonly used applications of digitalisation in trade industry are cloud services (57%), real-time tracking of the supply chain (51%) and e-commerce as a sales channel (49%). Also trade industry companies estimate that the operational use of Big Data analytics will fast become more common. According to the estimations given by survey respondents, already 67% of companies will use it in 2020. Real-time tracking of the supply chain would be used by 92% of the respondents and e-commerce as a sales channel by 80%. According to trade industry respondents as well, the applications least used at the moment and in 2020 are 3D printing (0% now and 10.5% in 2020) and augmented reality (2.4% now and 6.7% in 2020).

6 DEVELOPMENT OF FIRMS' PERFORMANCE BASED ON THE SURVEY RESULTS

Finland State of Logistics reports have studied the performance of firms in different ways already for 25 years. Since 2005, logistics costs and key indicators of the activities have been followed mainly by using comparable methods, which enables the creation of time series and comparison of developments in time, for example in relation to development of costs. The latest State of Logistics surveys have also included questions concerning respondents' views on the development of the firm's economic and logistical performance. The development of manufacturing and trade companies' as well as logistics companies' performance is presented in following chapters.

6.1 Logistics Costs in Manufacturing and Trade

National State of Logistics reports have followed the logistics costs in Finnish manufacturing and trade already for 25 years, the first point in time studied dating back to 1990. Comparable data on logistics costs using the same method have been collected since 2005. The following chapter deals with logistics costs of manufacturing and trade industry companies that operate in Finland while taking into consideration such factors as the level of internationalization and industry for example.

Figure 27 illustrates logistics costs in Finnish manufacturing and trade firms in 2005-2015. Numbers in the figure are based on the survey data of the State of Logistics reports and are weighted by firm and industry turnover.

Logistics costs have risen slightly when compared with the costs in 2013. Logistics costs in manufacturing and trade were on average 14.0% of the turnover in 2015, while in 2013, their share was 13.4% of the firm turnover on average.

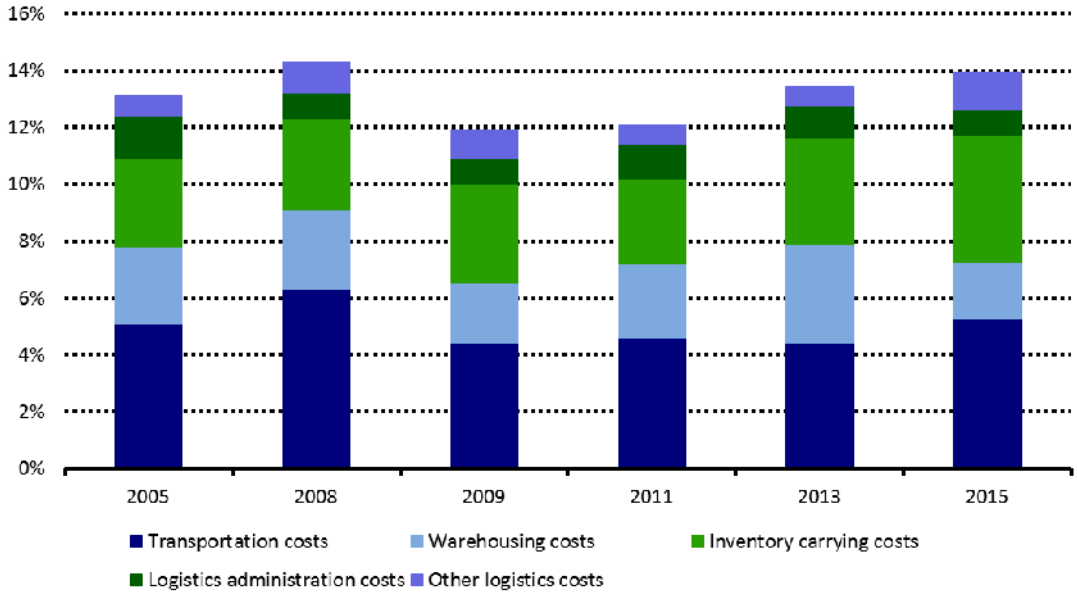

Figure 27 Logistics costs in manufacturing and trade as a percentage share of the turnover weighted by firm and industry turnover in 2005-2015

Compared to the year 2013, the logistics costs that have increased the most are tansportation costs, which on average accounted for 5.3% of the turnover in 2015, whereas in 2013, their share was 4.4%. Inventory carrying costs have also risen in comparison to 2013 and were 4.5% of the surveyed companies' turnover in 2015 (3.7% in 2013). A similar development can be observed also internationally. For example in the United States, firms' inventories have been growing since 2009 (CSCMP & AT Kearney 2016). On the other hand, warehousing costs have decreased from 3.5% in 2013 to 2.0% in 2015. Thus, the overall inventory costs have slightly decreased and the cost rise is mainly explained by increased transport costs.

6.1.1 Share of Transport Costs by Mode of Transport

Transport costs are on average the biggest cost component of logistics costs of firms operating in Finland and they account for almost 40% of all logistics costs. When assessing transport costs, it is essential to gain a good understanding of the shares of domestic and international transport as well as of the shares of different modes of transport.

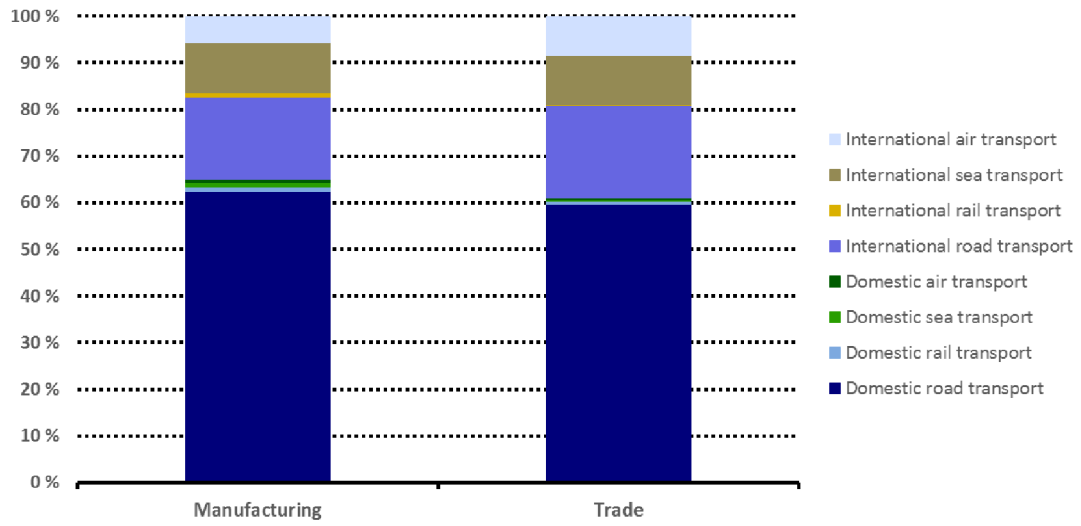

Figure 28 Distribution of transport costs in manufacturing and trade by domestic and international transport as well as transport mode in Finnish firms in 2015 (straight average)

Figure 28 illustrates the division of transport costs in manufacturing and industry by domestic and international transport and by different modes of transport. Approximately 60% of the transport costs in both industries are caused by domestic road transport. The second biggest share of the transport costs in these industries is accounted for international road transport of which the share in manufacturing is on average 17.5% and in trade 19.8%. The share of international maritime transport of all transport costs is approximately 11% in both industries.

If transport costs are observed from the point of view of the level of internationalization, the shares of different transport modes are very different. For the firms operating in the domestic market, a majority (87%) of transport costs accounts for domestic road transport. For export companies, the share of domestic road transport is about 26% and for international companies, only about 13% of all transport costs.

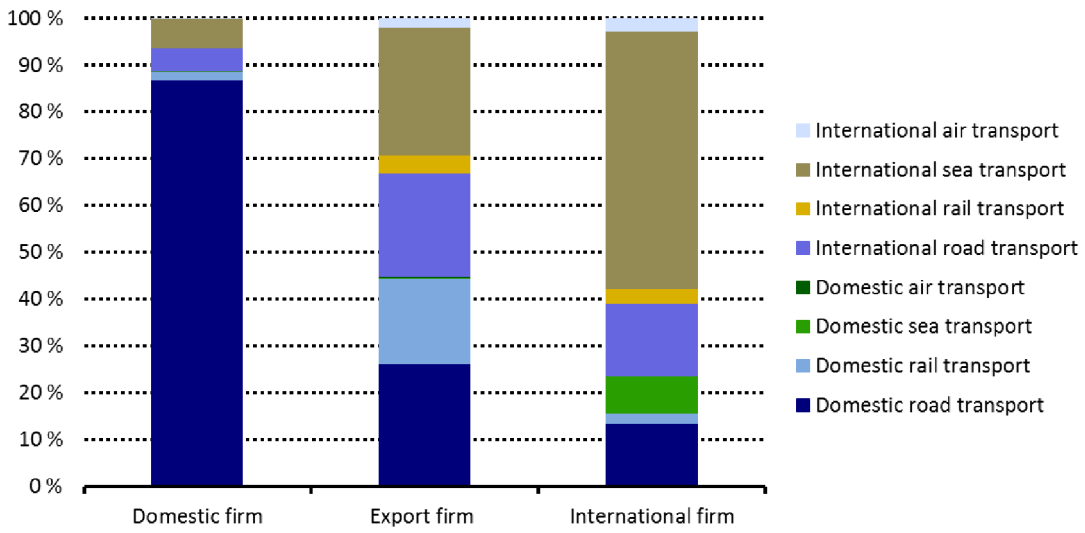

Figure 29 Distribution of transport costs in manufacturing by different transport modes and by the level of internationalization of the firm in 2015

The majority (55%) of international firms' transport costs are formed by international maritime transport. For export companies, their share is about 27%. The share of international road transport is also significant for both export and international companies. 22% of the export companies' and 16% of the international companies' transport costs are formed by international road transport.

There are also significant differences between industries on how big a share different transport modes account for. Figure 30 illustrates how transport costs are formed in some manufacturing industries. The share of domestic road transport is high in manufacture of food products (65%), manufacture of chemicals and chemical products (35%) and mechanical engineering industry (34%). In construction, up to 95% of transport costs are formed by domestic road transport.

The share of international maritime transport is high in timber industry (45%), manufacture of chemicals and chemical products (40%) as well as manufacture of transport equipment (48%). The share of air transport in turn is emphasized in electronics industry (45%) and manufacture of textile (28%).

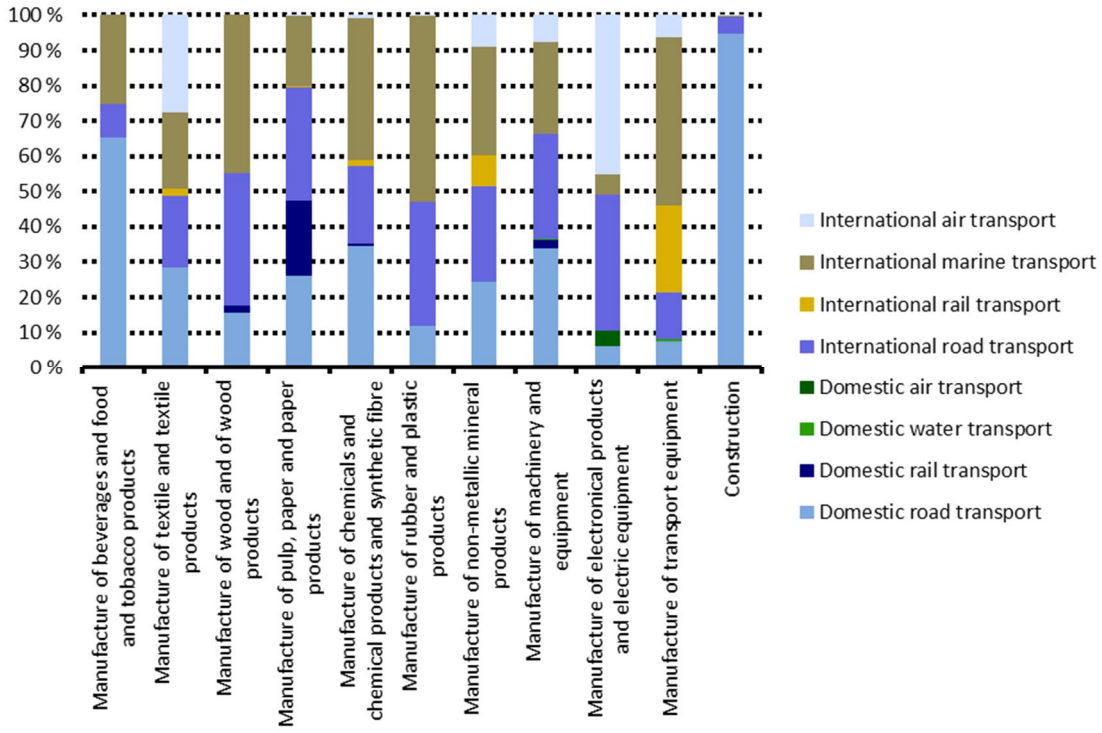

Figure 30 Distribution of transport costs by transport modes in some manufacturing industries

Out of the industries generating a significant turnover, particularly the manufacture of paper and paper products is an industry in which none of the transport modes dominate the others, as the transport costs are quite evenly distributed both domestically as well as internationally between different transport modes.

6.2 Key Indicators in Manufacturing and Trade

In addition to logistics costs, Finland State of Logistics reports have followed key indicators of companies' business activities. Such indicators include delivery time, share of perfect customer deliveries and payment times since 2005. Following sub-chapters deal with, for example, payment times of firms and cash-to-cash cycle time as well as indicators related to timeliness of shipments by different background variables.

6.2.1 Payment Times and Cash-to-cash Cycles

Based on the survey results, indicators related to firms' cash-to-cash cycle time have further lengthened for both manufacturing and trade companies (Figure 31

and Figure 32). Firms store the products longer, receive payments from clients later and similarly, pay suppliers later than before. The long-term development of Finnish companies' payment times has been studied by for example, Lorentz, Solakivi, Töyli and Ojala (2016).

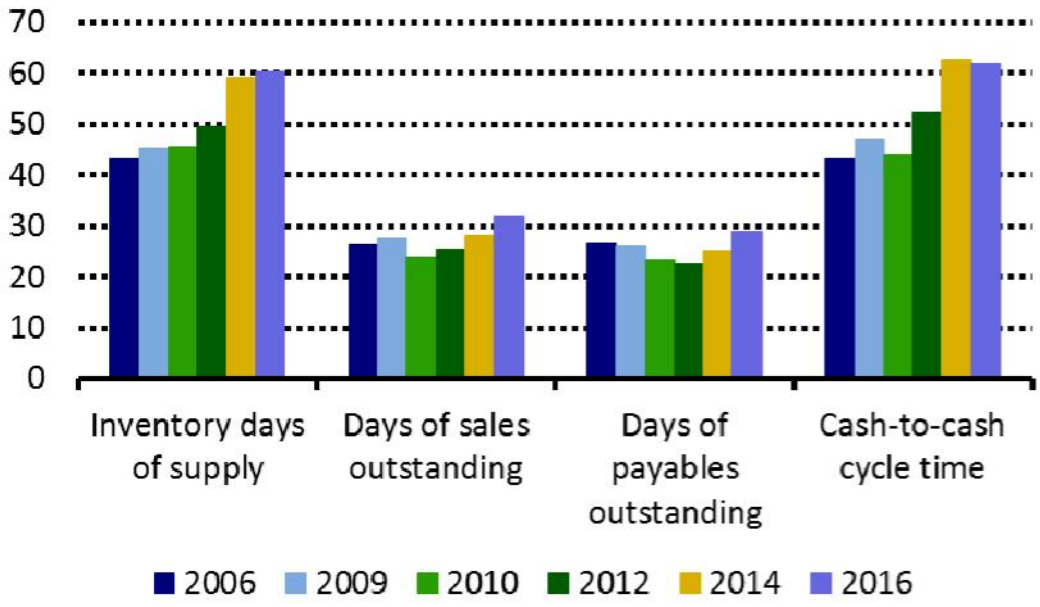

Figure 31 Development of payment times and cash-to-cash cycle time in manufacturing in 2006-2016

In manufacturing industry, the average cash-to-cash cycle time has become slightly shorter compared to the year 2014, whereas for trade firms, the cash-to-cash cycle time has further grown. Manufacturing firms hold the goods in the inventory on average for 60 days, while in 2014 the average inventory days of supply was 59 days. Similarly, manufacturing companies receive payments from clients in 31 days on average and pay their suppliers in 28 days on average. Thus, the average cash-to-cash cycle time is about 62 days.

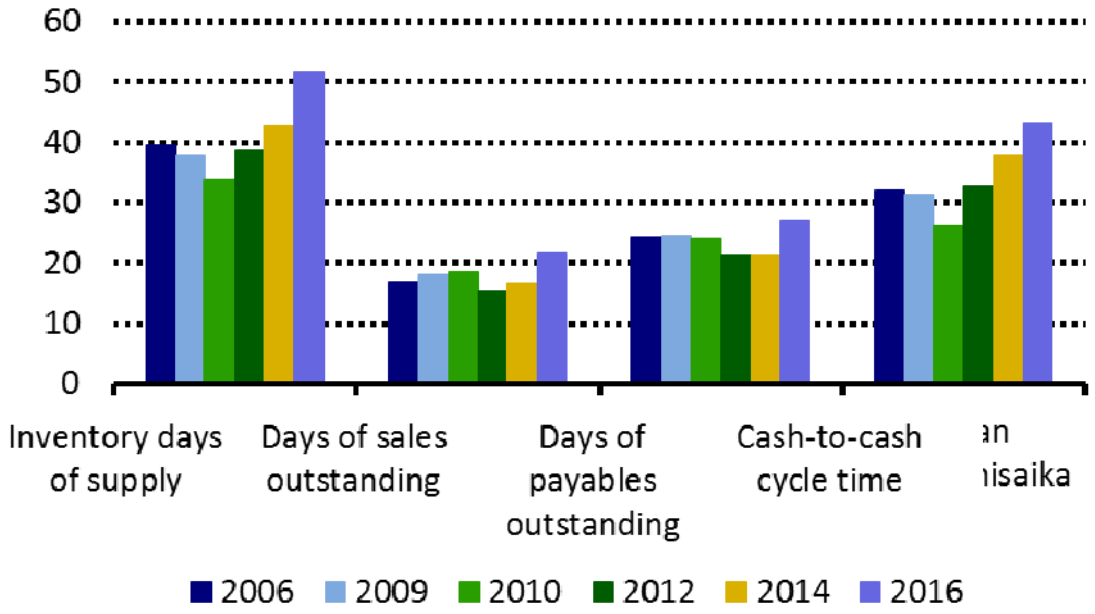

Figure 32 Development of payment times and cash-to-cash cycle time in trade in 2006-2016

Similarly, trade inductry firms' inventory holding time is on average 51 days, which is 9 days less than in 2014. It seems that payment time to suppliers is longer (27 days) than payment time from customers (21 days), which may be explained by the fact that many trade industry companies receive payments from their customers immediately.

However, average cash-to-cash cycle times are only a part of the whole picture. At the same time, it should be kept in mind that there is great variation between industries as well as inside the same industry on how cash-to-cash cycle time and its components are formed.

6.2.2 Delivery Timeliness

To measure the performance of firms' operations, respondents were asked to evaluate, for example, delivery timeliness for company's own shipments and for their suppliers'. Figure 33 presents manufacturing companies' assessments of their own as well as of their suppliers' delivery timeliness grouped by company size. When compared internationally, the delivery timeliness of Finnish manufacturing firms seems to be of rather high level and variation between different-sized companies is low. Large manufacturing companies achieve delivery timeliness of over 92%, medium-sized companies around 92% and small companies slightly above 91%. Surpsisingly, the results indicate that

micro enterprises are performing best in delivery timeliness, their on-time shipments reaching a share of over 93%.

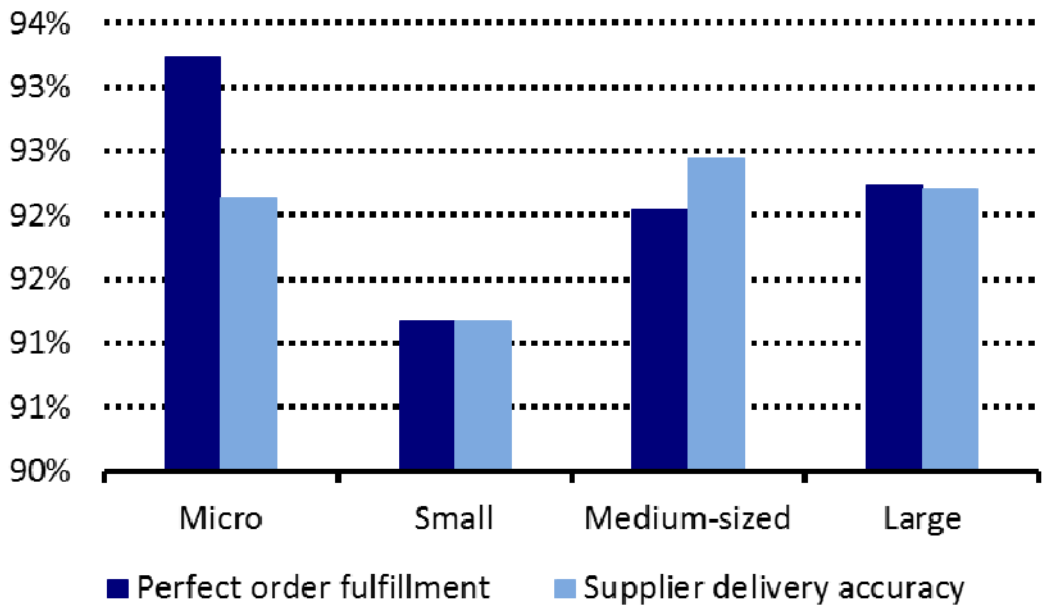

Figure 33 Manufacturing firms' assessments of their own and their suppliers' delivery timeliness as a percentage share of on-time deliveries of all shipments in 2015

In trade, the delivery timeliness (Figure 34) seems to be slightly better than in manufacturing. One reason for this is that in trade, the delivery timeliness does not depend on manufacturing process, which is the case in manufacturing industry. In addition, customer relationships are different. Thus, it is not meaningful to compare timeliness of shipments directly between these two industries.

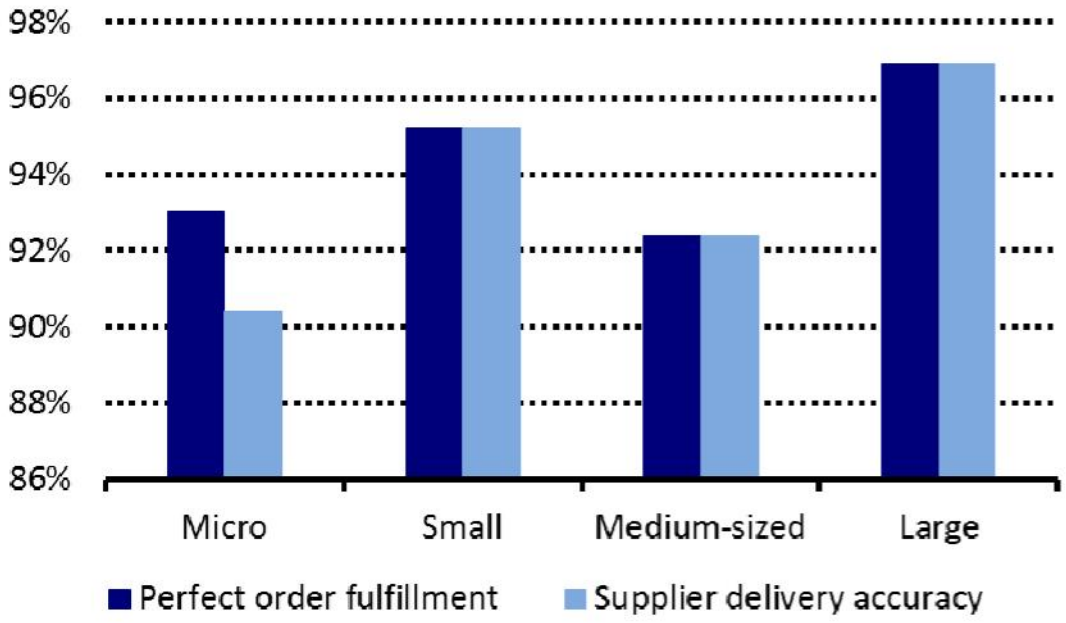

Figure 34 Trade firms' assessments of their own and their suppliers' delivery timeliness as a percentage share of on-time deliveries of all shipments in 2015

It can be stated that in general, the average delivery timeliness of Finnish firms is quite good. However, defferences between indutries can be observed based on the survey data. Figure 35 illustrates the share of perfect customer deliveries in some manufacturing industries.

Figure 35 Firms' assessments of their own and their suppliers' delivery timeliness as a percentage share of on-time deliveries in all shipments in some manufacturing industries in 2015

Based on the figure, it can be stated that the highest delivery performance, nearly 97%, is achieved in the chemicals industry, and the lowest in manufacture of machinery and equipment.

6.3 Performance of Logistics Firms

The ability to take advantage of the existing capacity and minimize the "unprofitable" time plays an important role in the performance of logistics companies and especially in that of of transport companies. Figure 36 presents the share of empty running by company size.

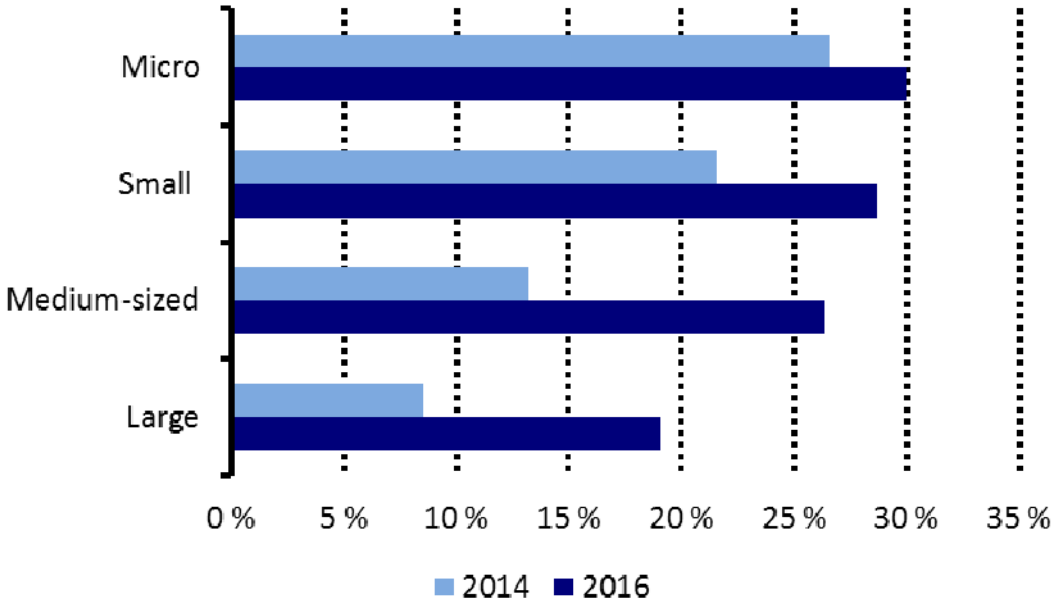

Figure 36 Share of empty running by company size based on FSoL 2014 and FSoL 2016

When comparing empty running in companies of different size, it can be stated that the share of empty runs becomes smaller as the company size grows. This might suggest that large enterprises have better possibilities for combining shipments and arranging for backhaul. At the same time however, it is likely that large enterprises operate in industries producing such outputs that enable backhaul in the first place, especially when the share of micro enterprises is big in such fields as excavation, for example, where a relatively large share of empty runs is unavoidable. Figure 37 depicts the share of empty running in some industries of road transport. According to the figure, the share of empty running for road transport companies is 20-40% depending on the mileage and industry.

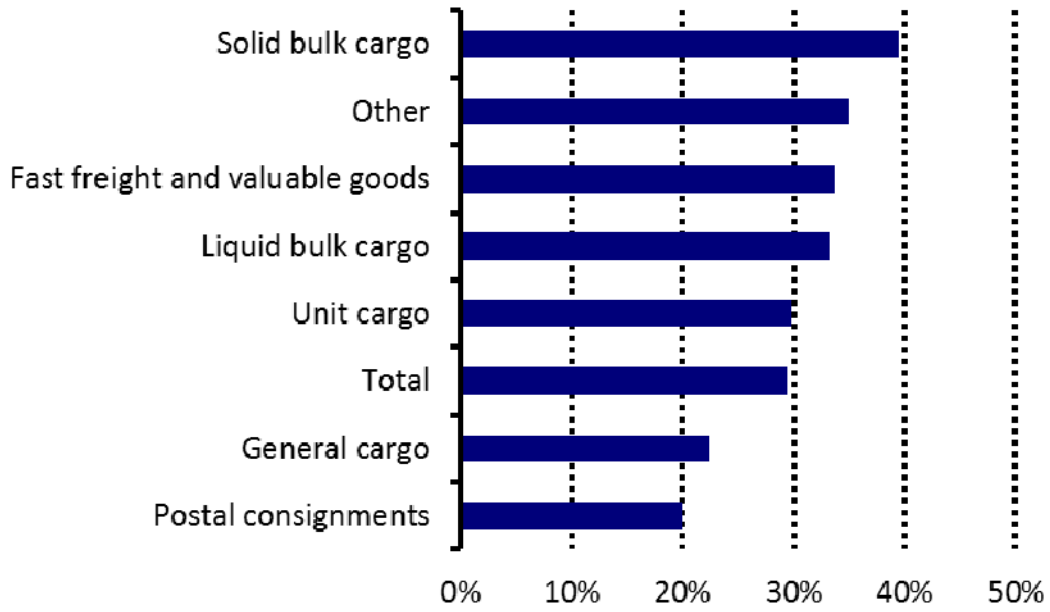

Figure 37 Share of empty running by cargo type in 2015

In addition to the share of empty runs, the load factor of cargo space during transport and the overall average load factor, taking into consideration the share of empty runs of the total mileage, are important. Figure 38 depicts the average load factor during transport of cargo (light bars) and average load factor when the share of empty running is taken into account (darker bars) in 2014 and 2016.

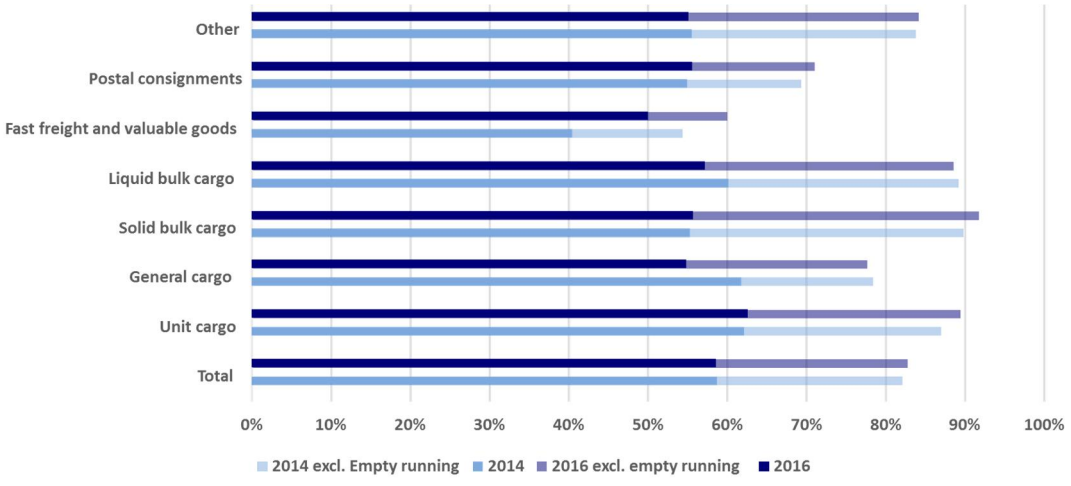

Figure 38 Average load factors of road transport companies (including the share of empty running) by cargo type based on FSoL 2014 and FSoL 2016

It can be seen from the figure that the average load factors have remained similar and that they are of quite high level when compared internationally (cf. ie. Piecyk & McKinnon 2010). It can also be stated that the differences in the share of empty running between different cargo types become less significant when load factors are compared. For some cargo types, such as solid bulk cargo, the relatively high share of empty running is compensated by a high load factor; vehicles carrying such cargo are in practice fully loaded. On the other hand, receiving backhaul is more difficult than it is for vehicles and companies transporting mixed cargo, for example.

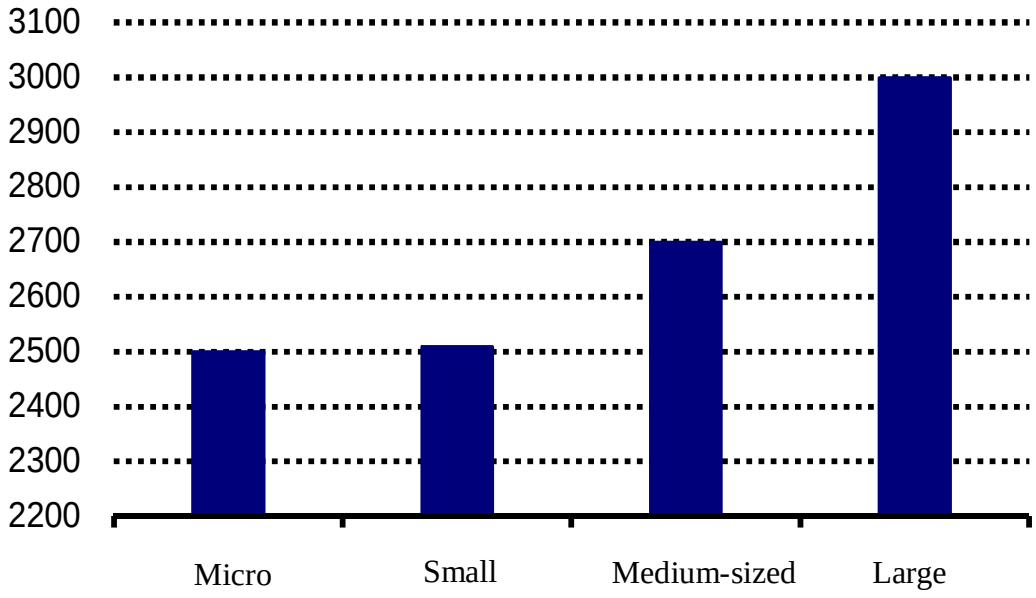

Figure 39 Average capacity utilization of road transport companies in hours per year in 2015

Besides the load factor, the operational efficiency of transport companies is measured by average service hours per year of the trucks. Figure 39 illustrates road transport companies' average truck capacity utilization in hours per year by company size. For large enterprises, capacity utilization is about 3 000 hours per year, whereas medium-sized enterprises reach about 2 700 hours per year and small and micro enterprises, about 2 500. When capacity utilization is observed together with the share of empty running, substantial economies of scale in efficiency become visible.

7 STATE OF LOGISTICS IN THE FINNISH ECONOMY IN 2016

At the time of writing of FSoL 2016, the situation of both the Finnish and international economy is unstable. The economic growth of Finland has already been low for a long time, despite good news in some individual industries, such as the shipbuilding industry. At the same time, the global economy has been shattered by many different crises. The great volatility in the Chinese stockmarket as well as the fact that the Chinese industrial production has been weaker than expected have provoked concern about the waning of the global economic growth. Continuing crises in Syria and Ukraine and the political instability they have caused as well as the spiral of sanctions and counter-sanctions have contributed to the weakening of preconditions for trade. Banking sector's resilience issues and most recently, Deutsche Bank's problems have created instability in the financial market. Due to the uncertainty about developments of the economy and due to new production methods and regions, the price of crude oil and thus fuel prices have remained moderate already for two years.

7.1 Physical Environment for Business Activities

As for logistical preconditions, the situation in Finland seems to be stable based on international comparisons as well as Finland State of Logistics survey. Finland was once again ranked among the top ten percent in World Bank's Logistics Performance Index of he year 2016. As in the previous State of Logistics surveys, Finnish firms are substantially more critical when assessing performance in the same dimensions measured in LPI than international evaluations of Finland and its logistical performance.

Questions used in the State of Logistics surveys to measure the operating environment for logistics in Finland has remained mainly unchanged since 2006. The preconditions for logistics are estimated to be best in Helsinki-Uusimaa, while the weakest assessments are given to preconditions in North and East Finland. In all regions, respondents are most critical towards transport infrastructure.

This report enabled for the first time making comparisons in time on respondents' views on the state of the transport infrastructure both for technical

conditions of the transport infrastructure as well as for road capacity and connections. This time, the assessments on the condition of the transport infrastructure were somewhat more positive than two years ago. During the past two years the government has invested in the maintenance of traffic roads, which, based on the survey data, seems to have had an impact on the respondents' statisfaction. The future will show if this change will last.

7.2 High Internal Performance and Efficiency but Rising Costs for Businesses

In terms of logistics indicators, Finnish firms' performance and efficiency are of good level. The delivery timeliness of both manufacturing and trade companies is high and payment times and cash-to-cash cycle time remarkably short when compared internationally. Also logistics companies, large carriers in particular, operate very efficiently in terms of average load factor and capacity utilization, for example. Thus, it is curious that logistics costs have been growing steadily already for many years despite firms' efficiency. Especially transport costs and inventory carrying costs have increased.

A significant part of the transport costs, approximately 25% for road transport companies and 50% for marine transport companies, are accounted for fuel costs. Considering that the price of crude oil and thus the fuel price has globally been quite moderate for long time, the rising of transport costs of Finnish companies is alarming. The structural change in manufacturing industries explains no doubt part of the increase but the impact of tightening regulation of the transport sector and, especially concerning marine transport, cannot be neglected. More than a half of the transport costs of Finnish international companies accounts for sea transport, which emphasizes the impact of shipping industry regulation.

What troubles the most is the fact that transport costs have risen at a moment when the development of the price of a key cost factor, such as the fuel, would indicate completely opposite. In practice, this means that when the fuel price will increase, the transport costs of Finnish firms will almost unavoidably rise even more. The development of the fuel price will also obscure the discussion of Finnish companies' competitiveness. For example, it has been claimed that limits on ships' sulphur fuel that entered into force in the beginning of 2015 have not had any cost effects. However, these claims are based on the illusion that the price of crude oil and thus ship fuel prices have dropped so low that in absolute numbers the price of fuel has remained at the previous level. Relatively speaking, however, low sulphur fuels cost about 200 USD more per tonne than the regular fuel, thus harming relative competitiveness.

7.3 Digitalization is Shaping Logistics in Businesses

Finnish firms estimate that digitalization will shape their business and logistics already in the short term. The majority of the firms that answered the survey estimated to use cloud services and real-time tracking of the supply chain as well as different mobile applications in their operations already by 2020. E-commerce applications are also making their way among Finnish firms.

If companies' expectations about near future developments become true, this evidently means that the Finnish logistics market will change dramatically and a significant demand for different digital applications will come about even in short period of time. Information, data analyzing and data mining as well as distribution of knowledge between a firm and its numerous stakeholders will form a significant potential for business and for improving efficiency that will benefit both customers and service providers. At the same time, this may signify that traditional logistics service providers' role and possibilities to continue their business as usual will be diminished as physical services increasingly become low-profit basic functions, while the added alue will be created from transforming products into services and managing relevant information flows.

REFERENCES

Bank of Finland (2016) Vaihtotase, netto (Balance of Trade, net values) <http://www.suomenpankki.fi/fi/tilastot/maksutase/Pages/vaihtotase_vuosi_netto_fi.aspx#Pa1ffc30403994f86a0238012accd2773_10_37iT0R0R0x15>, retrieved 23.8.2016.

CSCMP & AT Kearney (2016) CSCMP's Annual State of Logistics Report, Logistics in Transition: New Drivers at the Wheel.

Doing Business 2016 (2016) <http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB16-Full-Report.pdf>, retrieved 8.7.2016.

Eurostat (2016) Gross domestic product at market prices <http://ec.europa.eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=tec00001>, retrieved 23.8.2016.

EU transport in figures (2015) <http://ec.europa.eu/transport/facts-fundings/statistics/doc/2015/pocketbook2015.pdf>, retrieved 9.8.2016.

EU Transport Scoreboard (2016) <https://ec.europa.eu/transport/facts-fundings/scoreboard_en >, retrieved 1.2.2017.

IATA (2015) Air Passanger Market Analysis <http://www.iata.org/whatwedo/Documents/economics/passenger-analysis-dec-2015.pdf>, retrieved 8.7.2016.

IATA (2016) Air Passanger Market Analysis <http://www.iata.org/whatwedo/Documents/economics/passenger-analysis-may-2016.pdf>, retrieved 13.7.2016.

IMD (2016) The World Competitiveness Scoreboard 2016. <http://www.imd.org/uupload/imd.website/wcc/scoreboard.pdf>, retrieved 8.7.2016.

Kille, C. – Schwemmer, M. – Reichenauer, C. (2015) Top 100 in European Transport and Logistics Services 2015/2016 <http://www.scs.fraunhofer.de/content/dam/scs/de/dokumente/studien/Top%20100%20EU%202015%20Executive%20Summary.pdf>, retrieved 4.7.2016.

KOF (2015) KOF Index of Globalization (2014) <http://globalization.kof.ethz.ch/>, retrieved 7.7.2016.

KOF (2016) KOF Index of Globalization (2015) <http://globalization.kof.ethz.ch/media/filer_public/2016/03/03/rankings_2016.pdf>, retrieved 7.7.2016.

Liikennejärjestelmä.fi (2016) Liikenteen yritystoiminta kansantaloudessa. <http://liikennejarjestelma.fi/talous-ja-tehokkuus/arvonlisa/>, retrieved 30.11.2016.

Lorentz Harri, Solakivi Tomi, Töyli Juuso, Ojala Lauri (2016) Trade credit dynamics during the phases of the business cycle – A value chain perspective, Supply Chain Management: An International Journal, Vol. 21 No. 3, 363-380.

Piecyk, M.I., McKinnon, A.C. (2010) Forecasting the carbon footprint of road freight transport in 2020, International Journal of Production Economics, Vol. 128 No. 1, 31-42.

Serdarasan, S. A review of supply chain complexity drivers, Computers & Industrial Engineering, Volume 66, Issue 3, November 2013, Pages 533-540

Social Progress Imperative (2015) Social Progress Index 2015. <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/About-Deloitte/gx-cr-social-progress-index-executive-summary-2015.pdf>, retrieved 8.7.2016.

Social Progress Imperative (2016) Social Progress Index 2016. <http://13i8vn49fibl3go3i12f59gh.wpengine.netdna-cdn.com/wp-content/uploads/2016/06/SPI-2016-Main-Report.pdf>, retrieved 8.7.2016.

Solakivi, T., Ojala, L., Laari, S., Lorentz, H., Töyli, J., Malmsten, J., Viherlehto, N. (2015) Finland State of Logistics 2014, Turku School of Economics Publications E-1: 2015

Statistics Finland (2009) Suomalaiset tytäryhtiöt ulkomailla maittain vuonna 2007 <http://www.stat.fi/til/stu/2007/stu_2007_2009-09-17_tau_001_fi.html>, retrieved 30.7.2016.

Statistics Finland (2010) Liitetable 1. Suomalaiset tytäryhtiöt ulkomailla alueittain vuonna 2008 <http://www.stat.fi/til/stu/2008/stu_2008_2010-09-13_tau_001_fi.html>, retrieved 30.6.2016.

Statistics Finland (2011) Liitetable 1. Suomalaiset tytäryhtiöt ulkomailla maaryhmittäin vuonna 2009 <http://www.stat.fi/til/stu/2009/stu_2009_2011-06-09_tau_001_fi.html>, retrieved 30.6.2016

Statistics Finland (2014a) Yritykset toimialoittain ja liikevaihdon suuruusluokittain vuonna 2007–2012 (TOL 2008) muuttujina Liikevaihdon suuruusluokka 1000, Toimiala, Vuosi ja Yritysten tiedot <http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__yri__syr__010_yr_tol08/050_syr_tau_105_fi.px/table/tableViewLayout1/?rxid=ab8963d6-4d45-438c-bcd3-58b1239e8d0f>, retrieved 15.7.2016.

Statistics Finland (2014b) Yritysten henkilöstö väheni ja liikevaihto kasvoi vuonna 2012 <http://www.stat.fi/til/syr/2012/syr_2012_2013-11-28_tie_001_fi.html>, retrieved 30.6.2016.

Statistics Finland (2015a) Yritysten tilinpäätöstiedot 2012–2014 <http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__yri__yrti/010_yrti_tau_101.px/table/tableViewLayout2/?rxid=ab8963d6-4d45-438c-bcd3-58b1239e8d0f>, retrieved 5.7.2016.

Statistics Finland (2015b) Yrityksen toimialoittain ja liikevaihdon suuruusluokittain, 2013-2014 <http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__yri__yrti/030_yrti_tau_103.px/table/tableViewLayout1/?rxid=edd8ede0-6a0a-4097-ae62-fdc5581e67f8>, retrieved 15.7.2016.

Statistics Finland (2016a) Huoltotase neljänneksittäin 1990N1- <http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__ntp__ntp_2/120_ntp_tau_102.px/?rxid=4738f947-3b2e-474c-a4b3-51983a186d6e>, retrieved 30.6.2016.

Statistics Finland (2016b) Bruttokansantuote kasvoi 0,4 prosenttia vuonna 2015 <https://stat.fi/til/ntp/2015/04/ntp_2015_04_2016-02-29_kat_001_fi.html>, retrieved 14.7.2016.

Statistics Finland (2016c) Tuonti, vienti ja kauppatase <http://Statistics Finland.fi/tup/suoluk/suoluk_kotimaankauppa.html#kauppatase>, retrieved 21.7.2016.

Statistics Finland (2016d) Suomalaiset tytäryhtiöt ulkomailla maaryhmittäin vuosina 2010-2014 <http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__yri__stu/010_stu_tau_101.px/table/tableViewLayout1/?rxid=9bb2b2f1-4eef-40c0-b5ab-585f2a1d0b61>, retrieved 30.6.2016.

Statistics Finland (2016e) Polttonesteiden kuluttajahinnat (sisältää alv:n) <http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__ene__ehi/040_ehi_tau_104_fi.px/sortedtable/tableViewSorted/?rxid=398167e0-5c82-458c-95f0-f51f1d834bc0>, retrieved 4.7.2016.

Statistics Finland (2016f) Tuotanto- ja tulonmuodostustilit 1975-2015 muuttujina Toimiala, Sektori, Taloustoimi, Tiedot ja Vuosi <http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/070_vtp_tau_071.px/table/tableViewLayout1/?rxid=0c8bf4b9-e58f-42bd-9b08-056a59232f02>, retrieved 7.9.2016.

Statistics Finland (2016g) Kuljetuspalveluiden ulkomaankaupan maksutase, Excel-tiedosto: kuljetus_alaerät_2006Q1-2015Q4.

Transparency International (2015) Corruption Perceptions Index 2015. <http://www.transparency.org/cpi2015>, retrieved 7.7.2016.

UN Comtrade (2016) <http://comtrade.un.org/data/>, retrieved 22.8.2016.

Wagner, S.M., Kemmerling, R. (2010) Handling nonresponse in logistics research, Journal of Business Logistics, Vol. 31, No. 2, pp. 257-381.

World Bank (2014) <http://lpi.worldbank.org/international>, retrieved 7.7.2016.

World Bank (2016) Global Rankings 2016 <http://lpi.worldbank.org/international>, retrieved 7.7.2016.

World Economic Forum (2014a) The Global Enabling Trade Report 2014. <http://www3.weforum.org/docs/WEF_GlobalEnablingTrade_Report_2014.pdf>, retrieved 8.7.2016.

World Economic Forum (2014b) The Global Competitiveness Report 2014-2015. <http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf>, retrieved 8.7.2016.

World Economic Forum (2015) The Global Competitiveness Report 2015-2016. <http://reports.weforum.org/global-competitiveness-report-2015-2016/competitiveness-rankings/>, retrieved 8.7.2016.

FINLAND STATE OF LOGISTICS 2016

Tomi Solakivi, Lauri Ojala, Sini Laari, Harri Lorentz,
Juuso Töyli, Jarmo Malmsten, Ninni Lehtinen, Elina Ojala

TURUN KAUPPAKORKEAKOULUN JULKAISUJA
SARJA E 1:2017

978-952-249-510-5
ISSN 2342-4796