Bilateral shipping and trade

Swedish-Finnish experiences in the post-war period

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Abstract

This thesis explores the bilateral shipping and trade between Finland and Sweden during the post-war period. It comprises five articles and one introductory chapter for which the common point of departure is the growth and transformation of bilateral trade and shipping. The first two articles analyse the structural change of bilateral trade from a national and regional perspective. The three following articles provide an overview and analysis of the ferry shipping. By integrating the perspective in these articles in the introductory chapter and by providing a long historical record, the change of economic relations between Finland and Sweden in the post-war period is discerned.

This thesis applies an economic historical approach and is founded on various fields of social science. The issue of trade is analysed within the framework of conventional and new trade theory, and the analysis of ferry shipping is governed by economic and geographic theories. The studies on trade shows that the transformation of production seen in Finland and Sweden meant that the trade increasingly became dependent on an exchange of products arising from matching industries. In turn the foreign trade arising from the Northern part of Finland and Sweden was still dominated by so called inter-industry trade. In addition to these results, the studies of ferry services shows that the growth of vehicles and passengers conveyance, together with the expanded onboard services, also intensified the commercial exchange. Due of the multi-output structure, the ferry service efficiently met the growing demand of travel and trade.

The main conclusion of this thesis is that the convergence of incomes and economic structure had a significant impact on bilateral trade and ferry shipping. In addition the process of economic integration, technological advances together with specific policies issued on shipping also contributed to strengthen the economic ties between Finland and Sweden.

Keywords: Economic history, convergence, economic integration, trade, intra-industrial trade, inter-industrial trade, shipping, ferry services, gravity equation, economies of scope, economies of scale, economies of density.
The work of this thesis commenced almost five years ago. Along the way it has been much of lonely hours and long days of reading, thinking and writing. The completion of a thesis is not however a sole man’s effort. Without the help, support and criticism of others, this thesis would not have been what it is today. Nevertheless, when it comes to remaining shortcomings, the normal disclaimer applies.

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Introduction

The post-war development of Swedish-Finnish shipping and trade provides the themes addressed in this dissertation. The study of bilateral shipping focuses on the growth and restructuring of passenger and cargo conveyance and the study on bilateral trade focuses on the scope and commodity structure of trade. This thesis is based on five articles, where three papers focus on shipping and the next two on trade. In addressing the specific issues of shipping and trade, this thesis applies an economic historical approach, where present changes are considered in a long-term perspective. In the following introductory chapter, the historical background and the linkages between shipping and trade are outlined.

The remainder of this chapter is organised as follows. Section 1 describes the common point of departure of this thesis. Section 2 provides the objective, the delimitations and the previous research. Section 3 outlines the historical chronology and the relation between shipping and trade. Section 4 summarises the papers.

1. Swedish-Finnish economic relations

Economic growth and convergence

Over the last two centuries, Finland and Sweden have advanced from being part of the European low-income periphery to industrialized countries in the top twenty of the income league. In this process of industrialisation, Finland and Sweden experienced a rapid growth of production and income. Although the income levels are approximately similar today, the development process was not uniform throughout the 19th and 20th centuries. The transition to a path of modern economic growth started earlier in Sweden than in Finland.

While Sweden took off in the period 1890 to 1910, the Finnish industrial breakthrough is located to the 1920s and 1930s. As seen in figure 1, a process of divergence took place between 1870 and 1920. The Finnish long-term economic growth was slower and the slump caused by the outbreak of the First World War and the Finnish Civil War was severe. After the war however, the Finnish manufacturing industry soon gathered strength and the rate of GDP per capita growth between 1922 and 1937

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was twice the rate before the First World War.\textsuperscript{2} Although the divergence came to a halt in the 1920s and 1930s, this process continued in the 1940s, when Finland suffered from the effects of the Second World War and from the heavy war reparations to the Soviet Union.\textsuperscript{3}

A long-term catch-up growth versus Sweden took place after the Second World War. Finland experienced a “super growth” period, well above the West European average, while Sweden went through a period of less than average growth.\textsuperscript{4}

**Figure 1. Relations between GDP per capita levels in Finland and Sweden in constant prices (indices 2001=100) 1860-2001.**

![Graph showing the relations between GDP per capita levels in Finland and Sweden in constant prices (indices 2001=100) 1860-2001.](source: Andersson and Krantz (2005)).

The latter is especially pertinent in the years between 1970 and 1990, when Sweden lost its top five position in the world income league. In Finland on the other hand, the strong economic performance meant that a rapid convergence between Finland and Sweden took place in the 1970s and continued thereafter as seen in figure 1.\textsuperscript{5}

Like the convergence of income levels, the growth rates for real value added in the industry sector was higher in Finland than in Sweden after the Second World War. Although the Finnish industry sector gathered strength in the 1920s, the small size of her industry sector meant that the differences in growth rates had a small impact initially. Due to the size of the industry sector, the differences between Sweden and Finland were significant in the 1930s. However, the development following the

\textsuperscript{2} Krantz (2001), pp. 23-66.
\textsuperscript{4} Maddison (2001), pp. 186-188.
\textsuperscript{5} Andersson and Krantz (2005).
The Second World War meant that the Finnish and Swedish size of the industry sectors became, relatively seen, increasingly similar.

An additional process was the convergence of economic structure between Finland and Sweden. This process of convergence in the manufacturing industrial sector on the industry branch level gathered strength in the 1930s, and later on in the post-war period when the differences between branches were reduced to a minimum. Today, the differences in the industry structure in Sweden and Finland are very small seen in a West European perspective.

The process of convergence, in income levels as well as in the economic structure, implies a growing similarity in the consumption and production structures. This development meant that the conditions and possibilities for Sweden and Finland’s commercial exchange changed. For this reason, the macroeconomic changes form the backbone of this dissertation.

**Economic integration**

In the second half of the 20th century, Finland and Sweden underwent a process of economic integration. In this process, the scope and structure of foreign trade, foreign direct investments and foreign shipping changed with the general economic progress and the overall liberalization of the international economy. The two small neutral states Sweden and Finland experienced, with both different and similar political and economic connections, a unique position in the cold war international system. Finland’s position was especially delicate in balancing its actions between East and West as the cold war started. Although the geopolitical situation obstructed the process, their connection to the economic integration process in Western Europe was crucial. The joining of the Nordic bloc, EFTA, EEA and EU thus shows the primacy of the western markets.

The economic integration meant a close co-operation between Sweden and Finland. This co-operation reached from governmental level to trade unions and industry associations. Aspirations for freer

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9 Van Ham (1993), p. 27, 32, 61, 68, 69, 70, 110, 111, 136, 194, 202 and 216
foreign trade and trade agreements together with common policies in other areas were rooted in the similarities in economic interests. In the NORDEK negotiations, the Finnish industry federation together with its Swedish counterpart worked actively in the expanding Nordic co-operation.\(^{13}\) The Finnish and Swedish export industries, dominated by large-sized companies, mainly in the branches of forestry, metal and engineering, were dependent on the international markets’ for their use of comparative advantages.\(^{14}\) In utilizing the relatively favourable domestic factor endowment, the overall industry production could expand in a way that was not possible in an autarchic economy.\(^{15}\) Due to small home markets and the growing similarity in industry structure, the common motives for freer international trade are easily understood.

However, the strong reasons for two small states with large-sized export industry enterprises to integrate with western markets are not equally obvious in a bilateral context. Why should two small economies, with large and thus growing similarities in factor endowment and industry structures, engage in intense bilateral trade? How can we explain a strong progress in the bilateral shipping as the other western markets went open and transport costs sank? In considering if the restructuring of the Finnish-Swedish economic interplay is an exceptional case, or a most expected consequence of the Nordic and European integration process, we first turn to the themes of shipping and trade.

**Shipping and trade**

From a historical perspective, the post-war development of bilateral trade changed the commercial relations with reference to earlier experiences. Considering only the size of bilateral trade *vis-à-vis* total foreign trade, we find a record of relatively limited exchange. In figures, the Finnish export to and import from the Swedish market in the period 1850 to 1950, with the exception of times of war and occasional fluctuations, accounted for on average six and a half per cent of the total foreign trade.\(^{16}\) In Sweden the proportion was smaller due to the larger economy and hence the value of exports. With that in mind, it is hard to understand why the share of Finnish trade with Sweden accounted for some 15 per cent of total foreign trade in the 1970s. Sweden became the second, and for a couple of years,
the most important foreign market for Finnish companies in a time of unprecedented global expansion of the world economy.17

In a process where the Finnish and Swedish companies intensified their activities on their neighbours’ markets, not only the amplitude but furthermore the content of trade changed. The structure of bilateral trade was transformed. This shift occurred a decade after the Second World War when the primary products emanating from the Finnish agriculture and forest industries developed more slowly than engineering and metal industries. As long as the primary products amounted to more than half of the Finnish export value, one could stress that Swedish industry had competitive advantages in capital-intensive production and thus in the technology applied.

Since the 1960s, however, the increase in manufactures relative to merchandise trade as a whole and the exchange of commodities belonging to the same industry led to a shift in bilateral trade specialisation. In contrast to the former pattern of specialisation between industries, the bilateral exchange turned towards matching or intra-industry trade. One can therefore conclude that both the scope and content of bilateral trade changed significantly after the Second World War.18

The process of commercial integration was pertinent not only to the manufacturing industry. The exchange of bilateral services gained a strong position in the 1960s and later. The latter was an integral part of international changes. The economic interdependence following the integration of world markets had far-reaching effects on shipping, aviation and financial services. Focusing on the shipping sector, the “new” era of political, economic and technological changes after the Second World War led to a restructuring of liner, bulk and special shipping services. New technology adopted in the loading systems, e.g. containerisation together with larger ships, lowered transport costs and integrated the linkages in the international transport system more closely. The latter is clearly seen in the ferry shipping operation with the adoption of the roll-on-roll-off (ro-ro) technique.19

By using this technique, the ferry industry could meet the demand for vehicles transport at sea. In the 1960s and later the joint conveyance of freight and passengers became a distinctive feature on European short-sea markets. Ferry services proved to be an efficient mode of maritime traffic for short distances, as the industry met a rapid changing demand for cargo and passenger conveyance respectively. The growth and the restructuring

of the business on the Åland Sea was part of changes occurring on other European short sea markets.20

From being a complement to liner shipping, engaged in small-scale passenger transport during summer, the Swedish-Finnish ferry industry turned into a capital-intensive part of tourism activities and utility transport respectively. In the segments of tourism and commuting travel, a considerable expansion took place on the Åland Sea and the Gulf of Bothnia, with an increase from less than one million passengers in 1960 to almost ten million in 1990.21 Moreover, as far as gross receipts are concerned, the ferry industry became the most decisive mode of maritime interaction between Finland and Sweden.

However, the developments of shipping and trade were not, equal from a regional perspective. The geographic context has had an impact on the scope and structure of shipping and trade. The production structures, the home markets and the natural resource abundance have affected the potential and the means of interaction. In the north, across the Gulf of Bothnia, the interplay of Finnish and Swedish activities has been different from that on the Åland Sea. Looking into the new features of the shipping sector, we find for instance that the ferry services developed in a business context different from that seen on the markets in the south.22 The conveyance of passengers was less intense on the Gulf of Bothnia and the scope of trade was smaller too.23 The commercial exchange between Finland and Sweden did not centre on the Gulf of Bothnia.

2. Aim and structure of the thesis

Objective

The overall objective of this thesis is to analyse the post-war development of trade and shipping between Finland and Sweden. The thesis aims to account for the growth and restructuring of bilateral ferry shipping on the one hand and the change of scope and commodity composition in bilateral trade on the other hand. In analysing these issues of shipping and trade, the national macroeconomic development, together with institutional and international economic settings, provide an overall framework. With a basis in this framework, the two issues addressed are analysed in five articles where theories, methods and data suitable for the specific cases

21 Paper no. 3, p. 3.
22 Paper no. 3, p. 6 and 7.
are employed. Although the foci of the papers differ, two major objectives encompass the specific aims and questions outlined in the articles.

- To study the growth and structural change in the trade between Finland and Sweden and conduct an analysis of the specialisation in inter-and intra-industry trade, from a bilateral and regional perspective.
- To give an overview of the change of the Finnish and Swedish shipping industry and account for the growth of the ferry industry, due to tourism and commuting travel, by analysing the characteristics of supply and demand.

The first objective assumes an analytical character, by dealing with empirical analysis governed by trade theories. One study focuses on the growth of intra-industry trade and examines the factors behind the changing structure of bilateral trade within the framework of New Trade Theory. The following study aims at examining the development of foreign, while only partly interregional trade, in the Bothnian region (defined as the counties of Västernorrland, Västerbotten and Vaasa) within the conventional Heckscher-Ohlin theory.

The second objective assumes an analytical and descriptive character by combining an outline of the performance of the ferry industry with empirical testing of determinants of passenger flows and the cost structure of the ferry industry. The analysis of the ferry industry is divided into three studies. The first paper outlines the industry and traffic development. The second paper analyses the economics underlying the ferry industry due to the presence of scale, scope and density economies. In the final paper the determinants of passenger traffic are tested through a gravity equation approach. The objective and scope of the empirical analyses conducted in the thesis are described and motivated within the basic methodological points of departure.

**Method and sources**

The analysis of empirical propositions conducted in the articles is primarily of a comparative character. By evaluating aspects of changes in the national macroeconomic development together with institutional and international economic settings, I was able not only to find similarities and differences between Finland and Sweden, but also and foremost, the crucial factors behind shipping and trade. The national perspective is combined with features of interaction across the Gulf of Bothnia. By studying national and regional aspects of shipping and trade, the crucial
factors behind these phenomena can be more fully analysed. The basis of the analysis of the two issues addressed is to examine the empirical propositions derived from the theories and methods applied.

The selected methodological perspective is primarily macroeconomic in character. The macroeconomic perspective is helpful for identifying relationships among segments of the economy, not at least important for examining the relations between the domestic macro economic changes on the one hand and the scope of shipping and structure of trade on the other.

Although the macroeconomic perspective can provide clues to understanding the interaction process, it must be noted that pure domestic economic indicators need to be considered in the context of institutional and international economic settings. The institutional perspective provides an important reference for the analysis of ferry services, even though this thesis is not primarily governed by institutional theory. International agreements and national restrictions on for instance alcoholic beverages are one crucial prerequisite for the development of ferry shipping. International economic integration, due to free trade areas and bilateral arrangements in the topic of trade, is furthermore considered. The economic integration is viewed with reference to macroeconomic characteristics in the analysis of trade.

The object of a macroeconomic approach, regarding institutional and international economic settings, is to outline important relationships and features among the issues addressed. In this framework, a micro-oriented study can account for specific relationships and characteristics of the phenomena examined in a more detailed way. In the fourth article a micro-oriented approach, illuminating changes and specific actions in the ferry industry is used. The microeconomic theory applied here seeks to explain the economic characteristics underlying the Baltic ferry industry due to economies of density, scale and scope. In that sense, the macroeconomic framework is thought to identify general functional relationships, while the micro-oriented study seeks to identify specific mechanisms prevailing in one industry.

The main sources of the studies consist of official statistical material, which covers the macro-level development of Sweden and Finland. From the point of view of data sources, the macro perspective is an advantage due to the availability and scope of official data, pertaining to national accounts, trade, industry and shipping and other related data sources. This data is gathered in accordance with similar practice. The official statistics in Finland and Sweden are rooted in a common tradition and the statistical authorities have furthermore maintained close co-operation. Therefore, the differences in the gathering and organization of data are not
insurmountable. The similarity of data is helpful in comparative studies as well as in research on economic interplay.

In addition to the macro-oriented studies, one micro-based study is accomplished. The micro-oriented study concerning the Baltic ferry industry is based on primary material. This primary material consists of financial statements, due to balance sheets and income statements. The necessity of gathering this primary data is motivated by the aim of revealing the economics underlying the Baltic ferry industry.

The languages employed in the official statistics are Swedish, Finnish and in part English. The languages employed in the source material are not a barrier to access. However, the Finnish language employed in the literature could be a barrier. To overcome this obstacle, close co-operation with Finnish scholars has been conducted in the work with this thesis.24

**Geographic area and time period**

The thesis focuses on the Finnish activities in Sweden and Swedish activities in Finland in the fields of shipping and trade. Both a national and a regional perspective are applied. One important reason for studying the national level is the availability and scope of empirical sources. The data employed is primarily structured from a national point of view.

However, the experience on the national level is not applicable to all parts of the country. The regional perspective is important for providing means of understanding the crucial factors affecting the interplay in the fields of trade and shipping. The production structure and the size of the market together with natural resource abundance are some of the crucial factors that distinguish the regional prerequisites from the national ones.

In looking more closely into the geographic context of Swedish-Finnish interaction, the shores of the Gulf of Bothnia, more precisely the Finnish county of Vaasa (Central Ostrobothnia, Ostrobothnia and Southern Ostrobothnia) and the Swedish counties of Västerbotten and Västernorrland have been considered. One reason is the long lasting history of contacts across the Gulf of Bothnia.25 Early remains and later documentation in sources are indications of a relationship which has lasted for centuries.26 From a contemporary perspective, the area constitutes one submarket for the Finnish-Swedish ferry industry and hence a transport infrastructure for interregional trade exchange. Based on

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24 The suggestions of Riitta Hjerppe, Juhana Aunesluoma, Susanna Fellman and Marjatta Rahikainen are gratefully appreciated.
historical motives and the contemporary features, the study of this area could help to reveal crucial factors affecting the commercial interplay. In this study these counties, together constituting what is here defined as the Bothnia region, are considered in the broader national context of economic interaction in the post-war period.27

The historical definition of the Bothnia region emanates from Olaus Magnus’s *Carta Marina*. This old definition encompasses the area along the coast of the Gulf of Bothnia, *Botnia occidentalis*, on the one hand, and the inland area *Lappia occidentalis* on the other.28 In line with this old definition, contemporary definitions of the region have included the Swedish counties of Norrbotten, Västerbotten and Västernorrland, and thus the Finnish counties of Oulu and Vaasa.29 In this study, the counties of Norrbotten and Oulu are not included. The main reason for this is the heterogeneity and the large size of such an area.30 The Bothnian region is administratively, not economically, defined. However, this region differs from the national experiences of shipping and trade. The presence of these differences can in turn provide a better understanding of Swedish-Finnish commercial connections.

The study encompasses primarily the period 1960 to 2000. The exact time span covered in the articles varies, however, due to the available sources and issues addressed. The empirical data on the issues of bilateral and regional trade has been available since 1961 and 1965. Earlier data is available, but is not sufficient for the empirical analysis employed. An additional argument for focusing on the period after the 1960s can be traced back to historical motives. The size and structure of bilateral trade changed rapidly after the Second World War with reference to the earlier experiences. In the case of ferry shipping, the motive is similar. The available data dates back to 1960 and the take-off in the industry took place between 1965 and 1973.

**Research overview**

Much of the previous research on Finnish-Swedish interaction has focused on migration. The movement of people across the Swedish and Finnish borders has been going on for centuries. This process reveals a pattern of social and societal integration reaching from Finnish peasant migration in

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27 Appendix 1.
29 See eg. Gidlund and Sörlin (1992); Wiberg, (1993); Edlund and Beckman (1994)
Since 1996 the County of Uleåborg is named as North Ostrobothnia and the county of Vaasa is separated into Central Ostrobothnia, Ostrobothnia and Southern Ostrobothnia.
30 See e.g., Wande (1996), pp. 229-254.
the seventeenth century to labour migration in the post-war period. The geographic, sociologic, ethnologic and demographic approach applied in this research has provided important clues to understanding the relationship between Finland and Sweden.\textsuperscript{31}

However, the history of commercial interplay is less known. The issues of shipping and trade are mostly an uncharged field of research, and there are a small number of studies on economic interaction. Most of the economic history and economic research on Swedish and Finnish issues have tended to take the shape of comparative research. The comparative research is decisive for understanding the countries’ economic history and a great benefit for the research on their economic interplay. In considering what impact the domestic institutional and economic settings have had on the shipping and trade, the comparative research is an indispensable secondary source of information.\textsuperscript{32}

In the field of commercial relations, only a few studies have dealt with the economic history of bilateral trade and shipping between Finland and Sweden. Focusing on the size and structure of bilateral trade, only one previous study has been performed. Gösta Mickwitz’s study in 1952 focused, among other things, on the Finnish trade imbalance with Sweden, which severely obstructed the bilateral exchange in the inter-war period.\textsuperscript{33} The approach was primarily descriptive, although a preliminary analysis of the trade imbalance and the causes of trade was conducted. One tentative conclusion put forward is of special interest for this thesis. Mickwitz argued, in accordance with the Heckscher-Ohlin theory, that Swedish comparative advantages in capital-intensive production and Finnish advantages in labour-intensive production caused the Swedish net export of engineering products and the Finnish net export of raw materials emanating from the food and forest sector. This indicates that a shift took place in the post-war period, as studies on intra-Nordic trade emphasise, in analogy with the New Trade Theory, the large scope of intra-industry trade in the present times.

While studies concerned with foreign direct investment and intra-Nordic trade have to some extent touched upon the issue of Finnish-Swedish trade, only a few studies on intra-Nordic trade have employed

\textsuperscript{31} Tarkiainen (1990); Tarkiainen (1993); Allardt (1996); Häggström, Borgegård, Rosengren (1990).
\textsuperscript{33} Mickwitz (1952).
empirical variables pertaining to trade theory. In 1987 Jan Otto Andersson examined three different types of connection among integration, similarity and intra-industry trade across the Nordic economies. This study provided support for the New Trade Theory suggesting that intra-industry trade (IIT) will be greater between countries subject to some kind of economic integration and/or subject to economic, social and cultural proximity.

Later, in 1996, Johan Torstensson approached the topic of intra-Nordic trade by examining the significance of technical differences in inter-industry trade, i.e. net trade between sub-industry groups. The empirical analysis supported the theoretical proposals implying that countries are net exporters in sub-industries where the labour productivity is high and where they have high R&D expenditures. Torstensson showed that the IIT share of Nordic trade was the highest between Finland and Sweden and that, with the exception of Sweden-Denmark, the scope of IIT is significantly lower in the intra-Nordic trade. In line with this result, the bilateral inter-industry trade flows were analysed by means of a combined Ricardo and Heckscher-Ohlin approach.

Although this study is not primarily concerned with the Finnish-Swedish trade, it is important from two perspectives. One is the unequal amplitude of IIT in intra-Nordic trade, suggesting that other factors than economic integration are crucial for the structure of trade. The other is that the bilateral trade structure is dependent of both technical differences in the case of inter-industry trade and factors conducive to IIT.

While the previous research contribute with clues of understanding the bilateral trade between Finland and Sweden in the inter-war period and in present time, the development during the post-war period is less known. The growth and structural change of bilateral trade have not been discerned and neither is the shift in specialisation, due to the phenomenon of IIT analysed over time. This is surprising given that the foundation of bilateral trade specialisation changed and that the bilateral trade currently makes a significant contribution to the Swedish and Finnish economy. This thesis therefore seeks to address this situation and provide with insights that might help to explain the current character of the bilateral trade.

The research conductive to the long-term development of bilateral shipping is limited to a small number of studies and the current issues

35 Andersson (1987), pp. 131-149.
pertinent to the ferry services have not been subject to much academic research. The previous research could nevertheless provide with important background information on the issues addressed in this thesis.

From an economic historical perspective, the mercantile system during the time when the countries were united under one government has gained some interest. Although most of this research is focused on the mercantile systems’ impact on economic development, a few notes on the Swedish-Finnish commercial relations are provided. In Yrjö Kaukiainen’s study of Finland’s peasant seafarers and Stockholm, the long-term bilateral shipping and trade from the seventeenth up until the mid-nineteenth century is described. This study stresses the primacy of the Swedish capital and the importance of Finnish firewood and food exports.37

The research on bilateral shipping in the twentieth century is primarily focused on the post-war period. The post-war studies provide important clues to understanding the restructuring of the shipping services in general and some bilateral characteristics in specific areas. However, this line of research has not dealt with the long-term development of the ferry industry and none of the studies have examined the determinants of passenger shipping. From a macro perspective, Thomas Milchert in 1970 and Christopher Schirach-Szmigel in 1979 studied the foundation of contemporary ferry service, i.e. ferries using the technique of ro-ro, and the connections to liner shipping and general cargo transport. Milchert focused on the technological improvement of the “new” generation of vessels. Schirach-Szmigel’s study concentrated on the changes of cargo transport. Both studies have contributed to a better understanding of the settings for contemporary ferry industry.38

In line with this research, Pekka Sörenssen employed a historical approach to the analysis of Ab Silja Rederiet, an affiliated company owned by one Swedish and two Finnish shipping companies. The study provides an analysis of the motives behind the funding of Ab Silja Rederiet and the introduction of car ferry services. Additional information is given on the organisation of the business and the linkages between different shipping companies during the period 1957 to 1971. The study shows that the growing demand of transport services and the competition from other companies, were strong motives for Slite, Bore and Effoa companies to establish Ab Silja Rederiet and to introduce car ferries.39

The organisation of the business and the modernisation of tonnage have in present time been studies by Gernot Tesch and Tony Peiseley. The

38 Schirach-Szmigel (1979); Milchert (1970).
actor-oriented approach applied in these studies is combined with an analysis of the general characteristics of the ferry market. One concept put forward is that of “produced traffic”, suggesting that passengers are attracted foremost by the supply of tax-free commodities and other services onboard.\textsuperscript{40} This notion is thought worthy, since the actors and business concepts are for this reason eager to meet not only the utility transport demand but also the demand for leisure and tourism travel. Operators have an opportunity to utilize the multi-output structure by means of a mixed price policy. For this reason, both supply and demand factors are important to consider in the analysis of passenger conveyance.

Although the previous literature has pointed out factors stimulating the growth of traffic, it is no clear empirical evidence on the importance of factors such as income, population and taxation. Neither is the economic characteristics underlying the business clearly discerned. The implications of the multi-output structure and the growing size of vessels on the cost structure are far from concluded in previous research. This is surprising given the research accomplished on related maritime sectors.\textsuperscript{41}

This thesis thus further contributes to the literature by shedding light on the development of Swedish-Finnish shipping and trade. By using an economic historical approach, it is possible to obtain insights on how national macro economic development together with international and institutional changes have had an impact of on the development of bilateral ferry shipping and trade between Finland and Sweden during the post-war period. Therefore, this historical analysis of the Swedish-Finnish economic interaction should appeal to academic researchers and other with wider jurisdictional and interest.

3. Bilateral shipping and trade: An historical overview

A few years after the Korean War and up until the first oil crisis in the 1970s, the growth and restructuring of bilateral trade and shipping thoroughly changed the economic interplay between Finland and Sweden. With reference to the experiences in the early post-war years, we find a most unexpected expansion of commercial activities since the late 1950s. However, without a long-run perspective we still cannot conclude that the post-war period is an exceptional case. To put the post-war development

\textsuperscript{40} Tesch (1999), pp. 3-38; Peiseley (1992), pp. 5-26.
in perspective and give a background to contemporary changes, the long-term history of bilateral shipping and trade is first considered.

From the peace in Fredrikshamn 1809 to the First World War

For centuries, the development of shipping and trade across the Baltic Sea and the Gulf of Bothnia, have implied strong economic ties between Finland and Sweden. During the centuries when Finland and Sweden were united under one government, close commercial connections came into existence, as Finnish peasant seafarers undertook intense trade with Stockholm. The city became an important commercial and political centre in the Baltic Sea area in the seventeenth century. In contrast, the Hanseatic League, which controlled most of the trade in the Baltic Sea and the North Sea in the Middle Ages, stagnated in the seventeenth century.42 Stockholm’s sphere of influence came to include the greater part of south-western Finland and the Gulf of Bothnia at that time. With the later Russian expansion across the Baltic States, peasants from Nyland also began to trade in Stockholm. Only the south-eastern parts of Finland remained in the sphere of Tallinn and later St. Petersburg. As far as available sources suggest, the bulk of Finnish peasants’ shipping centred on Stockholm in the seventh and eighteenth centuries.43 Although the Bothnian trade restrain44 was abolished and free trade was issued in 1765, most of the Finnish merchants kept close connections with the Stockholm traders and the commercial exchange with Stockholm was of a magnitude close to the whole foreign trade during the first decades of free trade.45

After the peace in Fredrikshamn (Hamina) on 17 September 1809, when Finland was conquered by Russia, the influence of the Swedish capital was still great. The bulk of Finnish peasants’ vessels sailed from the Åland islands, and the coastal provinces in south-western Finland.46 The records from the Gulf of Bothnia suggest that there was some trade with Stockholm together with commercial exchange between fishermen from Västerbotten and grain suppliers on the Finnish side.47 However, the local trade was small in comparison to that with Stockholm and the primacy of the Swedish capital remained in the early nineteenth century.

44 The Bothnian trade restrain implied that most of the Finnish towns and Swedish towns along the Gulf of Bothnia had to take their merchandise to Stockholm before entering foreign ports. The Finnish towns were issued foreign trade rights in 1765.
46 Kaukiainen (1971), p. 119 and 120.
The needs of the growing population and hence the high prices paid for foodstuffs in Stockholm had a great impact on trade and shipping in the Baltic Sea and the Gulf of Bothnia. As Stockholm also being a commercial centre of the Baltic Sea, the Finnish seafarers could buy foreign goods on favourable terms. Finland’s own towns were on the contrary so small that their requirements could be satisfied from their rural surroundings.48

Firewood and foodstuffs were the staple commodities of the Finnish exports. As suggested by the comprehensive records from the Degerby customhouse at the Åland Island, the quantity of firewood occupied most of the cargo space, while other commodities were a supplement. However, the export of firewood facilitated the total export, as these less bulky goods of foodstuffs and cloth could only fill a small number of ships. Although the Degerby customhouse represents the majority of Finnish peasant seafarers, the figures on firewood and fish seem to understate the country’s overall export to Sweden as urban ships was rarely cleared through it. The Finnish export to Stockholm in the middle of the nineteenth century was nevertheless important. According to earlier studies, the supply of firewood met well over half of the estimated consumption, and foodstuffs such as fish, meat, butter and hops satisfied approximately ten per cent of the per capita needs in Stockholm. Finnish peasants supplied a significant part of the need for firewood and foodstuffs in Stockholm.49

The separation of Finland and Sweden bore more heavily on imports. An imperial manifesto issued for Finland in 1812 obstructed imports from Sweden. Most ships returned practically empty except for salt and occasional imports of iron, dyestuffs, fabrics and luxury goods. Although smuggling of spirits, tobacco and sugar arose, it might be concluded that there was a favourable Finnish export surplus, as the official figures show imports at only ten per cent of exports. The imbalance of trade together with a commercial agreement between Sweden and Finland (Russia) in 1817 further complicated the trade relations.

The duties on trade increased gradually up until 1845 as they became assimilated by the standard duties. This meant a decrease of Finnish peasant seafarers. In addition to the tariff policy, the fluctuations in the Swedish prices and the downturns in the 1810s and 1820s influenced prices of foodstuff adversely. Improved farming in Sweden also reduced the demand for Finnish food. In turn, Finnish exports of sprats and firewood kept their position on the Stockholm market, even though grain

and meat were supplied from inland areas, and indeed until the transport revolution changed the old conditions of shipping and trade completely.⁵⁰

During the transport revolution, the traditional interrelation between shipping and trade was weakened. This division of trade and shipping implied that the ship owner left his stake in the ship’s cargoes. The impersonal connections replaced the old personal bonds as specialised shipping agents and broker took over the old trade houses and agents.⁵¹ In conjunction with the economic progression following the transition from an agrarian to an industrial society, the late nineteenth century development of Swedish-Finnish commercial relations diverged from the earlier conditions.

Moreover, the stagnation of Finnish peasants’ shipping and trade to Stockholm seen in the mid-nineteenth century bore heavily on the commercial exchange between Finland and Sweden. Judging from the conveyance of goods measured as number of trips, we find a drop from 1047 to 140 in the period 1814 to 1853.⁵² As these trips only cover peasant seafarers, the significance of merchant shipping is unfortunately omitted. For this reason, the size of bilateral exchange is difficult to measure in the first half of the nineteenth century without time-consuming archival research, which is outside the range of this thesis. From 1850 onwards, however, the Swedish-Finnish trade and shipping is shown by Swedish official statistics. As for the figure on merchant shipping exchange, the trade relations were not closed as suggested by the data on peasant seafarers. Much on the contrary, the commercial exchange seems to have improved according to the Swedish figures. In the year 1854, no less than 2567 Finnish ships and 398 Swedish ships (with cargo) entered and cleared in Swedish ports. In the following years, the number of trips declined, while the quantity and value of the cargo slowly increased.⁵³ Clearly, a shift in bilateral shipping took place in the mid-nineteenth century.

Finnish companies successfully carried out the shift from peasants’ to merchants’ shipping on the Swedish-Finnish routes. The Finnish merchant navy dominated the conveyance of bilateral trade in the mid-nineteenth century. As the Finnish peasant seafarers turned their interest towards the growing domestic market and emerging cities in the Baltic States, the Finnish merchant navy took a large share of the Swedish-Finnish market. In the 1850s, the Finnish merchant seafarers held a

⁵³ BISOS, part F, 1858-1870.
market share of eighty to ninety per cent of the total bilateral trade.\textsuperscript{54} This domination of Finnish shipping companies furthermore continued up until the beginning of the twentieth century, as their market share still reached on average sixty per cent from 1911 to 1913, measured as tonnage volume.\textsuperscript{55}

As the conveyance of goods underwent a slow growth in the second half of the nineteenth century, the size of trade also increased. The commercial connections that developed at the time, in conjunction with the most unprecedented foreign trade expansion in both countries, changed the earlier conditions of peasants’ shipping and trade. The growth of foreign trade in Finland and Sweden and the integration with Western markets are clearly seen in the export figures of both countries. As for the Swedish foreign trade, the export to GDP ratio rose steadily in the second half of the nineteenth century. In the period 1860 to 1880, this ratio in current prices increased from ten to seventeen per cent, and later in the 1890s this trend culminated at twenty per cent. Similarly to the development in Sweden, the Finnish export gathered strength up until the First World War. During the period 1860 to 1880 the Finnish export ratio increased from nine to twenty-four per cent and after a decline in the 1890s, the figures turned upward and reached twenty-five per cent in 1913. As to the export performance, a close similarity is found, although the size of the Finnish commercial exchange with foreign markets was larger at the beginning of the twentieth century.\textsuperscript{56}

The use of export to GDP ratio could however bias the analysis of the total foreign trade, as the importance of imports is left outside. In measuring the trade surplus or deficit, we find a distinctive difference between Finland and Sweden. Despite the rapid expansion of exports, Finland had a long-term foreign trade deficit in the nineteenth century.\textsuperscript{57} On the Swedish side, we find on the contrary a much smaller trade imbalance. Although the imports tended to surpass exports, large foreign trade deficits were limited to the long depression (1873 to 1896) and to the beginning of the twentieth century. Later in the twentieth century, however, the foreign trade imbalance was limited to certain years.\textsuperscript{58}

The rapid growth of foreign trade is equally seen in the bilateral trade figures, as the commercial exchange between Finland and Sweden kept pace with the overall expansion on foreign markets. On the Swedish side, the export and import to and from Finland developed in much the same

\textsuperscript{54} BISOS, part F, 1858, 1859, 1860. \\
\textsuperscript{55} SOS, Shipping, 1911 and 1912. \\
\textsuperscript{56} Krantz and Andersson (2005). \\
\textsuperscript{57} Suomen taloushistoria vol. 3, pp. 232-241. \\
The bilateral trade share is almost equal in the mid-nineteenth century as in the years before the First World War. In line with the Swedish figures we should expect a similar trajectory in the Finnish trade accounts. Although we find a similar movement on the markets up until the 1890s, the Finnish export and import to and from Sweden declined relative to other foreign markets at the turn of the century. This stagnation meant that the bilateral share of foreign trade went down with the unpredicted expansion of other Finnish international commercial activities in the early twentieth century. As the growth of Swedish foreign trade was slower, we find a difference in the slope of bilateral trade shares in Finland vis-à-vis Sweden at the turn of the century. In figure 2, the bilateral trade shares are shown.

Figure 2. Bilateral trade (export and import) between Finland (solid line) and Sweden (dotted line) in percentage of total foreign trade, current prices, 1851-2000.

*Note:* The First World War years (1914-1918) and the Second World War years (1939-1945) are left out. The Swedish-Finnish trade shares were extraordinary high during the years of war due to the obstruction of ordinary peacetime trade routes.


From the time of the long depression, i.e. from the 1870s to the 1890s, and up until the First World War, the Finnish traditional staple export was still rooted in foodstuffs and forest products. The official Swedish statistical records on this issue support the view that the Finnish farming sector exported large quantities of butter, meat and fish to the growing Swedish market. In contrast to what seems predominant around the Degerby customhouse in the mid-nineteenth century mentioned earlier, the export
of foodstuffs exceeded that of firewood in the period 1872 and 1880. In measuring the value of export, we find in these years a sixty per cent share of foodstuffs, while the firewood together with timber takes only five to ten per cent of the total export.\textsuperscript{59} The figures from Degerby and the Swedish official statistics are, however, not easily comparable as the former are based on quantities. The quantities are moreover measured in a mix of weight and volume.

In the trade records from 1872 and onwards, the contents of trade are easily accounted for by value. On a closer look into these latter records, we find one distinctive shift. In the late nineteenth century, the Finnish firewood and foodstuff exports stagnated, on the one hand, while timber exports expanded, on the other. From the figures on timber exports for the period 1880 to 1910, it follows that an expansion took place. The timber share increased from two per cent in 1880 to sixty per cent of total export value in 1910. At the same time, the export of foodstuffs (fish, butter, grain and meat) declined from sixty per cent to eight per cent. In the years before the First World War, Finland became the most significant timber supplier on the Swedish market.\textsuperscript{60}

Commodities pertaining to iron, steel and metal works such as machinery and equipment dominated the Swedish export to Finland in the period 1870 to 1910. The supply of iron and steel was in the forefront in the beginning of this period. However, the subsequent development meant that products emanating from the Swedish engineering industry exceeded the metal industry supply. The export of machinery and equipment gathered strength already in the 1880s and reached a thirty-five per cent share of the total export at the turn of the century.\textsuperscript{61} Accordingly, the Swedish export industry had a strong position in supplying commodities from the metal and engineering industries.\textsuperscript{62} With that in mind, the content of the Swedish export in the early 20\textsuperscript{th} century pinpoints a distinctive specialisation of the bilateral trade as the staple of Finnish exports origin from other industries.

The bilateral structure of trade was largely divided among industries. These industries had in turn large differences in capital and labour intensity as well as in productivity. Given the structure of trade and the characteristics of the export industries, it is most presumable that the advantages prevailing in the structure of bilateral trade were rooted in the countries’ differences due to capital/labour ratios and/or in the technology applied. This presence of comparative advantages is furthermore

\begin{itemize}
\item \textsuperscript{59} BISOS, part F 1872 and 1880.
\item \textsuperscript{60} BISOS, part F 1880, 1890, 1900 and 1910.
\item \textsuperscript{61} BISOS, part F 1880, 1890, 1900 and 1910.
\item \textsuperscript{62} Kuuse (1977), p. 33.
\end{itemize}
plausible, as the transition to a development path of modern economic growth started earlier in Sweden. The industrialisation process commenced later in Finland as seen by the large gap in per capita income shown in figure 1.63 With the development of an internationally competitive engineering industry together with higher income, Sweden had a comparative advantage due to capital abundance and/or the technology applied. In Finland the lower labour costs together with less exhausted forest resources, paved the way for exports to Sweden.

From the First World War to the Second World War: The continuity of the pre-1914 structure of shipping and trade

The First World War had a great impact on the bilateral relations. Finland and Sweden undertook intense commercial exchange when the international peacetime economic relations broke down. The war and its aftermath had in turn a less significant impact on the inter-war bilateral relations. After the normalisation, the size of the bilateral trade returned to the pre-war level. Although Finland’s trade with Sweden was large relative to other markets in 1920, one should note that the volume of this trade was close to the figures in 1913.64 Accordingly, the First World War had a small impact on the structure of bilateral trade in the inter-war period.

In considering the amplitude of bilateral trade in the inter-war period one should note that the Swedish and Finnish foreign trade development followed different trajectories. The decline of international trade after the First World War bore heavily on the Swedish foreign trade. In the phase of disintegration following the First World War, the Swedish export ratio declined substantially. In figures, the ratio fluctuated between fifteen and twenty per cent. The Swedish experience was in contrast to the Finnish inter-war development much of a watershed between the pre-1914 period and the post-1945 period.65

The decline of world trade had a less significant impact on the Finnish export. The commercial connections were soon restored after the war and the normalisation. The trajectory of this development, i.e. as export to GDP, was similar to that in the years before the First World War. The export ratio reached a twenty-five per cent share for most of the inter-war period. This strong export performance was however obstructed

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63 See also Lindmark and Wikström (2003), p. 67.
64 Mickwitz (1952), p. 31.
65 Krantz and Andersson (2005).
by the difficult trade conditions during the great depression and in the late 1930s.\textsuperscript{66}

However, the importance of Swedish-Finnish trade, relative to the countries’ total foreign trade, did not undergo substantial shifts in the inter-war period. As seen in figure 2, at page 17, the Finnish trade on Sweden had advantages in the early 1920s, but then it soon went back to the pre-war level. The Swedish trade with Finland seems equally important in this period as in the pre-1914 period. The export and import figures underlying the bilateral trade shares reveal, however, a clear difference with reference to the pre-1914 experiences. The bilateral trade was highly imbalanced. The Swedish export to the Finnish market expanded continuously while the Finnish export to Sweden stagnated. Although this imbalance emerged as early as the late nineteenth century, the development during the inter-war period was more adverse\textsuperscript{67}

The trajectory of Swedish import was highly influenced by the booms and bust on the Finnish market. Even though the import volumes fluctuated over the years, the tendency is unambiguous. The supply of Swedish products in Finland, measured in volume, expanded continuously, although from a low initial level, by on average six per cent per year during the period 1920 to 1938. In contrast to this growth, the Finnish export to Sweden developed much more slowly. In the years after the war, the export to the Swedish market stagnated. Despite the fact that the Finnish export recovered somewhat after the great depression, the volume in 1938 was smaller than in 1920, and decreased by 0.2 per cent per year. In conclusion, the bilateral trade turned out to be highly imbalanced since Sweden had a clear advantage in export performance.\textsuperscript{68}

Although the basis of this commercial exchange was rooted in the pre-1914 commodity structure, the bilateral trade turned into a somewhat more diversified structure in the inter-war period. The staple commodities of the Finnish exports were forest products and foodstuffs. In the early 1920s the forest industry accounted for no less than half of the export value. The export of timber was important while paper only accounted for a minor part. However, the stronghold of the forest industry came to an end in the late 1920s. Forest products declined as the earlier fifty per cent share went down to thirty per cent at the end of the 1930s. In contrast to the stagnation of forest exports, the supply of Finnish foodstuffs on the Swedish market had a revival during the inter-war period. As noted in the previous chapter, the export of foodstuffs had an eight per cent share of the total export value in 1910. In 1920 this figure was doubled and later in

\textsuperscript{66} Krantz and Andersson (2005).
\textsuperscript{68} Mickwitz (1952), pp. 97-98 and 162-164.
the 1920s and 1930s, the share balanced at thirty per cent. Although the staple export goods were similar to those in the pre-1914 period, the structure of trade diversified with the growth of machinery and equipment together with textiles in the 1930s.69

Products from the metal and the engineering industries were the staple commodities of the Swedish export to Finland. This export feature originated from the growth of engineering exports in the late nineteenth century. During the inter-war period, this industry held a forty per cent share of the total Swedish export to Finland. Vehicles, electronic devices and machinery were the bulk of this export. In addition, the metal industry became the second most significant exporter, due to the supply of crude materials. The export of crude iron and steel represented on average ten per cent of the total export value and other metal products were equally important. With a share of almost sixty per cent of the export value, the engineering and metal industries clearly supplied most of the export to Finland.70

In the analysis of the bilateral export structure, the economist Gösta Mickwitz summarized the causes of the Swedish export structure in two points. The first one, which could be divided into two, was geographic circumstances. The nature of the geography had an impact, since the Swedish industry developed machinery and equipment suited for Swedish and accordingly for Finnish conditions. We find for instance that Swedish ships were built for cold weather conditions and the same is true of hydroelectric establishments and equipment. The geographic circumstances also seem important due to the short and often time and cost efficient transport across the water between Finland and Sweden. The short trips made purchase of capital goods more convenient due to machinery and industry equipment, and thus, the shipments were made easier too. The second point stressed by Mickwitz concerns the demand side, the need for Swedish capital goods in Finland. The Finnish metal industry was lagging behind and hence needed machinery and equipment to develop. The output of this industry gathered strength in the inter-war period, and as a result the demand for the most recent forms of capital goods from the Swedish metal industry increased.71

The circumstances underlying the structure of the Finnish export to Sweden is not fully analysed in Mickwitz’ study, although some notes are offered on the development of significant commodities. In this analysis, the stagnation of timber and the slow growth of foodstuffs are analysed. As for the timber export, one should note the development of the Finnish

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71 Mickwitz (1952), pp. 133-140.
sawmill industry. This industry expanded in the inter-war period and therefore needed a significant supply of timber. In turn, the Finnish saw and pulp mills exported sawn timber and paper products to the other West European markets. Bearing in mind the export of foodstuffs, one should note that, although the pre-war figures were exceeded, the growth of the export was slow during the inter-war period. In accounting for this slow growth, Mickwitz argued that the Swedish import restrictions together with self-sufficient ambitions moderated the Finnish export. However, the “new” content of trade, involving the metal and engineering industries, was not taken into account but considered a growing segment for future exports from Finland.²²

Following the specific circumstances that characterised the countries’ exports, Mickwitz analysed the bilateral structure with arguments embedded in the Heckscher-Ohlin theory.²³ The comparative advantages stressed were seen as a result of the differences in the countries’ capital/labour ratio. The main reason for this difference was considered to be modernisation. The industrialisation process started earlier in Sweden and, as seen in figure 1, at page 2, there was a large gap in GDP per capita income. The income level was higher and the capital assets embedded in the industry sector were larger in Sweden than in Finland. Due to lower labour costs, Finland could, on the other hand, effectively export labour intensive products. With support from the Heckscher-Ohlin theory, decisively improved nineteen years before Mickwitz’ completion of his thesis, the Finnish comparative advantages in labour intensive production vis-à-vis Sweden were emphasised. This conclusion is supported by the fact that Finland exported foodstuffs, textiles and timber, which were produced by labour intensive methods at the time. The Swedish relative capital abundance was shown by the net export of machinery, vehicles, ships and industry equipment.²⁴

These comparative advantages revealed that the structure of trade in the inter-war period still was deeply rooted in the pre-1914 conditions. Although a diversification of Finnish export took place with the supply of products from the metal and engineering industries, the size of this trade was small. Judging from the bilateral trade volume, the commercial connections were stronger, although imbalanced, in the late 1930s than before the First World War.

Due to the change of bilateral trade, we should also expect an increase in the demand for shipping services. The conveyance of export

²³ Ohlin developed the international trade theory introduced by Heckscher in 1919 in his study of Interregional and international trade. Ohlin (1933).
²⁴ Mickwitz (1952), pp. 213-220.
and import commodities needed an additional input of transport services. However, seen from a shipping perspective, the bilateral trade routes became less important with the expansion on the North Sea. In the Finnish case, the transition from sail to steam paved the way for an expanding trade on the North Sea trade routes.\textsuperscript{75}

Since the mid-nineteenth century, the transformation of the merchant navy in Finland and Sweden, had paved the way for bilateral and international trade. As a part of the international development from windjammers to steam and motor vessels, the navy of the two countries had experienced a process of rapid technological development. While the tradition of windjammers lived long in Finland, the Swedish merchant navy utilized the improvements of steam and motor engines together with steel hulls in the second half of the nineteenth century. In the period 1890 to 1910, this tonnage expanded rapidly, while the sail vessels were reduced to only a small share.\textsuperscript{76} It is apparent that the structural change was slower in Finland. Whereas the tonnage of windjammers included ten per cent of the Swedish merchant navy in 1925, the majority of vessels, or sixty-six per cent of the net tonnage still consisted of sail vessels in Finland. However, the technical transition was rapid in the inter-war period and at the end of the 1930s, the windjammer tonnage had been almost discarded. New vessels together with second-hand tonnage were obtained in the technical transition of the Finnish merchant fleet.\textsuperscript{77}

In the inter-war period, the Finnish merchant navy was chiefly employed in the conveyance of the country’s foreign trade. The growth of the market generated a four-fold increase in income, and as prices were slightly higher in the early 1920s than in the late 1930s, the real growth was actually higher.\textsuperscript{78} Among the different trades, the English generated the bulk of incomes. Compared to the Baltic trade, the North Sea shipping increased faster. Measured in gross income, the coastal traffic to Sweden and the Baltic states played a lesser role than previously. In 1913, the Baltic Sea traffic accounted for fourteen per cent of all incomes, while in the 1920s this share was reduced to less than ten percent. In addition, the passenger traffic played a role in this stagnation. Traffic to Sweden suffered from the total cessation of Russian travel after the Bolshevik Revolution. The Finnish-Swedish market dropped from about 40,000 passengers just before the war to 20-24,000 in the early 1920s.\textsuperscript{79} In turn,

\textsuperscript{75} Kaukiainen (1993), p. 114 and 141.
\textsuperscript{76} Larsson (2000), p. 25.
\textsuperscript{77} Kaukiainen (1993), p. 138 and 139.
\textsuperscript{78} The impressive growth figures were due in part to the effect of the low initial level. The First World War severely reduced the pre-war tonnage in Finland.
\textsuperscript{79} Kaukiainen (1993), pp. 140-144.
this Åland passenger market grew rapidly in the years following the great depression in the early 1930s. Due to the growth of the market, the Swedish-Finnish consortium *de samseglande* had a heyday in their passenger traffic across the North Baltic waters.\(^{80}\) Their conveyance of passengers between Sweden and Finland expanded from 25,000 in 1933 to no fewer than 60,000 in 1939.\(^{81}\)

While the number of passengers increased in the near-sea shipping conveyed by ferry lines, the cargo volume developed more slowly. The growth of ferry services did not affect the market of conventional shipping in the Baltic Sea very much.\(^{82}\) Nor did the development of ferry shipping change the distribution of Finnish and Swedish shipping incomes.\(^{83}\) As for the commercial exchange, the development of the merchant navy produced increasing foreign shipping gross receipts. In turn, the Baltic area and the Finnish-Swedish routes became less important, as suggested by the distribution of the Finnish shipping income. Also on the Swedish side, the routes to Finland contributed less, as seen in table 1.

### Table 1. Bilateral trade distributed by the nationality of tonnage 1856-1958 in per cent.

<table>
<thead>
<tr>
<th>Year</th>
<th>Swedish</th>
<th>Finnish</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1856/58</td>
<td>17,3</td>
<td>81,7</td>
<td>1,0</td>
</tr>
<tr>
<td>1911/13</td>
<td>24,4</td>
<td>60,6</td>
<td>15,0</td>
</tr>
<tr>
<td>1921/23</td>
<td>39,7</td>
<td>30,6</td>
<td>29,8</td>
</tr>
<tr>
<td>1936/38</td>
<td>37,9</td>
<td>37,5</td>
<td>24,6</td>
</tr>
<tr>
<td>1951/53</td>
<td>30,2</td>
<td>44,0</td>
<td>25,8</td>
</tr>
<tr>
<td>1956/58</td>
<td>26,4</td>
<td>32,4</td>
<td>41,2</td>
</tr>
</tbody>
</table>

*Note:* The tonnage is measured in tons gross, except for the years 1856/58 where an earlier volume measure, “läster”, is employed.


The gross receipts of Swedish shipping to and from Finland relative to other markets accounted for eight per cent in 1913 but only one per cent in the mid-1920s and yet five per cent in the late 1930s.\(^{84}\) From a shipping perspective, one can conclude that the bilateral commercial exchange declined relative to other markets in the 1920s and 1930s.

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\(^{80}\) The Consortium comprised the following companies: *Finska ångfartygs Ab (Effoa), Stockholms rederiaktiebolag Svea (Svea AB)* and *Ångfartygs Ab Bore (Bore Line AB).*

\(^{81}\) Sörensen (1979), pp. 23-27.

\(^{82}\) Schirach-Szmigel (1979), pp. 50-53.

\(^{83}\) Kaukiainen (1993), pp. 140-144.

\(^{84}\) SOS Shipping 1913, 1920, 1925, 1935 and 1938.
Moreover, the conveyance of bilateral trade was not solely a Swedish and Finnish affair. Foreign shipping companies carried an increasing part of the trade. As Swedish shipping companies took a larger part of this market together with other nationalities, the domination of Finnish tonnage came to a halt in the inter-war period. After the Second World War, foreign companies gained a larger share of the trade routes between Finland and Sweden.

The growth and restructuring of bilateral shipping and trade

With the outbreak of the Second World War, Finland and Sweden entered into intensive bilateral commercial exchange. Due to the closedown of peacetime trade routes, foreign trade was reduced to a minimum. The bilateral trade was one mean to overcome this deficit. In conveying bilateral trade, the Finnish and Swedish merchant navies played a crucial role. The merchant navy was however, compared to most other industries, in a highly exposed position. The warfare had a momentous impact on the tonnage development. Finland suffered from great losses. Due to the war and the war reparations to the Soviet Union, only forty per cent of the pre-war tonnage remained. Moreover, the technical standard deteriorated, which meant a great difference from the conditions in Sweden. By proper maintenance during the war, the Swedish tonnage losses were compensated and the merchant fleet was modernized by a transition from steam to motor vessels.

The difficulties in the shipping sector were, however, only one striking example of how the war and its aftermath affected the economic development in Finland and Sweden. Seen in a general economic perspective, the Finnish economy was highly influenced by the warfare. Both direct and indirect losses hampered the function of the economy. These economic difficulties are clearly seen in the growth of GDP per capita. In comparison with Sweden, the Finnish economy developed more slowly, as seen in figure 1 at page 2. The inequality in per capita income increased dramatically during the 1940s. Finland was in great need of normalizing the economy and thus to rebuild the damages of the war.

However, the Finnish foreign trade soon gathered strength with the expansion on foreign markets. By utilizing the comparative advantages in the forest industry and to some extent in the metal industry, the export to

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87 Karlsson (2003), pp. 165-182.
GDP ratio increased rapidly. Due to favourable export prices, the great need for imports was met by export of forest products. Up until the mid-1950s, the contribution of forest exports owed much to the rebuilding of the metal and engineering industries. Machinery, equipment and raw material were in short supply and import of these essential commodities was a necessity. However, the import was not solely a part of the normalisation phase. The import structure was partly a consequence of the war reparations. As the Soviet Union demanded capital goods such as tonnage, machinery and thus industry equipment in large quantities, an additional transformation pressure was put on the Finnish economy. The import of basic industry products together with a rapid structural change was needed to pay the war reparations. Accordingly, the metal and engineering industries became an increasingly important part of the manufacturing sector.

The unique circumstances that followed the war had a strong impact on the trade between Finland and Sweden. After the war, Finland exported large quantities of forest-based products, while Sweden exported machinery, equipment and crude metals to Finland. The needs caused by the war reparations led furthermore to Swedish-Finnish negotiations, which resulted in important exports from Sweden. Although the trade relations soon normalised after the war, the Finnish export remained one-sided. The export of forest products took a dominating part and despite the favourable export prices of forest products, the Finnish export could not match the import from Sweden. Up until the late 1950s, the inter-war structure of trade once again characterised the bilateral trade.

The inter-war structure of shipping services was to some extent characteristic of the Swedish-Finnish shipping activities following the Second World War. Despite heavy tonnage losses, the Finnish merchant navy could successfully capture a large share of the trade routes to and from Sweden. After the war, no less than forty per cent of this market was held by the Finnish merchant navy, while the Swedish share stagnated compared to the inter-war years. However, during the 1950s the expansion on the West European market turned the Finnish interest temporarily away from the North Baltic trade route. As a result, the Finnish shipping income from this trade was reduced to only a small share in the mid-1950s. As the tonnage losses were replenished by second-hand ships purchased from abroad, the pre-war level was reached in 1952. Like the geographic structure of the foreign trade, the merchant navy was mainly employed on the North Sea, Southern Baltic and the Atlantic waters respectively. The

Export and import on the North Baltic market accounted for only six per cent of the Finnish gross receipts of shipping in 1955. In Sweden, this share accounted for three per cent.

A few years after the Korean War and up until the first oil crisis in the 1970s, the growth and change of bilateral shipping and trade transformed the commercial connections. From both a Finnish and a Swedish perspective, the structure of foreign trade and transport changed so that the Baltic Sea gained in importance. In Finland, the shipping income from the North Baltic trade increased from six to eighteen per cent in the period 1955 to 1965 and then to twenty-four per cent in 1975. In total, the Baltic market accounted for half the Finnish shipping income in 1975. In Sweden, the development of shipping on the Baltic Sea gathered strength in the 1970s. From a small proportion of one per cent of total gross receipts, the conveyance between Finland and Sweden accounted for four percent in the 1970s and over ten per cent in the late 1980s. In this process, the tonnage development and thus the technical progress were important parts. The liner shipping services and as a part of these, the ferry shipping, specifically reflects the change in the technology and the geographic distribution of shipping. This growth on the North Baltic market was fuelled by the increasing importance of long-distance truck transport and the integration of sea and land transport.

The era of political and economic changes in the 1960s led to a transformation of the liner shipping on short-sea markets. In this process, the development of road transport was nonetheless important. Growing competition from long distance transport on trucks put pressure on the modes of conveyance at sea. The demand put on a common carrier changed with the superiority of the wheel for general cargo transport. Due to the change of land transport, the general movement of cargo changed from a flow of non-homogenous units to a fairly homogenous flow with the truck as the basic unit. The need to effectively meet this changing structure of general cargo handling at sea meant that the ro-ro technology and the organisation of the liner shipping service were mostly applied. In utilizing the technology, the ferry industry turned into a convenient mode for truck conveyance at sea. This requires limited port equipment for cargo handling. Accordingly, the organisation of shipping, and the

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94 SOS; Shipping 1955.
95 SOS; Shipping 1950-1987.
96 Schirach-Szmigel (1979), pp. 50-51.
demands caused by common carriers for passengers, cars and goods transformed the characteristics of general cargo handling.  

In utilizing the trade routes across the Baltic Sea and the Gulf of Bothnia, one obvious prerequisite was the size of this market. As for the time since the 1960s, we find that the most prominent feature has been the growth of bilateral trade volumes. For the period 1960 to 2000, the average growth rate was six per cent per year. In relative terms, we find in the period 1955 to 1975 that the bilateral share of foreign trade in Finland increased from 5 per cent to some 15 per cent. This process was concomitant with the structural change of foreign trade. The change of the inter-war structure of bilateral trade involved a shift from bulky exports of wood and metals towards products emanating from the engineering industry. This shift in commodity composition led to a dramatic change in the specialisation of bilateral trade, to particular products emanating from the same industry. This growth of matching trade and bilateral trade changed the demand for transport.

Figure 3. The bilateral trade volume in total (solid line) and by ferries (dotted line) in million tons, 1960-2000.

![Figure 3](image)


The mode of transport of general cargo met crucial problems related to the geographic prerequisites. Due to long distances, water barriers and the need for flexibility in cargo handling, the ferry industry soon established itself as a decisive part of the Nordic transport sector. In conveying the increasing volume of truck cargo, the traditional carriers

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met intense competition from the ferry services. This shift on the transport market is clearly seen in the growth of ferry conveyance. Figure 3 shows the volume of bilateral trade and the volume carried by ferries.

As a part of the Swedish-Finnish trade, the conveyance by ferries emerged after 1960. Seen as the share of this market, trade conveyance by ferries expanded from a small proportion of two per cent in 1960 to thirty per cent in the mid-1970s. The trade conveyed by the ferries culminated with a forty per cent share in the mid-1990s, and since then the division of the market has been fairly stable, as the conveyance of trade on ferries has kept pace with the growth in the bilateral trade volume. In addition to ferry shipping, the truck transport across the land border accounted for ten per cent up until the mid-1980s and later this share seems to have decreased somewhat with expanding ferry conveyance.101

Still, traditional carriers chiefly convey the bilateral trade volume. The tramp and liner shipping services convey approximately 50 per cent of the bilateral trade volume at present. Although the conveyance of trade by ferries has expanded, the traditional carriers have remained the most important method for conveying the bilateral trade.102 The rapid technological transition of cargo handling, seen in the general development of the container system, planning and organization of the business together with the growth in ship size, has reasonably secured the position of bulk and liner carriers on Swedish-Finnish routes. The demand for bulk shipping is also reasonably strong, since the volume of bulk products, emanating chiefly from the wood, paper and chemical industries, is larger than what the value shares suggests.103

The transport costs have fallen. The introduction of car ferries with ro-ro technique, incurred a reduction of approximately fifty per cent or more in handling costs.104 Due to the convenient loading procedure, also time for entering and clearing shrank to a minimum. The technical transition was not however limited to ro-ro technique. The liner shipping services underwent the so-called container revolution in the 1960s. This process not only lowered handling cost but moreover the time for entering and clearing ports. One can conclude that the technical transition in the shipping services due to larger ships and advances in technique and organisation incurred lower transport costs.105 Since it obviously was not only pertaining to the bilateral trade routes, the impact on the geographical

104 Schirach-Szmigel (1973), 84.
105 Stopford (1997), pp. 4-6 and 340-341.
structure of trade is yet difficult to discern. Transport costs are difficult to measure without time-consuming research of different transport modes operating on various trade routes. The transport cost issue is outside the range of this thesis.

The transport cost issue is not however limited to the geographic structure of trade. It has also an impact on the choice of transport mode. From this perspective, the lowered transport cost of truck conveyance by car ferries, gave the consignors an additional alternative for trade conveyance. Ferries challenged the traditional carriers due to potential time saving and flexibility associated with truck transport. The truck has one obvious advantage in conveying goods all the way from industry to the end of the retail chain.

In considering the restructuring on the Swedish-Finnish transport market one should note that the growth of the bilateral trade and thus the higher value per ton viewed in this context, represented a crucial prerequisite for the development at the ferry market. With trucks being the basic unit of conveyance, the ferry services obviously had advantages. By the integration of sea and land transport, the bilateral shipping and trade are as strongly as or even more strongly integrated than before the Second World War.

Due to the integration of land and sea transport by means of the ro-ro technology the ferry industry has turned into a significant mode of sea transport. The growing importance is clearly seen in the development of tonnage and thus in the distribution of incomes.

The transition of tonnage employed in foreign shipping services changed the distribution of merchant navy gross receipts in the post-war period. In Finland and Sweden, there has been a major shift in this income distribution since the 1960s. According to official statistics, the gross receipts of Finnish ferry shipping as a share of total merchant shipping rose from some ten per cent in the 1960 to fifty per cent in 1990. As seen in figure 4, the distribution of Swedish merchant shipping income also turned out to be in favour of the ferry industry.

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The ferry industry accounts for a significant part of the total shipping incomes in Finland and Sweden as seen in Figure 4. The gross receipts by tonnage (gross tons) are higher in ferry shipping than in bulk and dry cargo shipping. In competing with traditional carriers, the ferry industry has proved to be a competitive alternative for goods conveyance in the short sea market. As such, the ferry industry has been highly effective in utilizing its expensive tonnage on short routes. The structure of costs and thus the productivity are crucial for the operation of the vessels.

A puzzling issue is that compared to the value of the tonnage, shipping income developed much slower in Finland after 1950. This suggests a decreasing marginal productivity of capital. However, the investments in new tonnage also resulted in lower fuel consumption and lower manning costs. Due to shorter turn-around time, port duties could also be lowered. In managing the lower marginal productivity, the ferry industry had, compared to traditional liner operators, a number of advantages. The combination of cargo and passenger conveyance produced not only two, but also three possible kinds of income receipts. The prices of tickets, cargo charges and prices of onboard consumption gave the operators an opportunity to manoeuvre the supply in an efficient way. In managing this supply by way of price adjustments, the cost structure was one important part. The operators had to manage the supply according to the most effective combination of services. An additional task was to manage the most effective size of the operation. In this

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108 Appendix 2 and 3.
109 Appendix 5.
managing decision process, the underlying economy of the ferry industry was important. The economies of density and scope were characteristic of the ferry industry. The economic efficiency measured was most likely an advantage in the competition with traditional carriers.\(^{111}\)

The trade-off between freight and passenger conveyance left the ferry operators with two emerging market segments. Looking closer into the latter, we find that the change in the geographic dimension of shipping activities had an impact on passenger traffic. By utilizing the demand for combined carriers, the ferry services functioned as an important part in the commercial exchange between Finland and Sweden. In addition to the facilitation of trade, the shipping services to the growing market of tourism and commuting travel. The ferry industry has advanced from being a part of the liner shipping, engaged in small-scale passenger transport during the summer, to being an integrated part of tourism activities and utility transport. Although this industry was rooted in the conveyance of export and import of commodities, the passenger traffic changed the amplitude of the business.

The shift on the demand side and thus the restructuring of the ferry industry changed the scope of commercial exchange between Finland and Sweden. The growth of passenger conveyance and thus bilateral trade by way of ferry shipping had a far-reaching impact on the scope of shipping services between the countries. To capture this, the share of bilateral shipping incomes to export from Finland to Sweden and vice versa is outlined.

In accounting for the share of shipping income, one should note that this is measured as the Swedish and Finnish gross receipts from shipping to and from the respective country. As shown in figure 5, the obvious paradox is that the shipping income has grown faster than the export value since the 1970s. Due to the development of freight rates in the post-war period, the opposite tendency might have been expected.\(^{112}\)

However, the growth of the shipping income owes much to the restructuring of the shipping market. Due to the passenger traffic, the ferry industry turned to a utility and a tourism transport mode respectively. This tourism business, which gathered strength after the mid-1970s, altered the relation between bilateral shipping and trade. Despite the unprecedented expansion of bilateral trade, the growth of service exchange pertinent to the shipping industry developed more rapidly. Although the interaction by means of trade still dominated the economic interplay between Finland and Sweden, the growth of service exchange put an additional impact on


\(^{112}\) Stopford (1999), p. 5.
the economic interplay. The development of shipping services in conjunction with bilateral trade meant that closer economic ties came into existence.

**Figure 5. Incomes of bilateral shipping relative to export from Finland (solid line) to Sweden (dotted line) and vice versa, current prices 1950-2000.**

*Note:* Gross receipts of shipping services are measured as the incomes of Swedish shipping companies in the traffic to and from Finland and *vice versa.*


The post-war growth and restructuring of bilateral shipping and trade provide strong reasons to believe that commercial connections changed in comparison with the earlier conditions. The concomitant phenomena of growing shipping and trade suggest that the integration of bilateral trade and shipping was stronger than before. The growth of trade owed much to the expansion of shipping services, and the restructuring of shipping services facilitated the development of trade. The integration of the transport system between sea and land provided closer links between transport and trade.\(^{113}\) Due to the expansion of truck conveyance, the ferry services became an integral part of the transport chain. Furthermore, the ferry industry combined this utility transport with tourism and leisure service, which in turn led to the growing service incomes. In conclusion, the growth of shipping and trade and the integration of commodity exchange and service led to an unprecedented expansion of the economic interplay between Finland and Sweden in the post-war period.

\(^{113}\) Stopford (1999), pp. 294-295.
4. Summary of the four papers

The issues of shipping and trade outlined in the previous section have touched upon a number of cases where the underlying conditions have not been much analysed before. The aim has been to give a long-run overview and thus provide some linkages between bilateral shipping and trade. In the following section a summary of the four articles is accomplished.

Convergence and structure of trade: The Swedish-Finnish case

As pointed out previously, there are quite few, comprehensive studies of the development of Swedish-Finnish bilateral trade. This paper addresses this situation and provides insights that might help to explain the current character of the trade structure. The study will link the development of the intra-industrial trade with domestic economic development and economic integration.

The bilateral trade has been relatively small over a long period of time. The Finnish export to the Swedish market since the late 19th century up until the mid-20th century accounted for a few per cent of total foreign trade, with exceptions for occasional fluctuations and war periods. In the inter-war period this trade was characterised by net trade or inter-industry trade, i.e. exchange of products emanating from different industries. Finland exported raw materials emanating from the wood industry and agriculture and imported manufactured products from the Swedish engineering and basic metal industries.

However, the basis of bilateral trade changed in the 1960s. The transformed structure of production in Finland and Sweden as well as in other developed countries in the post-war period meant that trade more and more came to be characterised by exchange of similar products. This matching trade grew strong in the 1960s and 1980s, and today it accounts for some 68 per cent of the total Swedish-Finnish trade. In comparison with other bilateral trade flows on the Nordic market, the considerably large amplitude of Finnish-Swedish matching trade stands out in the 1980s and later.

The process of convergence and transformation in the industry structure in the post-war period had a significant impact on the specialisation in bilateral trade. In this context we can note that Swedish-Finnish trade, like that of the other Nordic countries, was affected by economic integration. The process seems to have had an impact on the geographic structure of trade. However, the differences in the size of matching trade suggest that other determinants were more important.

The demand side was important for the overall increase of matching trade. The growth of average income and hence the reduced inequality in
the Finnish-Swedish case, affected the structure of trade. Finland experienced a vigorous growth of income, well above the OECD average. The convergence of income has been significant, especially since the 1970s, and the empirical analysis conducted supports earlier findings, which suggest that the share of IIT is larger for countries with similar incomes per capita than for others. However, the demand side “explanation” cannot account for the differences in matching trade between different sub-industries.

The profound transformation of the manufacturing industry reduced the trade of primary products emanating from similar kinds of natural resource assets; Sweden and later on Finland moved towards broader and more diversified economic activities in the post-war period. In line with this development the increasing returns of scale became increasingly important for the specialisation of trade, while the growing the similarity in factor endowment limited the specialisation between industries. The empirical analysis performed supports, as suggested by the New Trade Theory, the importance of industry characteristics.

According to this theory, the extent of economic integration, economies of scale and convergence of economic structure together with income are conducive to the growth of matching trade. In conclusion, this study confirms the significance of convergence and transformation of industry structure.

**Foreign trade in Northern Finland and Sweden**

The development of foreign and interregional trade in the Bothnian region exhibits distinctive contrasts to the national conditions of foreign trade in the post-war period. The regional foreign trade was characterised by net trade, where the surplus exports and imports were concentrated to different industries. Similarly, the interregional trade was concentrated to the most important export industries in the area.

On the export side, forest based industries had strong comparative advantages on foreign markets. The most important export products were paper and pulp. Although the economic development meant that the engineering, basic metal and textile industries captured advantages on foreign markets, the basis of foreign trade was rooted in the forest sector.

On the import side, a distinct pattern of net import is evident. In contrast to the export structure, the petrochemical and mineral industries and agriculture were predominant. On the basis of these characteristics, this study concludes that the regional foreign trade was based on the presence of comparative advantages and disadvantages in different industries.
The development of foreign trade was dependent on the unequal distribution of factor endowment. Since production in different industries differs in input requirements, i.e. factor intensity, the potential for utilizing comparative advantages in production is unequally distributed between industries. This study confirms that factor intensity proportions in the net export are correlated with the input of energy and raw material in production. The factor endowment recognised in the region is in line with this result. Here, the abundance of natural resources, forest and minerals, together with low energy costs, compared to the most important export markets, have contributed to a strong export performance.

Although the interregional trade figures have shown a relatively larger share of intra-industry trade, at least since the late 1970s, the specialisation in the forest and mineral sector and the small home market have limited the size of interregional trade. One important conclusion is that the intra-industry trade in primary goods and forest-based manufactures is small in comparison with other manufactures.

As suggested by the Heckscher-Ohlin theory, specialisation occurs as a result of regions taking advantage of their relatively abundant production factors. The empirical analysis, conducted on the basis of this theory, highlights the dependency on comparative advantages based on natural resources and energy supply.

The Swedish-Finnish ferry shipping market: An economic historical perspective

The Swedish and Finnish ferry industries developed rapidly in the post-war period. Despite the industry’s role in providing an important infrastructure for trade and travel, it has so far not been analysed in an economic historical perspective. This paper provides an analysis of traffic flows, market organisation and major players over the period 1960 to present time.

The paper shows that the ferry routes introduced and the investments in car ferries, of increasingly larger size and quality, met a strong demand for travel and trade between Finland and Sweden. Finnish migrants and travellers on daily shopping tours or on tourist trips from both sides constituted the key features of the growing passenger market. In conjunction with passenger travel, the personal car conveyance emerged in the 1960s. It is shown that the travel between Finland and Sweden was closely related of the development of short and long distance traffic by cars. In addition to travel, the development of ferry services was stimulated by the growth of trade flows.
However, the fluctuations in demand considerably affected the ferry industry. A distinct pattern of business cycles has been present over the years. The first growth of car ferry service commenced in 1965 and ended in 1973. During the oil crisis in the 1970s, the market development was much slower. The problematic economic situation and the higher oil prices caused a recession in the ferry industry. However, the situation changed in the 1980s. The figures for passenger and vehicle conveyance turned upwards and the large investments in tonnage were soon covered by increasing revenues. However, since the beginning of the 1990s, the demand has no longer matched the increasing capacity. The economic recession in Finland and Sweden meant that the expected passenger numbers never materialised and that led finally to shrinking onboard revenues.

The ferry companies made heavy tonnage investments over the years. In terms of investments, one should remember that the ferry industry was much aware of the potential of not only increasing capacity but also of upgrading the quality of services. The most decisive step was taken in the 1960s when the first car ferries were introduced. Larger and more luxury-equipped vessels later on followed this first generation of ferries. During the 1970s the second generation of ferries was introduced. These ferries were larger and characterised by elements more often found in the cruise industry. Later in the 1980s, the investments in cruise ferries were taken a step further as both the size and the quality were upgraded. However, the investments carried out should be seen in a market context.

The ferry services could be divided into two distinctive submarkets: The Gulf of Bothnia and the Åland Sea. The ferry services on the Gulf of Bothnia conveyed a minor proportion of the total traffic between Finland and Sweden. The share of passengers travelling across the Gulf of Bothnia was roughly 8 to 15 per cent and the share of cars transferred some 12 to 20 per cent during the period 1965 to 1995. Given the large differences between markets and also across links, it is suggested that the business opportunities were unequal.

It is also suggested that changes in demand due to real income, population and migration together with the tax-free concession issued, contributed to the growth of passenger travel.

In line with the industry development it is also proposed that the ferry industry was efficient in matching the demand for travel and freight conveyance. The multi-output structure and the management of capacity on routes are considered to be efficient from a cost perspective.
Economic efficiency of multi-product structure: Evidence from the Baltic ferry industry

The Baltic ferry industry has undergone a process of rapid growth concurrently with structural change since the 1980s. One of the key features in this structural change is that the ferry companies have developed a mix of tourism business activities and as a result exhibit a multi-product structure. In utilising this dual structure of the business, the ferry companies have invested in increasingly larger and more cruise oriented ferries. Despite the growth of business size and the high capital intensity, the industry includes both small and large operators. Therefore, the issue here is whether the organisation of the market is a reflection of the cost structure. In addition, this study will provide an analysis of the rationally of combining the utility transport with cruise services. For the analysis in this paper a translog cost function is estimated. The data used in this model comprises four Finnish ferry companies during the period 1983 to 2003.

In the estimation of the cost function this study applies two efficiency measures; economies of scope, scale and economies of density. This study shows that the ferry companies are operated with scope and density economies respectively, while economies of scale is not present. Companies with relatively small sales attain the largest economies of density. However, the companies with larger sales show larger economies of scope, on the other hand. With that in mind, this study stresses that a trade-off between density and scope economies exists as the sales increase. For this reason, the optimal business size can be recognized in a wide range of sales.

In line with the results derived from the cost estimation, an outline of the unique characteristics of the Baltic ferry industry shows that additional gains can be utilized on the revenue side. The combination of transport and maritime tourism leaves these cruise ferry services with a mixed revenue structure. In pricing the different outputs a trade-off between revenue from transport of passengers and vehicles together with onboard sales is shown. The ferry companies have in that sense, a good opportunity of managing the capacity efficiently on the Baltic Sea.

The determinants of ferry traffic flows: A gravity equation approach

A core issue in the study of ferry industry is to pinpoint the spatial determinants of passenger traffic flows. Although crucial factors pertinent to the growth of passenger factors have been suggested previously, there is no clear empirical evidence on the importance of different determinants.
This paper therefore addresses the situation and analyses the traffic performance of Swedish-Finnish ferry services through a gravity equation approach.

The gravity approach is thoughtful since it enables the testing of propositions stated in earlier studies. In the empirical analysis, the gravity model was employed to estimate the impact of income, population and distance on the passenger travel. The model was modified by the introduction of a policy variable. The latter variable aimed to account for the presence and non-presence of tax-free.

The study focuses on four routes across the Gulf of Bothnia. This market is taken into consideration, since the supply characteristics on different lines are fairly similar, while the traffic performance is not equal. The situation gives strong reasons to believe that the factors due to population and distance might have had a strong impact on the traffic flows.

The analysis of the determinants of ferry traffic flows shows that the growth of income had a significant impact on the overall growth of travel, while population, distance and migration movements also played a role in the distribution of traffic between routes. However, the remarkable growth of passenger travel since the 1960s is hard to explain without taking the concession of tax-free sales into account. The case of the Gulf of Bothnia shows that duty free services attracted travellers who was not primary concerned with transport but to make cheap purchases on board the ships. In that sense, the duty free sales meant an attraction that domestic substitutes hardly could challenge. In turn, the abolition of tax-free meant that the scope of the traffic deteriorated.

These results also indicate that the remarkable difference between the Gulf of Bothnia and the Åland Sea could be attributed to differences in population size. The ferry services across the Åland Sea connect two large urban areas while the services across the Gulf of Bothnia connect small cities. In terms of business opportunities, the latter submarket shows a much smaller potential.

**Sammanfattning**

Efter andra världskriget har strukturerna i de svenska och finländska ekonomierna och deras politiska och institutionella omgivning förändrats i grunden. Det ekonomiska utbytet med omvärlden har växt liksom samarbetet genom en rad internationella organisationer. Tillväxten och internationaliseringen av näringslivet har inneburit en fördjupad integration med andra länder. I det sammanhanget har relationen mellan
Sverige och Finland varit karaktäriserad av flera särdrag. Länderna har en lång gemensam historia och en likartad samhällsstruktur liksom värdegrund. Ur ett ekonomiskt perspektiv har likheterna förstärkts under efterkrigstiden. I synnerhet har Finlands ekonomiska utveckling varit stark. Detta har inneburit att inte bara inkomstnivåerna har utjämnats mellan länderna utan även att den ekonomiska strukturen har blivit alltmer lika i Finland och Sverige.

Denna avhandling tar sin utgångspunkt i ekonomisk tillväxt, konvergens och ekonomisk integration i undersökningen av utbytet av varor och tjänster mellan länderna under efterkrigstiden. Den bilaterala handelns tillväxt och omvandling har behandlats i två artiklar och utvecklingen inom färjenäringen, den snabbast växande delen av sjöfartssektorn, har skildrats i tre artiklar. Sjöfarten och handelns ömsesidiga relation och dess långsiktiga omvandling har behandlats i avhandlingens inledningsavsnitt.


Expansionen för de nöjesrelaterade sjöfartstjänsterna har varit en viktig del av hela färjenäringens tillväxt. Investeringarna i större och mer fashionabla utrustade färjor kan dock förklaras på flera sätt än enbart från intäktssidan. Kombinationen av flera tjänster innebar att kostnader förenade med olika insatsvaror kunde delas på ett effektivt sätt. Kostnaden för att producera de tre huvudsakliga tjänsterna, ombordsservice,


övriga delarna av länderna. Detta mönster i utbytet förefaller i sin tur vara avhängigt av skillnader i befolkningsstorlek liksom i produktionsstruktur.


Sammanfattningsvis har ovanstående framställning pekat på att konvergensen av inkomster och ekonomisk struktur har haft en stor inverkan på den bilateralala handeln och färjesjöfarten. Icke förtys har den ekonomiska integrationsprocessen, den teknologiska utvecklingen tillsammans med skattepoltiken, bidragit till att stärka varu- och tjänsteutbytet mellan Finland och Sverige.
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Appendix 2. Merchant tonnage by type of vessels (per cent of total tonnage in tons gross).

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<td></td>
<td>Ferries</td>
<td>Tankers</td>
<td>Other vessels</td>
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<td>1960</td>
<td>3.9</td>
<td>29.7</td>
<td>66.4</td>
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<tr>
<td>1961</td>
<td>4.2</td>
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<td>4.5</td>
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<td>1965</td>
<td>5.4</td>
<td>33.5</td>
<td>61.0</td>
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<td>1966</td>
<td>7.3</td>
<td>34.5</td>
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<td>1967</td>
<td>7.8</td>
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<tr>
<td>1971</td>
<td>3.2</td>
<td>53.0</td>
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<td>8 205</td>
</tr>
<tr>
<td>1993</td>
<td>17 275</td>
<td>6 326</td>
</tr>
<tr>
<td>1994</td>
<td>15 186</td>
<td>5 852</td>
</tr>
<tr>
<td>1995</td>
<td>14 506</td>
<td>5 732</td>
</tr>
</tbody>
</table>

Convergence and Structure of Trade: The Swedish–Finnish Case

Lars Fredrik Andersson

1. Introduction

Compared with Sweden, Finland was economically backward up to the second half of the 20th century. Today, Finnish economic activities of various kinds arguably have an impact on the economic situation in Sweden that can be seen at least in relative terms to the same extent as Swedish activities influence the Finnish economy.\(^1\) The progress of bilateral trade and foreign direct investment changed the economic relations, with reference to the earlier experiences.\(^2\)

The bilateral trade was small over a long period of time. Finnish exports in the Swedish market in the period 1885 to 1950, with the exception of times of war and occasional fluctuations, accounted for some 5% of total Finnish trade. In the inter-war period, this exchange was imbalanced and still dominated by net trade, the exchange of products emanating from different industries. As argued in an early study by Mickwitz, the comparative advantage of capital-intensive production was strong in the Swedish export trade and the advantage of labour-intensive production was present in the Finnish case. Under these conditions, Finland exported raw materials emanating from the wood and food industries and imported manufactured products from the Swedish engineering and base metal industries.\(^3\) This pattern corresponded to the characteristics of the Finnish trade structure pointed out by Sundbäck, suggesting that Finnish exports and imports were one-sided prior to the 1950s.\(^4\)

However, the foundation of bilateral trade changed in the 1960s and later. The

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transformed structure of production seen in Finland and Sweden as well as in other
developed countries meant that trade increasingly came to depend on an exchange
of products arising from matching industries. This trade within industries, or intra-
industry trade, gathered strength in the 1960s and 1980s. In figures, we find a
growth from some 20% to 70% during the post-war period. This development was
exceptional in a Nordic context. In a previous study, Torstensson demonstrated
that the wide scope of Swedish–Finnish matching trade deviates to most of the
other trade flows in the Nordic market since 1980.5

On the basis of historical-theoretical motives, the object of this article is to
account for the growth of matching trade between Finland and Sweden in the post-
war period. The empirical analysis, governed by the new trade theory, focuses on
the impact of economies of scale, product differentiation, incomes and contiguity on
the change in bilateral trade content. By measuring the scope of matching trade
and analysing the impact of empirical variables employed, it is possible to obtain
information on how similarities and differences in Swedish and Finnish economic
development had an impact on the structural change in bilateral trade.6

2. Theoretical framework

According to the classic theory, foreign trade emerges as a result of comparative
advantages, where each country specializes its production to the commodity with
the lowest opportunity costs, i.e. takes advantage of the best technology available to
the country.7 By analogy with the classic theory, the conventional trade theory
represented by the Heckscher-Ohlin model stresses the unequal geographical
distribution of productive resources among nations. A country’s pattern of
comparative advantages will be determined by its endowments of various kinds of
resources relative to other countries. In principle, factor abundance explains the
trade between industries, the so-called inter-industry trade or net trade.8 However,
a large share of present world trade consists of the exports and imports of products
within the same product group emanating from the same industry.9 This
phenomenon, recognized by Grubel and Lloyd in 1975, was not considered at
the time to be coherent with the traditional theory.10 The transformed structure of
trade and the pattern of intra-industry trade (IIT), identified in the early empirical
studies, called for an alternative analytical framework.11

5 J. Torstensson, “Technical Difference and Inter-Industry Trade in the Nordic Countries”,
6 Grubel and Lloyd, Intra-industry Trade, the Theory and Measurement of International Trade in Differentiated
7 The theory of comparative advantages was founded by David Ricardo in the Principles of Political
Economy and taxation (1817). See, for example, T. Peach, Interpreting Ricardo (Cambridge University
Press, 1993).
8 E. Leamer, International Trade Theory, the Evidence, in Grossman & Rogoff, eds. Handbook of International
11 The New Trade Theory (NTT) and the conventional Heckscher-Ohlin (HO) Theory should be
considered as complements, not substitutes, since the NTT is conducive to IIT and H-O to inter-
industry or net trade.
2.1. The new trade theory

The new trade theory was developed in the late 1970s in the work of Krugman, Lancaster and Helpman. The literature contributed a number of important concepts; foremost, the concepts of imperfect competition, economies of scale and production differentiation were taken into account to conceptualize the relation between industry characteristics and IIT.\(^\text{12}\) These concepts were in turn based on a number of conditions.

Starting with product differentiation, we find that every product group (e.g. cars) consists of a bundle of characteristics and that products can be differentiated into different varieties (e.g. car models). Consumers, moreover, view products as collections of characteristics and since they are interested in a particular product because of the characteristics it possesses, industrial firms will end up producing differentiated products.

Economies of scale provide an additional incentive for specialization and trade. Suppose an industry whose products are differentiated and produced with increasing returns of scale. Also assume that that these economies of scale are relatively small, so that the industry can accommodate many producers, each one producing a variety of products. Then we should expect an imperfect market structure where firms meet the demand of different market segments. Taking into account the foreign trade, the different varieties will be demanded not only on the domestic but also on the foreign markets. The two-way trade (IIT) will commence as products are imported and exported simultaneously.\(^\text{13}\) In that sense, the redistribution of world trade towards matching trade in manufactures highlights, on the one hand, the importance of economic diversity, and on the other specialization within industries. Given that products are differentiated and the market is characterized by imperfect competition, the new trade theory predicts that specialization within market segments and increasing returns to scale will result in competitive advantages at the level of firms.\(^\text{14}\)

The empirical literature on IIT conducted according to the new trade theory framework has employed a number of different models for “testing” the concepts mentioned above. This proliferation of models means that the methodological approach general adopted is eclectic; empirical analyses incorporate different proxies for specific dimensions of industry structure. However, the overriding problem in quantifying the concepts of product differentiation and scale economies has proven to be difficult to overcome owing to the shortage of appropriate data.\(^\text{15}\)

The models for testing product differentiation have been elaborated with different forms of product varieties. However, the forms are closely related and are


\(^{13}\) Ibid.


hardly distinguishable in the trade statistics. A more straightforward method is to account for the proposition that product differentiation is expected to be more prevalent in manufactured goods than in trade in raw materials and primary goods. The models on scale economies have focused on the horizontal and vertical form of specialization. In both instances, economies of scale are captured when the number of products manufactured in a firm is reduced. Plants concentrate on the production of a specific product variety to utilize increasing returns of scale in a single market segment. Various measures have been applied, e.g. value added per man and plant size. Another method is to measure the similarity of production structures, since specialization within industries is conducive to IIT because of similarities in factor endowments. If factor endowments were the same, there would be no net trade but only IIT.

In the literature on IIT, country characteristics have taken on an important position, besides the industry characteristics mentioned above. In this line of research, the scope of IIT is generally considered in relation to country size and income per capita. Starting with income, we find that the demand for variety, i.e. differentiated goods, is likely to grow with income. The higher income level is also associated with income per capita similarity. The reason is that income similarities are related with similarities in demand structures that, in turn, provide the basis for mutual trade in differentiated products. In countries with high levels of income, the variety of demand for differentiated products will be greater than in countries with low levels of income. Moreover, Helpman provided proof of the proposition that the extent of IIT will be greater the more similar the capital–labour ratios of the trading partners. The scope of IIT is dependent on the variation of factor endowments. According to this proposition the share of IIT should be larger for countries with similar per capita incomes, reflecting both product differentiation and similar factor compositions. As explanatory variables, the average and relative differences in per capita income are important considerations. However, the income variable seems to reflect both demand and supply effects, i.e. it is hard to isolate the influence of the convergence effect from other possible influences of the trend.

The extent of IIT will be greater in trade between countries subject to some kind of economic integration. The causal connection involved may not, however, be related to economic integration per se, but rather to factors linked to economic integration. By virtue of this fact, integration is in practice more likely between geographically, politically and economically proximate countries where demand structures also are more similar. This proposition meets the similarity thesis revealed previously. Alternatively, the aspects of economic integration are in part

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linked to the increased potential for reaping scale economies in enlarged markets. Although, the predictions of the traditional trade theory are that economic integration will reinforce existing patterns of NET. Owing to the two theoretical frameworks, one could argue that economic integration tends to facilitate the existing direction of specialization rather than transform it.

2.2. Empirical variables and analysis

This article combines two approaches by examining both country and industry characteristics. The country characteristics are indicated here by measuring income equality, i.e. convergence is a proxy for the shifts on the demand side. Furthermore, the development of main sectors, the overall structural change in the economy, is discussed with reference to the shift in commodity structure. The industry characteristics are accounted for by analysing changes in the production structures. At the industry level, the impact of scale economics, production differentiation and similarity is accounted for. In the empirical analysis, I will estimate two multiple regression models to capture the impact for both country and industry characteristics. Finally, I will analyse the impact of economic integration, by comparing the trade partners involved in the process. These variables are fully outlined in Appendix 1.

The figures on IIT are measured by the conventional index created by Grubel and Lloyd. The average index will be adjusted for the aggregated trade imbalance, since the Swedish export surplus was large up to the mid-1960s. When considering the index with no adjustment for trade imbalance, the measure of IIT is biased downwards during the 1960s, but similar to the adjusted index since 1970. Measures of IIT are dependent of the definition of industry. In this study, I have chosen the 3-digit level of aggregation since it is broadly equivalent to the definition of an industry. Even where an attempt is made to use economically more meaningful categories, there is the problem of agreeing on the appropriate criteria for grouping products and there is a risk of separating products that are essentially products of the same industry. To secure compatibility with the research on the topic, the 3-digit level is employed. Furthermore, the SITC rev 2 data employed in the study have been analysed in detail to make possible a re-classification according to ISIC rev 2. Products emanating from the same industry are grouped together at the 4-digit level of ISIC, since the links between matching trade and industry characteristics are to be examined.

3. Internationalization and Swedish–Finnish trade

After World War II, an unprecedented global expansion and transformation of trade changed the structure of the world economy. A process of global and regional economic integration led to growing trade to GDP and thus increased

22 Grimwade, op. cit., p. 72.
23 The variables and the equations are defined in Appendix 1.
interdependence between those countries that shared the process. The rapid expansion of income facilitated the trend, which in itself owed much to the easing of trade restrictions. In some respects it resembles the classic free-trade era of 1850–1875. In contrast, we find a mix of liberal, nationalist and socialist economic policies, which gave a much greater role to governments. In these commitments, governments were successful especially with reference to the period after World War I. Their success was due in part to the conditions that allowed relatively stable expansionary fiscal and monetary policies, not least in small economies in Western Europe.

3.1. The geographic structure of foreign trade

In the 20th century, openness and interdependence have been key features of the small democratic states of Europe. One reason is that the industry structure of small states is typically less diversified compared to bigger economies. Although post-war development meant that primary production grew more slowly than manufacturing and services production, the domestic market did not sufficiently meet the varieties of supply required. In that sense, foreign trade is a means to overcome this asymmetry between supply and demand. From this perspective, the processes of internationalization and the regional economic integration of Western Europe contributed to the growth process in the small states of Finland and Sweden after W.W.II.

The process of economic integration facilitated the orientation towards the Western European economies in the post-war period. Notably, West Germany and Great Britain constituted the main foreign markets for the Swedish and Finnish firms. This pattern was coherent with the pre-war structure. However, in contrast to the Western orientation, Finnish foreign trade with the Soviet Union gained a larger share compared to the inter-war period. Finland’s trade with the Soviet Union covered an average of 16% from 1945 to 1990.

In the Western market, Finland and Sweden managed to safeguard their shares, although the bilateral trade shares underwent a palpable redistribution at the level of states. The British market had stagnated. From being traditionally the major export market, the trade shares had been in decline since 1950 up to the present, the greatest decrease being in the 1970s. On the other hand, Finland and Sweden managed to keep their trade shares on the rapidly expanding West German market. The direction of trade, moreover, advanced somewhat towards small- and

26 Note that the ratio of merchandise exports to GDP at current prices reached approximately the same levels in the 1970s as in the 1920s. A. Maddison, The World Economy in the 20th Century (Paris, 2001), p. 143.

medium-sized countries of Western Europe. The internal EC market became increasingly important toward the end of the 20th century.\textsuperscript{29}

The trade among the Nordic states was nevertheless important. Although the intra-Nordic trade gradually stagnated in the 1970s and later, the Swedish and Finnish trade shares in that time exceeded the inter-war figures. Since W.W.II., the growth of intra-Nordic trade was significant in the Swedish and Finnish cases. The need for economic integration and cooperation during W.W.II. at first had an impact on the scope of intra-Nordic trade and later on the trade policy discussion.\textsuperscript{30}

During the phase of normalization, the intra-Nordic trade was stabilized at the pre-war ratio. The orientation was further facilitated by the intensification of the Finnish and Swedish activities on this market. The Finnish and Swedish industry played an active role and advanced their positions on the Nordic market in terms of trade and foreign direct investments.\textsuperscript{31}

The growth and later stagnation of the Nordic market was concomitant with the bilateral trade between Finland and Sweden.\textsuperscript{32} In a wider time perspective, we find that Finland gradually gained a larger share of Swedish foreign trade since the inter-war period. From an average Finnish export proportion of 5% from 1920 to 1938, Sweden became the major trading partner. The Finnish exports to the Swedish market accounted for 18% of total exports in 1972. Including exports and imports, Sweden became Finland’s most important trading partner (1970–1974), corresponding to the Finnish ranking of being among the fourth to sixth most important exporters on the Swedish market during the 1970s.\textsuperscript{33} Thereafter, the market shares decreased and the Finnish and Swedish trade grew more rapidly on the EC market. The downward trend was thus not exactly parallel in the Finnish and Swedish figures owing to the fluctuating trade balance and share of foreign trade to the GDP.\textsuperscript{34} In a wider time perspective, however, we find that the bilateral trade shares exceed the inter-war figures. In that sense, Sweden and Finland became closer collaborators. The progress of bilateral trade up to the mid-1970s and the growth of foreign direct investments, notably in the late 20th century, intensified the business activities between Finland and Sweden.\textsuperscript{35}

3.2. The commodity structure of foreign trade

The growth of foreign trade was concomitant with the major changes in the commodity structure of Swedish and Finnish trade. Until the beginning of the 1950s, Sweden was able to utilize the demand throughout Europe for industrial


\textsuperscript{31} Byquist, op. cit., pp. 36–45.

\textsuperscript{32} Mickwitz, op. cit., pp. 205–210.

\textsuperscript{33} Byquist, op. cit., p. 46.

\textsuperscript{34} For Finland, the rapid growth of exchange with the Soviet Union, augmented the general foreign trade of Finland mainly in the years between 1975 and 1987, indicated for instance by the higher ratio of foreign trade to GDP.

\textsuperscript{35} C. Fredriksson, De nya nordiska företagen (Stockholm, 1993), pp. 41–79.
raw material and semi-manufactures that had accumulated during W.W.II.\textsuperscript{36} Over the years, these characteristics gradually disappeared and export clearly shifted towards finished manufactures. The export industries did not lose their roots in mining, metal industry and forestry, but they were forced to fight for a place within the growing international trade, which increasingly was based on exchange of similar products between the developed countries of the world.\textsuperscript{37} The greatest growth in exports is identified within the engineering sector. Machinery and transport equipment played a leading role and advanced from a share of around 18\% in 1950 to roughly 45\% in 1990. A corresponding change occurred on the import side. The growth of engineering products was important and in 1970 the share roughly amounted to one-third. In conclusion, we find a shift in foreign trade towards manufactured products and a relative decline in primary products.\textsuperscript{38}

The commodity composition of Finnish exports changed to a large extent similarly to that in Sweden. As with Sweden, forest-based products in Finland have traditionally been of prime importance, and today they account for some 40\% of total trade.\textsuperscript{39} Despite major changes in the structure of the manufacturing industry's final output, the forest-based industries have remained at the core, although many new industries have emerged as spin-offs from the forest or forest-related business. Finland is nowadays a leading producer of paper machines in the world.\textsuperscript{40} By contrast, trade in primary commodities (sawn timber and minerals) has grown more slowly. In addition, trade in manufactures has grown much faster than total merchandise trade.\textsuperscript{41} Trade and production figures reveal a diversification of trade and a greater export value share of finished manufactures.\textsuperscript{42} In that sense, the overall structure of foreign trade, tended to shift from net trade to matching trade. The latter is clearly confirmed in the Finnish–Swedish bilateral trade.

3.3. The commodity structure of bilateral trade

The development of bilateral trade in the second half of the 20th century brought major changes in the commodity composition. This refers to the change in the share of bilateral trade accounted for by different product groups and the share of intra-industry trade (IIT). The growth of manufactured relative primary products that took place mainly in the ten-year period from 1955 to 1965 indicates a major shift in the trade structure. The terms of trade changed. The division of labour based on Swedish capital-intensive export and Finnish labour-intensive export

\textsuperscript{37} Pettersson, op. cit., 139–154.
\textsuperscript{38} P. Hanson & L. Lindberg, \textit{Från basindustri till Høg teknologi?} (Stockholm, 1995), pp 30–58.
\textsuperscript{40} S. Vouri, & P. Yla-Abttila, eds. \textit{Mastering Technology Diffusion – the Finnish Experience}, (Helsinki, 1992), pp. 11–17.
\textsuperscript{41} The expressions merchandise trade and total commodity trade are used interchangeably in this paper. Merchandise trade is divided into primary products and manufactures.
\textsuperscript{42} Lindholm & Fellman, op. cit., pp. 188–190.

gradually decreased and a different kind of trade emerged: the exchange of products belonging to the same industry.

Since the late 1950s, bilateral trade figures have revealed a significant growth in IIT. This suggests a narrower form of specialization, a specialization in particular products emanating from the same industry. As a consequence, Swedish and Finnish exports and imports belonging to the same industry increased simultaneously.

The development of trade between and within industries across Finland and Sweden is plotted in Fig. 1. The first impression when looking at the performance of IIT and net trade is the big difference between the start and stop years (1961 and 2000). During this period, the performance of IIT alternates between phases of slow and phases of rapid growth. We find that the growth of IIT was rapid during the 1960s and the 1980s. In contrast, the trade figures for the 1970s and 1990s show a more fluctuating pattern. The structural change in the bilateral trade pattern has grown slower and faster at different periods.

The growth of IIT meant that products emanating from the same industry on average increasingly dominated the exchange. However, this pattern is not evident for the different industries over time. The export and import shares, as well as the structure of trade, have changed differently over time. At a detailed level, the structural change in bilateral trade is more complex than the picture given by the average index. The somewhat scattered figures of trade structure and specialization presented by industries have nevertheless undergone some general developmental trends that help us to understand the movement behind the growth and fluctuation in the average index of specialization.
The development of bilateral trade in the period 1955 to 1970 brought important changes in two areas. The Finnish exports to the Swedish markets reached historically high levels and the trade imbalance was reduced as a consequence. An additional shift is identified in the commodity structure as the scope of primary products declined. Finnish export of wood products dropped from 50 to 15% in the ten-year period from 1955 to 1965. Simultaneously, products from the engineering industry increased from a 16% share to 30%. In the context of overall IIT growth, the shift in commodity structure was nevertheless important. As the scope of IIT in primary products is clearly lower than that in manufactures, the shift from wood to engineering products played an important part in the growth of average IIT from 1955 to 1970.

In contrast to the big shifts in the 1960s, the following ten-year period is characterized by fluctuations. The average trend indicates only a minor growth in IIT. By analogy to this pattern, the trade shares for the industries were much the same during this period of time. We find that the leading trade sector was the engineering industry. In this sector, machinery and transport equipment dominated the exchange. Differentiated products originating from the same industries meant that the level of IIT in this sector increased during this decade. This pattern is evident in general. However, we find an exception in the clothing industry (subgroup of the textile industry). In Finland the development of the clothing industry during the 1970s had no counterpart in Sweden. Measurement of production factor intensities indicates a high labour and raw material intensity. The comparative advantage seems to have been based more on factor endowments than on increasing returns of scale. In that sense the clothing industry was an exception from the overall growth to IIT specialization.

The economic downturn following the oil crises affected the geographical structure of trade and thus the bilateral trade shares. Although the scope of bilateral trade declined, the structure and specialization of bilateral trade underwent, as in the early post-war period, a continuing redistribution towards the manufacturing industries. For Finland, machinery and transport equipment continued to advance together with products from the chemical industry. The growth of IIT was moreover facilitated by the decline in Finnish textile exports during the 1980s. This movement seems to have been the most important factor behind the general IIT development in the period since 1980.

The trade structure and the IIT by type of industry are presented in Table 1. At the level of industries, we find differences in the scope of IIT. One noticeable feature is that the food, textile and wood industries have a lower share compared with the average in the manufacturing sector, with the exception of textiles in 1960 and food in 1980. Independently of the year selected (1960 to 2000), the share of the primary sector of wood is significantly lower than the average IIT. This fact supports the proposition mentioned in the previous chapter that the scope for product differentiation is greater for manufactures than for primary products. The

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43 FOS, *Industry, Industrial Activity by Groups of Industries* (1970). In the textile industry the measure of sales value to value added and value added to number of employees is lower than the average in the industry sector.
Table 1. Bilateral trade structure (export from Sweden to Finland and import to Sweden from Finland) and specialization by industries, 1960, 1980 and 2000

<table>
<thead>
<tr>
<th>Industry</th>
<th>Trade shares in percent</th>
<th>Intra-industry trade share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food industry</td>
<td>2.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Textile industry</td>
<td>4.3</td>
<td>12.6</td>
</tr>
<tr>
<td>Wood industry</td>
<td>1.0</td>
<td>48.9</td>
</tr>
<tr>
<td>Paper industry</td>
<td>0.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Chemical industry</td>
<td>8.8</td>
<td>4.9</td>
</tr>
<tr>
<td>Mineral industry</td>
<td>0.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Basic manufacturing</td>
<td>16.1</td>
<td>7.6</td>
</tr>
<tr>
<td>Engineering industry</td>
<td>65.3</td>
<td>16.4</td>
</tr>
<tr>
<td>Manufacturing n.e.s</td>
<td>0.9</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

GL-Index: Index on intra-industrial trade. SITC re-classified according to ISIC Rev. 2.

labour-intensive food and textile sectors are not coherent with primary goods, although the share of IIT for the whole period is lower than the IIT average, with the exceptions already mentioned. In that sense, the decline in the exchange between these basic industries meant that not only the structure but also the specialization of trade became narrower and more dependent on product differentiation and increasing returns to scale than on differences in factor endowments.

In a wider perspective, the scope of bilateral IIT in the Swedish and Finnish case was greater than most other Finnish and Swedish trade relations. We find, for instance, in Finnish studies that the amount of IIT specialization with Sweden was high by international reference. The GL-index on Finnish–Swedish trade was more than 30% higher than that in the Parjanne ranking list from 1985. Studies on Nordic trade suggest that matching trade constitutes an important part of total trade. Measures of IIT in Nordic trade show that the trade flow between Sweden and Finland clearly was characterized by an internationally high degree of IIT. In the intra-Nordic trade, the Finnish–Swedish trade stands out owing to the scope of IIT since 1980.

4. Economic integration

After W.W.II., a process of economic integration continuously changed the conditions for Swedish and Finnish foreign trade. International protectionism and bilateral trade agreements were left behind for multilateral trade, although the

44 M.-J. Parjanne, Econometric Analyses of Intra-Industry Trade, Evidence from Finnish Cross-Section Data (Diss. Helsingfors; School of Economics, 1992), pp. 70–73.
45 Torstensson, op. cit., pp. 95–97.
geopolitical situation obstructed the process. The share of foreign trade to GDP rose and the content of trade changed with the growth of manufactures. In this process of structural change in commodity composition the scope of IIT expanded in the European, Nordic and bilateral trade between Finland and Sweden. In the following section, the relation between economic integration and the scope of IIT are outlined.

4.1. Trade agreements

In the West European sphere, the creation of free trade areas and customs unions integrated the economies and enabled division of labour on a larger scale. The steps towards economic integration in the West European markets were nevertheless politically problematic. Sweden on the one hand both wanted and managed to remain outside the military and political blocs in post-war Europe, while Finland’s position, on the other hand, was very delicate in balancing its actions between East and West, with the start of the Cold War. However, movement towards the international organizations of the IMF, OEEC, GATT and the Nordic co-operation after W.W.II. was considered as acceptable.

The creation of EFTA in 1960 gave Sweden access to a valuable free trade area for manufactured products including both Great Britain and the Nordic area and from 1961, Finland (FIN-EFTA). The period after the EFTA agreement was, as mentioned, a time of increased foreign trade and reallocation of trade between different states. Among the EFTA states, all members, with the exception of the UK, experienced vigorous economic expansion and higher export ratios. The reduction of tariffs and other obstacles to trade, reached before schedule (1966), facilitated trade between the countries that shared the process. Sweden and Finland worked actively in this process, although the economic advantages were weighed with consideration to the geopolitical reality. Although the EFTA agreement proved to function well for Finland and Sweden the situation was made complicated by the UK’s intention to join the EEC. Therefore, the prospects were somewhat blurred until 1973. When Denmark and the UK finally left EFTA and joined the EEC, the remaining EFTA states each signed reciprocal trade agreements with the EEC in 1973. Tariffs on most manufacturing products were eliminated successively on trade between the Nordic countries and the original six members of the EEC during the period 1973–1977.

Although the EFTA states benefited from a comparatively privileged status vis-à-vis the EEC, they could not compete with the larger member countries. The clear evidence is that the only successful EFTA member to join the EEC was Norway. EFTA had several problems that hindered its development. The member countries were originally divided in their economic policies, which was a hindrance to cooperation. Additionally, the member countries had different economic structures and were not all able to benefit equally from the free trade agreements. Furthermore, the EFTA states were not able to compete with the larger member countries and their economic policies were not harmonized.

48 Finland remained outside the OEEC because of Soviet opposition. With the Helsinki-Club treaty in 1957, 12 OEEC countries promised that Finland would be given the same conditions of trade as the OEEC members.
50 Kleppe, op. cit., pp. 66–78.
**4.2. Economic integration and the scope of intra-industry trade**

The process of economic integration facilitated the development of intra-Nordic trade in the 1960s and Nordic-EC trade and specialization during the 1970s and onwards when tariffs and quotas were eliminated on trade in manufacturing products. The focus on manufactured products owed a good deal to the growth and specialization of foreign trade among the countries involved. However, as most theories predict that economic integration would lead to increased trade and specialization, the impact on IIT specifically is affected by other factors as well. To account more specifically for the impact of economic integration on the scope of IIT, a comparative method is applied. The impact of contiguity is compared across the countries mentioned above and over time.

The structural change in bilateral trade and the growth of IIT was concomitant with the EFTA period 1961 to 1972 in the Swedish-Finnish case. Although the lowered tariffs on manufactures and the growth of IIT overlap in time, the significance of the impact is unclear for two reasons. Firstly, the structural change in bilateral trade emerged before the agreement was signed. Since the mid-1950s, the composition of commodities in bilateral trade changed. In the Finnish export to the Swedish market we find a noticeable growth of manufactures during the late 1950s. The decrease in wood export and the increase in engineering export started before 1961. Secondly, the development of IIT between the Nordic countries followed different trajectories. Considering the EFTA period 1966 to 1973, when the reduction of tariffs and other obstacles to trade was reached, we find an average growth across the Nordic countries. However, we find big differences in growth rate and in the scope of IIT. Although the lowering of tariffs had an unequal impact on IIT, the significance of economic integration cannot be excluded, as the average

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trend was positive. The conclusion that integration stimulates IIT more than inter-industry trade is confirmed in numerous studies, as the fact that IIT tends to be higher in bilateral trade of countries belonging to the same custom union or free trade areas.\textsuperscript{55} These results hold for the average growth of IIT, which, however, is subject to impact from other factors as well. To confirm the significance of economic integration, we need support from industry studies. The issue is then whether tariff elimination has a different effect across industries. In two studies from 1990 and 1992, Lundberg analysed the impact of tariffs on IIT between the EC and the Nordic countries. The hypothesis was tested for a cross-section of Nordic manufacturing industries. The most important conclusion was that the increase in IIT between the Nordic countries and the EC in 1970 to 1984 had been high for sectors where tariff reductions among the EFTA were large.\textsuperscript{56}

In the Nordic case we find a high proportion of IIT, which as recorded in the theoretical framework, is expected since the level of IIT is lower in the trade of non-integrated countries. The causal connection may not be related to contiguity \textit{per se}, but rather to factors related to economic integration. Here, the impact of distance, cultural similarity and other proximity variables may be influential. An additional dimension is the relation between contiguity and the potential to reap scale economies on enlarged markets. Given that economic integration was decisive alone, one should expect a similar level of IIT on the Nordic market. On looking more closely at the figures on this phenomenon, we find that, quite the contrary, the level of IIT is the highest for Finland and Sweden. Although the trade between Sweden and Demark was also characterized by a high proportion of IIT, the Finnish–Swedish case has stood out since 1980.\textsuperscript{57} One important conclusion from these measures is that economic integration has played a role, but other crucial factors have resulted in a discrepancy in the structure of trade.

5. \textbf{Country characteristics}

Given that factors such as per capita income, market size and economic integration are dependent or influenced by the level of economic development, it is expected that matching trade will be related to economic development and modernization. The growth and convergence of income is expected to have an impact on foreign trade, including IIT specialization. Here we can start out with the fact that demands for differentiated human capital-intensive products are linked to the income level. With that in mind, the following analysis focuses on the impact of income on the scope of IIT.

In a wider perspective, we recognize that trade in differentiated products has increased in the post-war period. The trend was facilitated by the growth of incomes and the size of markets. The process of growth and integration of markets implied increased openness and interdependence for Sweden and Finland during


\textsuperscript{57} Torstensson, op. cit., pp. 95–96; Horwitz, op. cit., p. 295.
the post-war period. The economic development and the growth of income also had an impact on the change in the commodity structure and thus to a redistribution of trade at the level of states.

In a long-run perspective, the process of modernization and the converging levels of income, productivity and welfare are closely related to shifts on the demand side, and changes in consumption patterns. In a bilateral trade pattern, the growth and convergence of income is expected to correlate with IIT specialization, owing to differentiation on the supply side and hence to the increased demand for differentiated products. The tendency has been considered mainly as a result of overall economic development since the 1950s. In a long-term perspective, however, the process of converging levels of income needs to be accounted for with reference to the cumulative effects of industrialization. These measures need to be considered when studying the relation between convergence of income and the scope of IIT specialization.

5.1. The convergence of incomes

In the case of Finland and Sweden the pattern of economic development is clearly different. Finland was economically backward until the second half of the 20th century. The industrial breakthrough occurred in Sweden at the turn of the 20th century (1890–1910). Here, the manufacturing sector had a higher productivity than the agricultural sector and Swedish economic development was clearly dependent on the manufacturing industry. Taking into account its initially lower economic levels, the Finnish industrial breakthrough is suggested to have taken place in the inter-war period (1920–1938). Later, Finnish economic growth rate was higher than the Swedish rate, which has led to Finland’s belonging today to the group of countries with the highest income per capita in the world.

The industrialization started earlier in Sweden than in Finland and the breakthrough was earlier, too. The process of modernization recognized here, suggests, as Gerschenkron expected, that a swifter industrial growth would occur in a latecomer’s industrial breakthrough than in that of a more advanced country. Although the process of industrialization in recent research has tended to emphasize the smoothness of the process of economic change in Finland, the industrial output clearly grew stronger in the 1930s. In Finland industrial growth was more rapid than that in Sweden. In output figures, Finland records a significantly higher growth rate than in Sweden during the 1930s, although it is probably too early to conclude a convergence pattern in these years as the trend was basically reversed during W.W.II.

The process of convergence of income is apparent in Fig. 2. The key feature of the process was that Finland experienced a “super growth” period, well above the

West European average, while Sweden went through a period of less than average growth.\textsuperscript{61} Accordingly, the Finnish income level increasingly resembled that of Sweden even if the trend is not evident over the whole period. In the phase of normalization after W.W.II., Finnish economic development, growth of per capita income, exceeded that of most other West European countries. The strong economic performance in Finland was matched by the vigorous growth in Sweden during the 1960s. This, in turn, meant that the convergence trend stagnated in that decade. The growth of incomes in Finland thereafter exceeded the Swedish figures. The economic recession following the oil crises had a strong negative impact on the economic development in Sweden. In the period 1970 to 1990 a convergence pattern emerges. At the end of the century the levels of income were similar in Finland and Sweden. One conclusion is that the convergence of incomes was relatively stronger in the 1970s and later, which suggests that the impact on IIT specialization was weaker during the 1960s.

The specialization between industries (inter-industry specialization) was gradually reduced as the convergence process smoothed the previous difference in factor endowments. The symmetry in Swedish and Finnish production structures increased because of the change in capital/labour ratio.\textsuperscript{62} This economic process changed the scope of specialization within industries, and thus affected the intra-industries’ specialization. Here, the process of convergence observed in per capita income nevertheless was important. As shown in Fig. 2, the income level in Finland compared with that in Sweden approximately was similar at the turn of the 1990s. Owing to the steeper trend recognized in the 1970s and later, the impact on the trade structure seems to have been greater in these years than in the 1960s. Moreover, the swifter growth of industrial production in Finland suggests a converging pattern between the economies.

To examine how the growing similarity on the demand side affected the growth of IIT, a regression model has been estimated. As previously mentioned, the

\textsuperscript{61} Maddison, op. cit., pp. 186–188. Twelve Western European countries included: Austria, Belgium, Denmark, Finland, France, Germany, Italy, The Netherlands, Norway, Sweden Switzerland and the UK.


Table 2. Regressions results of country characteristics and IIT specialization

<table>
<thead>
<tr>
<th>Estimated coefficient</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inequality</td>
<td>$-1.3884^{**}$</td>
</tr>
<tr>
<td>No. of obs.</td>
<td>39</td>
</tr>
<tr>
<td>Multiple R-squared</td>
<td>0.72</td>
</tr>
</tbody>
</table>

Figures in parentheses are $t$-values.

**Significant on the 1% level. The variables are defined in Appendix 1.


analysis is based on the measure of income inequality between Finland and Sweden. The inequality variable is expected to be negatively correlated with growth of IIT.$^{63}$

As suggested by the NTT framework, the variable has a significant impact on the scope of matching trade, as can be seen in Table 2. The independent variable corresponds to 72% of the variation of the independent variables. These results lend support to the expected relation between similarity and economic development and the extent of trade within industries. The demand side is, although only approximately estimated by incomes, suggested to be a key in the explanation of structural change in the bilateral trade pattern. As income growth and inequality are reduced, so too grows the demand for differentiated goods. However, we cannot “explain” the growth of IIT on specific sectors by this variable.

Given the results in Table 2, we can conclude that the convergence of incomes and the extent of IIT are significantly correlated. This supports earlier findings that the proportion of IIT should be larger for countries with similar income per capita.$^{64}$ Although the findings are accepted, it is of course difficult to isolate the influence of GDP per capita growth for other possible influences on the trend. It is important to consider this result in relation to economic integration and country characteristics. Regarding economic integration, the impact of income proves to be an important additional variable.

5.2. Growth in main sectors

Taking into account the post-war growth and convergence of per capita incomes, the process of structural change, i.e. change in the allocation of factors of production, between sectors is likely to have been rapid. In the Finnish and Swedish case we find a decline in the primary sector relative to manufacturing and services. The reallocation between sectors was not domestically isolated; quite the contrary, the structural change was an integral part of the changes in foreign trade. The commodity composition, as previously shown, was transformed, as manufactures advanced relative to primary products. The vigorous growth of Finnish export of manufactures in the 1950s reduced the share of primary products. The growth of

$^{63}$ Data and definitions are outlined in Appendix 1.

$^{64}$ Helpman, op.cit., pp 62–81.
manufacture output changed the base of specialization in bilateral trade by contributing to the growth and specialization in the manufacturing sector. In that sense, the basis for export in differentiated manufactured products, especially machinery and transport equipment, was attained by the change in the country’s economic structure. The process of convergence recognized in overall income levels and in the volume of industrial productions made the economic structures in Finland and Sweden more equal.\(^65\)

The process of modernization progressively changed the bilateral trade structure. The growth of manufactures in relation to primary products is evident, and, furthermore, the scope for trade in differentiated products expanded. Throughout the early post-war period, the increase in manufactures relative to merchandise trade as a whole clearly reflects a process of specialization. The basic difference in factor endowment, indicated by the differences in income levels in the inter-war period, resulted in a specialization between industries. In contrast to the former pattern of bilateral exchange, the trade flow in the post-war period was redirected towards products emanating from the same industry. This changed the structure of specialization within industries towards a growing share of intra-industry specialization. This development provided the basic prerequisite for IIT, as seen in the trade figures in the 1960s and later.

On examining the structural changes in the manufacturing sector, it can be seen that the metal and engineering industries took a dominant position in the Finnish industrial structure as late as in the 1970s. The initially lower level of industrial output and the more rapid growth since the 1930s is clearly divergent from that in Sweden.\(^66\) In short, taking this basic difference between the countries into account, the Finnish manufacturing sector developed as follows. At first, owing to metals, engineering, chemicals and the production of electricity power, manufacturing industries were the fastest growing industries of the 1930s. Increasing protectionism made growth in the domestic market important, notably in agriculture, defence and the pulp and paper industries. A strong industrial base was established in these years.\(^67\) The key industries, metal and engineering, furthermore expanded vigorously in the post-war period, although to some extent they were affected by the political situation immediately following W.W.II.\(^68\) Finland was forced to pay heavy war reparations to the Soviet Union according to the peace treaty. At first, this burden obstructed the process of normalization of foreign relations and thus the normalization of the Finnish economy. In a long-term perspective, this issue is more complex. The commodity groups of metal manufactures and transport equipment were to be the major part of the reparation, while wood products were limited to one-third of total trade. These characteristics suggest that war reparations placed high transformation pressure on the Finnish manufacturing sector.\(^69\)


\(^{66}\) Vuori & Yla-Anttila, op. cit., 10–11.

\(^{67}\) Hjerpe, op. cit, p. 79.

\(^{68}\) Fellman & Lindholm, op. cit., 70–76.

Furthermore, trade with the Soviet Union proved to be important for the expansion of the engineering sector. The Soviet market and the Nordic countries later functioned as important markets for the expansion and internationalization of various branches within the engineering industries. Among these “new” industries the most important were industrial electronics and automation, and later, telecom equipment. The Finnish industry managed to retain a strong position in the period after the 1950s. One consequence was that the performance in the export industry was built on a skilled workforce, technical competence and research and development.70

On the other hand, the Swedish economy was the most highly developed in the years after W.W.II. Because Sweden remained neutral during the war, the Swedish manufacturing industry gained from the reconstruction period and onwards, utilizing its industrial capacity built up since the turn of the century. The Swedish industry had a strong competitive edge in the engineering sector. Conversely, Finland was well behind the other Nordic economies concerning the manufacturing output per capita, although later developments changed the output performance relatively swiftly. A comparison between the Nordic economies shows that manufacturing output expanded most vigorously in Finland over the four decades since 1950.71

The annual growth of GDP per capita and the volume of industrial production by the main sectors are summarized in Table 3. The long-term process of convergence of GDP per capita mentioned above is apparent in the growth figures for the period 1950 to 1973. The increase in the volume of Finnish industrial

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production in the inter-war period (1920–1938) was very high, and continued to expand in the post-war period (1950–1973). On the other hand, the Swedish industrial output accelerated from the late 19th century, after which the high growth rates continued, with a break in the 1970s. The initial lower level of industrial production in Finland, and the higher rate of growth since the 1920s, resulted in a convergence pattern, as Finland experienced a relatively higher growth of industrial production than Sweden in the post-war period.72

In contrast to the process of convergence in economic structure in the early post-war period, we find somewhat different developmental paths in Finland and Sweden in the period 1973–1990. The most striking feature is that the Swedish industry experienced a period of slow growth. After the devaluations in the early 1980s, the industry recovered, albeit temporarily, but still faced problems with inflation, balance of payment deficits and slow growth. The share of manufacturing to GDP significantly decreased in these years, and firms involved in basic industries were closed down. The crisis industries accounted from some 10% of manufacturing employment in the late 1970s. In consequence, the industrial sector expanded more slowly and to a relatively lesser extent than the services sector. Furthermore, the manufacture production of so-called “knowledge-intensive” products expanded with the growth in industries producing transport and electrical equipment.73

This structural change by industry matched the change within the Finnish industry, as shown by the growth of matching trade.74 Regarding the Finnish industrial sector, we find rapid growth in output and employment until the early 1980s. During this period, the process of structural change tended to be concentrated on the industry activities towards capital-intensive sectors. The engineering and chemical industries attained a stronger position in the Finnish industrial sector.75 On a closer look, we find that the engineering sector displayed a relatively strong growth in the electronics, machines and instrument industry, suggesting that a skilled labour force and research and development became increasingly important.76 One reason for this trend was the international competition, demanding high technological skills and production of knowledge-intensive commodities.

6. Industry characteristics

The profound transformation of the manufacturing industry reduced the trade in primary products emanating from natural resource-intensive industries. Sweden, and later Finland, moved towards a broader and more diversified field of economic activities. Accordingly, the bilateral trade figures display a reduction in the share of crude wood material in favour of a wide field of manufactures. In this context, there are obvious technological grounds for supposing that the scope for both product

72 Lindmark & Vilström, op. cit., pp. 59–64.
73 SOS: Industry statistics 1975 and 1990; value added on the 3-digit level of aggregation.
differentiation and scale economies is greater for manufactures than for primary products.\(^77\) Moreover, the growth in per capita income and the convergence over time align to meet the growing demand for more income-elastic products such as manufactured goods. Increasing similarities between production structures are recognized as are also the patterns of business cycles and economic policy between countries.\(^78\) These characteristics support the conclusion that IIT is more likely to be dominant in countries that are more similar in terms of level of economic development.

Moreover, IIT specialization should be prevalent in countries and industries where scale economies in production and product differentiation play an important part, when factor endowments, such as abundance of natural resources, limited the extent of division of labour pointed out in classic trade theory. Similarity in production structures is conducive to IIT.\(^79\)

As shown in Table 4, the specialization within industries, measured as the relative similarity between Swedish and Finnish industry, indicates an analogous pattern with reference to the trade figures in the twenty-year period since the mid-1950s. On the Finnish side, the rapid growth of the engineering and metal industry, as referred to above, resulted in a significant specialization within the manufacturing sector. Economies of scale in industries producing differentiated products contribute to a narrower pattern of specialization, i.e. specializing in particular products within a given industry. In that sense, economies of scale have an impact on product varieties and on the segmentation of the market. In sum, the transformation of commodity structure, from the specialization between industries in the inter-war period towards a narrower base of specialization between products,

\(^77\) Petersson, op.cit., pp. 197–211.


in turn suggests that the scope for bilateral trade was extended in the post-war period.

In Table 4 we find that the growing similarity in the industry structures in Finland and Sweden seen in the period 1975–1990 did not follow the trend observed in the previous period (1955–1975). On comparing Finland and Sweden, the index of specialization within the industries is similar in 1990 and 1975. A list of the key industries, chemicals, engineering and manufactures, is presented in Table 4. Within the industrial sector minor changes in the index are recorded. We find, for instance, a lower index in the engineering industry. However, the trend is not evident for the industry as a whole. At a closer look, we find that the rapid growth in the Swedish vehicles industry mainly explains the reduced specialization in the engineering sector. Moreover, the lower level of specialization within the mineral sector brings down the average, even though the industry is of minor importance in the bilateral trade. Conversely, the growth and specialization observed in the chemical industry suggest that the production structures in that sector became more similar between Finland and Sweden over the period. Moreover, the index of specialization in the industry of basic manufacturing is the same in 1975 as in 1990. Accordingly, the observed tendency towards lower specialization is on average not evident for the whole manufacturing sector.\(^\text{80}\)

The impact of industry characteristics on the growth of matching trade is scattered across the key industries. To some extent, the different measures of similarity in the key industries are reminiscent of those of the trade structure. The pattern is evident for the chemical and basic manufacturing industries, but not for the engineering sector. This might be due to the divergent growth rates within one industry sector, e.g. vehicles in the engineering industry.\(^\text{81}\) Still, this finding suggests that the prior connection between industry characteristics and IIT specialization has been attenuated.

As revealed above, the similarity index gives a hint of the reduced inequality in factor endowment based on the traditional theory of comparative advantages. However, this proxy leaves us with only a partial explanation of the growth of IIT. The problem in the empirical analysis is to account for returns to scale and product differentiation. A preliminary analysis is conducted in this study. Three independent variables, functioning as proxies for economics of scale, differentiation and similarity in factor endowment have been employed.\(^\text{82}\)

In the empirical analysis I have utilized data from the STAN database, covering industry characteristics on the 4-digit level of aggregation during the period 1980 to 1998.\(^\text{83}\) As mentioned in section 3, the growth of IIT was strong in that period, and a major reason for this was the reduced share of the textile industry. The exchange across Finland and Sweden in this industry was considered to be dependent on differences in factor endowment. However, since the income levels converged, this basis of trade presumably was reduced. To examine that presumed relationship

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\(^\text{81}\) SOS: Foreign trade, op. cit.; FOS: Foreign trade, op. cit.

\(^\text{82}\) The variables are outlined in Appendix 1.

\(^\text{83}\) STAN database denotes Source OECD: Industry Structural Analysis database.
Table 5. Regression results of industry characteristics and IIT specialization

<table>
<thead>
<tr>
<th>Estimated coefficient</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economies of scale</td>
<td>0.0013** (2.8788)</td>
</tr>
<tr>
<td>Product differentiation</td>
<td>−0.0163 (−0.2389)</td>
</tr>
<tr>
<td>Similarity in factor endowments</td>
<td>0.2875** (7.9004)</td>
</tr>
<tr>
<td>No. obs.</td>
<td>647</td>
</tr>
<tr>
<td>Multiple R-squared</td>
<td>0.13</td>
</tr>
</tbody>
</table>


and, moreover, to cover the other industries, I have tested the significance of industry characteristics to the extent of IIT for all industries. In Table 5, the regression results of industry features and IIT specialization are shown. We find that the variables, with the exception of product differentiation, are significant.

One conclusion is that industry characteristics are important for the structure of trade and the scope of IIT. However, as noted in the literature on this issue, the proxies are crude indicators of scale economies and product differentiation. The data set is large but gives only a limited “explanation” of IIT specialization in the industries. Here, we have a problem in linking the theoretical framework to the observed phenomenon since good indicators are not accessible. With these shortcomings in mind, we can still conclude that industry characteristics are important for the development of matching trade. The impact of economies of scale and of similarity in factor abundance on the structural change in bilateral trade and the scope of matching trade is significant.

7. Conclusion

The development of Swedish–Finnish bilateral trade in the second half of the 20th century brought major changes in the commodity structure. This refers to the change in the share of bilateral trade accounted for by different product groups and the share of intra-industry trade. The structural change in trade was not dependent on the relative unequal distribution of factor endowments or technical differences pointed out by traditional trade theory. On the contrary, the concept leading to the new trade theory proved to be useful in the analysis of the phenomenon. The empirical analysis, governed by the new trade theory, concluded a significant impact of economies of scale, product differentiation, incomes and contiguity on the change in bilateral trade content.

The process of economic integration facilitated the development of Nordic and West European trade and specialization in the post-war period. The removal of non-tariff barriers and the lowering of tariffs on manufactured products had an impact on the scope of intra-industry trade among the Nordic countries. The trade agreement had an impact on both intra-industry trade on average and on industries. Among the Nordic countries we find, however, that the structural
change in trade was different. Both the commodity structure and the scope of intra-industry stand out in the Swedish–Finnish bilateral trade.

The growth of incomes and the reduced GDP per capita inequality had a large impact on the scope of intra-industry trade, on average. The rapid growth of income in Finland made access to income-elastic products more attainable and the growth of manufacturing output functioned both as an engine of export and a basis for expanding purchases of industrial equipment. It is concluded that the process of income convergence was an important factor behind the growth of matching trade.

The structural change in the Swedish and Finnish manufacturing industry sectors had a major impact on the commodity composition in the bilateral trade. A process of convergence in economic structure and at the level of industries implied that the production structures of Finland and Sweden were becoming more similar. The reduced differences in factor intensity and factor endowment meant that the scope of net trade or inter-industry trade had decreased. This result support the proposition that if factor endowments were the same, there would be no net trade but only intra-industry trade. Moreover, the intra-industry specialization analysed on the industry level highlights the significant impact of economies of scale. By utilizing increasing returns of scale and producing a specific variety of products to meet the diversified demand structure, the Finnish and Swedish enterprises could expand in a different manner in their neighbour’s market. The structural change in production and trade had in that sense an impact on the scope of Finnish activities in Sweden as well as Swedish activities in Finland.
Appendix 1. Definitions of the variables and the equations applied

<table>
<thead>
<tr>
<th>(A) Dependent variables</th>
<th>Description of Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>$IIT_{ij} = \frac{(X_{ij} + M_{ij}) -</td>
<td>X_{ij} - M_{ij}</td>
</tr>
<tr>
<td>$IIT_{ij} = \frac{\Sigma(X_{ij} + M_{ij}) - \Sigma</td>
<td>X_{ij} - M_{ij}</td>
</tr>
<tr>
<td>$IIT_{ij}(adj) = \frac{\Sigma(X_{ij} + M_{ij}) - \Sigma</td>
<td>X_{ij} - M_{ij}</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(B) Independent variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$INEQ = \frac{</td>
<td>Y_F/N_F - Y_S/N_S</td>
</tr>
<tr>
<td>$SIMI = \frac{(VA_S + VA_F) -</td>
<td>VA_S - VA_F</td>
</tr>
<tr>
<td>$SCALE = \frac{(VA_S + VA_F)}{(E_S + E_F)}$</td>
<td>Since $IIT$ is suggested to be less prevalent in primary products, the intensity of raw material is measured. The proxy is denoted by raw material ($RM$) to gross value ($GV$), for the industries ($j$) and in Finland ($F$) and Sweden ($S$).</td>
</tr>
<tr>
<td>$DIFF = \frac{(GV_S - RM_S) - (GV_F - RM_F)}{(GV_S + GV_F)}$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(C) Equations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$IIT_{ij}(adj) = \alpha + \beta_1 INEQ_1 + \mu$ (Country characteristics)</td>
<td></td>
</tr>
<tr>
<td>$IIT_{ij} = \alpha + \beta_1 SCALE_{ij1} + \beta_2 DIFF_{ij2} + \beta_3 SIMI_{ij3} + \mu$ (Industry characteristics)</td>
<td></td>
</tr>
</tbody>
</table>
Från industrisamhällets framväxt till dagens tjänstesamhälle har internationella ekonomiska förhållanden varit av stor betydelse för den ekonomiska utvecklingen i områdena längs Bottenviken. Genom utrikeshandeln har det skapats möjligheter för specialisering, överföring av resurser till områden där de inhemska tillverkarna har haft en stark internationell konkurrenskraft. Rika tillgångar av naturresurser och en liten folkning bidrog till att utrikeshandeln blev viktig, inte minst för att uppväga asymmetrin mellan den specialiserade produktionen och diversifierade konsumtionen.


Har två geografiskt närbelägna och ekonomiskt likartade områden, med en lång historia av ekonomiskt samarbete, även ett jämförligt utvecklingsmönster i branschspecialisering och utrikeshandel? Kan den specialiseringen förklaras utifrån tillgången av naturresurser, eller har andra faktorer blivit viktigare i de två traditionellt råvaruexporterande områdena?

Enligt den konventionella Heckscher-Ohlin teorin bestäms ett lands eller en regions komparativa fördelar, produktionskostnader.
i olika industrier relativt kostnaden internationellt, av tillgängen på produktiva resurser som finns i landet och de olika behoven av resurser som finns inom industrin. I linje med resurstillgångarna är exporten från ett område orienterad mot de produkter vilka kräver relativt stora insatser av de i landet, relativt exportmarknaderna, rika resurserna. De i området knappa insatsfaktorerna är grunden för importens sammansättning. Specialisering uppstår som ett resultat av att industrier har konkurrensfördelar i produkter med hög intensitet av de i landet relativt rika produktiva resurserna. Givet att produkterna är homogena, marknaden kännetecknas av perfekt konkurrens och att en teknologi som ger konstant skalavkastning används, kommer skillnader i områdesbundna faktortillgångar att ge olika komparativa fördelar mellan industrier och länder (se tex. Leamer och Levinsohn, 1995).


**GRUNDMODELL**


**DEFINITIONER OCH DATA**

Det geografiska område artikeln omfattar är de svenska länen Västerbotten och Västernorrland och finländska f.d. Vasa län (upp-
gick i Västra Finlands län 1996). Dessa län benämns Botniaområdet i den följande framställningen.

Undersökningsområdet har valts med hänsyn till datamaterialets sammansättning för handel och transportinfrastruktur. Den regionala handelsstatistiken är indelad i transportområden, vilket matchar det geografiska område artikeln omfattar.


REGIONAL HANDELSSTRUKTUR

Den regionala ekonomin i Botniaområdet är liten och öppen, den är starkt beroende av utrikeshandel. Internationaliseringen och tillväxten under efterkrigstiden har inneburit att handeln inom området, men särskilt med omvärlden, har expanderat och kommit att omfatta avlägsna marknader även om den dominerande marknaden var europeisk. Tillväxten på den europeiska marknaden var viktig för importens och exportens expansion.


Importsidan uppvisar även den en koncentration till tre branscher. Framförallt var importen av råvaror, särskilt bränsle och mineraler samt livsmedel omfattande sett till total import. Införseln av produkter från den petrokemiska branschen stod för mer än hälften av importen, även om införseln från omkring år 1980 minskade relativt övriga branscher. Vid den tiden kan vi se att andra råvaror, särskilt obearbetat timmer och mineraler, bidrog till en bestående förändring av importstrukturen.


EST 2/03 LARS FREDRIK ANDERSSON

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från verkstadsbranschen växte, särskilt när textilindustrin stagnerade från början av 1990-talet.


**EXPORT- OCH IMPORTSPECIALISERING**


I Tabell 1 nedan redovisas hur inter-industriell handel för industribranscher i Västerbotten och Västernorrland har utvecklats under några år under efterkrigstiden. De för den regionala utrikeshandeln komparativa fördelarna respektive nackdelarna motsvarar hur branscherna på export och importsidan är uppdelade. Exportindustrier, vilka karaktäriseras av en positiv nettohandel, utgörs av skogssektorn, metall- och senare verkstadsbranschen. De övriga brancherna uppvisar en tydlig komparativ nackdel för efterkrigstiden.


Tabell 1. Inter-industriell handel fördelat på branscher i Västerbotten och Västernorrland.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gruvindustrier</td>
<td>–90</td>
<td>–84</td>
<td>–85</td>
<td>–86</td>
<td>–99</td>
<td>–100</td>
<td>–100</td>
</tr>
<tr>
<td>Trävaruindustrier</td>
<td>62</td>
<td>72</td>
<td>70</td>
<td>21</td>
<td>–2</td>
<td>–20</td>
<td>–46</td>
</tr>
<tr>
<td>Massa-, pappersindustrier</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>91</td>
<td>88</td>
</tr>
<tr>
<td>Jord- och stenvaruindustrier</td>
<td>–100</td>
<td>–100</td>
<td>–100</td>
<td>–100</td>
<td>–100</td>
<td>–77</td>
<td>–100</td>
</tr>
<tr>
<td>Järn- och stållindustrier</td>
<td>23</td>
<td>29</td>
<td>43</td>
<td>100</td>
<td>45</td>
<td>81</td>
<td>87</td>
</tr>
<tr>
<td>Verkstadsindustrier</td>
<td>0</td>
<td>–15</td>
<td>54</td>
<td>45</td>
<td>44</td>
<td>25</td>
<td>9</td>
</tr>
</tbody>
</table>

Anm: Nettohandeln är beräknad genom \( 100 \times (X_i - M_i) / (X_i + M_i) \), där \( X_i \) är export (import) från bransch (i).

Källa: Sveriges officiella statistik (SOS); SM T; Utrikes och varutrafik, varutrafik på lastfartyg mellan Sverige och utlandet fördelat på varukategorier, lossade och lastade varor i 1000 ton mellan Skellefteå och Sundsvall, klassificerat enligt SNI 68.

Tabell 2. Inter-industriell handel fördelat på branscher i f.d. Vasa län.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Livsmedelsindustrier</td>
<td>–86</td>
<td>–77</td>
<td>–35</td>
<td>–18</td>
<td>35</td>
<td>54</td>
<td>65</td>
</tr>
<tr>
<td>Textilindustrier</td>
<td>–82</td>
<td>–32</td>
<td>17</td>
<td>7</td>
<td>8</td>
<td>–53</td>
<td>–31</td>
</tr>
<tr>
<td>Trävaruindustrier</td>
<td>98</td>
<td>94</td>
<td>66</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Massa-, pappersindustrier</td>
<td>99</td>
<td>98</td>
<td>93</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Jord- och stenvaruindustrier</td>
<td>–83</td>
<td>–90</td>
<td>–92</td>
<td>–49</td>
<td>–100</td>
<td>–100</td>
<td>–100</td>
</tr>
<tr>
<td>Järn- och stållindustrier</td>
<td>–88</td>
<td>21</td>
<td>44</td>
<td>38</td>
<td>89</td>
<td>88</td>
<td>80</td>
</tr>
<tr>
<td>Verkstadsindustrier</td>
<td>–71</td>
<td>–58</td>
<td>–18</td>
<td>10</td>
<td>35</td>
<td>38</td>
<td>58</td>
</tr>
</tbody>
</table>

Anm: Nettohandeln är beräknad genom \( 100 \times (X_i - M_i) / (X_i + M_i) \), där \( X_i \) är export (import) från bransch (i).

Införseln av varor från gruv-, mineral-, livsmedels- och petrokemisk bransch var be- stående under efterkrigstiden. Den stora nettoimporten ger vid handen att det fanns komparativa nackdelar i de industrierna under efterkrigstiden.


INDUSTRIBRANSCHERNAS FAKTORINTENSITET

Tillväxten och internationaliseringen under efterkrigstiden bidrog till att fördelningen av produktion, sysselsättning och realkapital på olika branscher blev annorlunda i jämförelse med tidigare. Utrikeshandelnas expansion skapade nya möjligheter till specialisering. Till skillnad från en sluten ekonomi, påverkades den regionala ekonomin inte enbart av det egna landets utbud och efterfrågan på olika varugrupper och sektorer, utan även av de inhemska tillverkarna, i branscherna med stor nettoexport, har haft en stark internationell konkurrenskraft. I andra branscher med svag internationell konkurrenskraft har istället nettoimporten varit omfattande.

Skogsindustrin var den i särklass viktigaste exportindustrin även om exporten från metallindustrin och senare verkstadsbranschen med tiden blev allt viktigare. De komparativa fördelarna inom dessa exportindustrier påverkades av i vilken grad företagen utnyttjade resurser med låg geografisk rörlighet. I fråga om de ovan nämnda exportbranscherna, var insatserna av energi och naturresurser förhållandevis stora i jämförelse med andra branscher. Den industriella karaktären kan i den mening förväntas skilja sig åt mellan branscher och aktiviteter.


Vi kan se att variationerna mellan branschernas faktorintensitet svarar för 55 till 65 procent av variationen i målvariabeln.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PHINT (4.4928)</td>
<td>0.1762**</td>
<td>0.0266**</td>
<td>0.0139**</td>
<td>0.0009</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4.1354)</td>
<td>(5.0694)</td>
<td>(2.9512)</td>
<td>(0.2591)</td>
<td></td>
</tr>
<tr>
<td>NAINT (4.4928)</td>
<td>0.1273**</td>
<td>0.0088**</td>
<td>0.0520**</td>
<td>0.0057*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.6579)</td>
<td>(6.2609)</td>
<td>(2.5896)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.54</td>
<td>0.65</td>
<td>0.60</td>
<td>0.55</td>
<td></td>
</tr>
</tbody>
</table>

Anm: Talen inom parentes är t-värden. ** anger att variablerna är signifikanta på 1 % nivån och * på 5 % nivån. Datamaterialet är organiserat i paneldataset; 9 branscher under 4 år. 36 observationer per variabel.


Den industriella karaktären och de skattade komparativa fördelarna inom exportbranscherna var inte identisk. Användningen av resurser skiljde sig åt mellan de olika branscherna. Av datamaterialet som används till regressionsmodellen framgår att inom skogssektorn är det pappers- och massabranschen som vid de undersökta åren har de tydligaste fördelarna givet faktorintensitet. Vidare framgår det att förbrukningen av energi och råvaror är större per anställd inom metallbranschen än verkstadsbranschen i Västerbotten och Västernorrlands län. Det pekar mot att exportöverskottet inom verkstadsbranschen kan vara avhängigt av andra faktorer.


sursintensiva branscher expanderade på exportsidan, samtidigt som importen inte alls ökade på motsvarande sätt, har regressionsmodellen en bättre anpassning.


RESURSTILLGÅNGAR


Av Tabell 4 framgår att skogstillgångarna ur ett internationellt perspektiv är relativt starkt representerade i Västerbotten och Västernorrland och f.d. Vasa län, även om det för det senare fallet inte är fullt lika tydligt.

Tabell 4. Skogsareal per invånare, regionalt och på de viktigaste exportmarknaderna.

<table>
<thead>
<tr>
<th>Regioner / Länder</th>
<th>1970</th>
<th>1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>Västerbotten och Västernorrland</td>
<td>9,59</td>
<td>9,71</td>
</tr>
<tr>
<td>F.d Vasa län</td>
<td>1,07</td>
<td>1,10</td>
</tr>
<tr>
<td>USA, Kanada</td>
<td>2,79</td>
<td>2,35</td>
</tr>
<tr>
<td>Västtyskland</td>
<td>0,12</td>
<td>0,12</td>
</tr>
<tr>
<td>Frankrike</td>
<td>0,28</td>
<td>0,26</td>
</tr>
<tr>
<td>Storbritannien</td>
<td>0,03</td>
<td>0,04</td>
</tr>
<tr>
<td>Nederländerna</td>
<td>0,03</td>
<td>0,02</td>
</tr>
<tr>
<td>Belgien</td>
<td>0,06</td>
<td>0,07</td>
</tr>
</tbody>
</table>


Källa: SOS; Internationella översikter, arealen fördelning efter användning och skogsbruk, skogsmarksareal efter län. FOS; Skogshushållning, markarealens fördelning. FOS: Ha Vol 2; Export och importtransporter enligt utförselorter och enligt bestämmelseländer åren 1981 till 1990.

Förekomsten av naturresurser av mineralisk art kan vidare äga ett inflytande på utrikshandelns sammansättning. Exporten från metallbranschen visar att det kan finnas komparativa fördelar inom området. Kopplingen mellan gruvor och stålindustri har emellertid försvagats med sänkta transportkostnader och nya producerare. Lokaliseringen av stålindustrier liksom verkstadsindustrier tenderar att bli allt mindre beroende av råvarukällans geografiska hemvist, andra lokaliseringsfaktorer har blivit viktigare under efterkrigstiden (Hansson och Lundberg, 1995). Ett vidare problem i att undersöka komparativa fördelar i mineraltillgångar är att på ett rimligt sätt skatta de regionala tillgångarna i förhållande till internationella.


I Tabell 5 bekräftas bilden av att elmarknaderna är nationella i meningen att prisskillnaderna mellan länderna är stora. Vidare kan vi se att prissättningen i hög utsträckning påverkas av möjligheterna att ex-

---

**Tabell 5. Produktion av elektrisk energi och elpriser i Sverige och Finland på regionala exportmarknader.**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sverige</td>
<td>7537</td>
<td>17130</td>
<td>16</td>
<td>30,3</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>4806</td>
<td>13118</td>
<td>20</td>
<td>38,5</td>
<td></td>
</tr>
<tr>
<td>Nordamerika</td>
<td>8746</td>
<td>15160</td>
<td>25</td>
<td>44,0</td>
<td></td>
</tr>
<tr>
<td>Västtyskland</td>
<td>3846</td>
<td>7420</td>
<td>35</td>
<td>78,9</td>
<td></td>
</tr>
<tr>
<td>Frankrike</td>
<td>2771</td>
<td>6661</td>
<td></td>
<td>52,1</td>
<td></td>
</tr>
<tr>
<td>Storbritannien</td>
<td>4462</td>
<td>5761</td>
<td>36</td>
<td>48,4</td>
<td></td>
</tr>
<tr>
<td>Nederländerna</td>
<td>3138</td>
<td>5423</td>
<td></td>
<td>52,2</td>
<td></td>
</tr>
<tr>
<td>Belgien</td>
<td>3155</td>
<td>6754</td>
<td></td>
<td>60,8</td>
<td></td>
</tr>
</tbody>
</table>

ploatera naturtillgångarna inom länderna. God tillgång på vattenkraft har inneburit låga elpriser. Vidare har utbyggnaden av kärnkraft och andra politiska beslut påverkat prissättningen på elkraft i Finland och Sverige (Statens energiverk, 1988:7).

Den regionala industrin i Botniaområdet har påverkats av tillgången och priset på elkraft. I förhållande till de viktigaste exportmarknaderna är skillnaden i produktion och pris relativt sett stora. Med anledning av det förhållandet har området komparativa fördelar inom elintensiv industrin. En viktig slutsats utifrån de ovan redovisade resurstillgångarna är att de ligger i linje med faktorintensiteten. Detta förhållande förklarar varför exportindustriernas konkurrensfördelar ligger inom områdena energi och skog.

SLUTSATSER

I artikeln har specialiseringen inom handeln i Botniaområdet analyserats med utgångspunkt i Heckscher-Ohlinteorin. Specialiseringsprocessen i handel, avseende inter-industriell handel, har analyserats utifrån faktorintensiteten inom industrisektorn och i linje med har de regionala faktortillgångar undersöks.


REFERENSER


FOS: Industri (I), vol 2; Den industriella verksamheten länsvis inom näringsgrenar.


### APPENDIX 1. Variabeldefinitioner och data

<table>
<thead>
<tr>
<th>Definitioner av variabler och ekvationer</th>
<th>Data källa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a) Beroende variabler</strong></td>
<td></td>
</tr>
<tr>
<td>NET$<em>{ij}$ = ($X</em>{ij}$–$M_{ij}$) / ($X_{ij}$+$M_{ij}$)</td>
<td>SOS; SM T; Utrikes och inrikes varutrafik, varutrafik på lastfartyg mellan Sverige och utlandet fördelat på varukategorier, 1965–1990.</td>
</tr>
<tr>
<td>$X_{ij}$ = Export från industri ($j$) till område ($i$)</td>
<td>FOS; Ha Volym 2; Importens och exportens värde (1000MK.), fördelning enligt varugrupper för hamnar 1967–1975.</td>
</tr>
<tr>
<td>$M_{ij}$ = Import till industri ($j$) från område ($i$)</td>
<td>FOS; Ha Volym 2; import och exporttransporter (ton), fördelning enligt varugrupper för hamnar, 1981–1989.</td>
</tr>
</tbody>
</table>

| **(b) Oberoende variabler**              |            |
| PHINT$_{ji}$ = ($kWh_{ij}$ / $NE_{ij}$) × ($GV_{ij}$ / $\sum GV_{ij}$) | SOS; SM I; regional redovisning, Saluvärde, föråldringsvärde och kostnader för råvaror och bränslen mm samt förbrukad elenergi för åren 1971–75 och 1985–89. Regional redovisning, Antal arbetställen, antal sysselsatta (män och kvinnor), antal sysselsatta kvinnor samt antal arbetstimmar för åren 1971–75 och 1985–89. |
| NAINT$_{ij}$ = ($RM_{ij}$ / $NE_{ij}$) × ($GV_{ij}$ / $\sum GV_{ij}$) | FOS; I volym 2; Den industriella verksamheten länsvis inom näringsgrenar för åren 1971–75 och 1985–89. |

| kWh$_{ij}$ = 1000 kWh förbrukat inom industri ($j$), område ($i$) |            |
| RM$_{ij}$ = 1000 KR/MK i råvaror och bränslekostnader för industri ($j$), område ($i$) |            |
| $NE_{ij}$ = Antal sysselsatta inom industri ($j$), område ($i$) |            |
| $GV_{ij}$ = 1000 KR / MK i saluvärde för industri ($j$) och område ($i$) |            |
| $\sum GV_{ij}$ = 1000 KR / MK i saluvärde för alla industrier, område ($i$) |            |
THE SWEDISH-FINNISH FERRY SHIPPING MARKET:
AN ECONOMIC HISTORICAL PERSPECTIVE

1. Introduction

As part of an infrastructure system, the ferry services support the functions of the land based road system such as conveyance of passengers and vehicles across water barriers. In this system, the ferry service is open to all vehicles and passengers; it meets the demand put on a common carrier.\(^1\) In such Nordic countries as Norway, Finland, Denmark and Sweden, history records that the ferry industry followed a number of economic, political and technological changes during the post-war period.\(^2\) In comparison to other international ferry markets such as the English Channel and Øresund, the rapid growth of the Swedish-Finnish market is remarkably rapid given the late start of car ferry services and the sparsely populated areas of Sweden and Finland.\(^3\) On the Swedish-Finnish routes, about ten million passengers travelled a year and the freight volume a year was approximately four million ton at most.\(^4\)

Given the significant contribution to the trade and travel between Sweden and Finland, it is surprising that the ferry service has not been subject to much academic research. The present study therefore seeks to address this situation and give some insights that might help to explain the Swedish-Finnish ferry markets’ contemporary character. The study will contribute with a historical context and overview of the historical development of ferry shipping on various sub-markets for interpreting the current situation of the ferry industry.

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\(^1\) Schirach-Szmigel (1979), p. 50.
\(^3\) Baird (1999), pp. 33-55; Peiseley (1992), pp. 5-26; Tesch (1999), pp. 3-38.
This paper is organized as follows. Section 2 outlines the past performance on the ferry market while section 3 examines the economic characteristics of the ferry services. Section 4 provides the key features of the ferry industry with respect to market organisation and major operators. Section 5 attempts to identify the causes behind the market expansion and the last section concludes on factors pertinent to the traffic performance and the industry development.

2. Traffic flows between Finland and Sweden

The Swedish-Finnish transport market underwent far-reaching changes in the post-war period with the restructuring of the liner services and the expansion of long distance truck transport. In this process, the ferry industry played a distinctive role by conveying a growing number of passengers, cars and trucks across the Åland Sea and the Gulf of Bothnia. Due to the combined conveyance of passengers and vehicles, the ferry industry not only challenged the monopoly of traditional general carriers but also and foremost changed the market structure of shipping and the relationship towards the domestic transport market by combining different outputs and by integrating the transport network across land and sea.

Conveyance of passengers, cars and trucks

After the Second World War, the car ferry services emerged on short sea markets across Western Europe. The core of this development was between Denmark and Sweden on the Øresund and between Britain and France, Belgium and Netherlands on the English Channel. An important offshoot appeared between Finland and Sweden on the Åland Sea. Across these markets, the passenger travel gathered strength during the 1950s and 1960s. However, the timing and the scope of these short sea markets were not uniform as the Swedish-Finnish market lagged behind and was small in comparison with the English Channel and Øresund.

As to passenger travel it can be shown that between Sweden and Denmark it increased from 2,4\(^5\) to 21,1 million in the period 1950 to 1965 while the Swedish-Finnish traffic increased from 0,2 to 1,8 during the same period. The Channel routes between England and France/Belgium developed slower. Passenger conveyance increased from 2,3 to 6,6

\(^5\) This figure also includes traffic between Denmark and Germany
millions between 1950 and 1965. Due to scope, the Øresund market obviously was by far the largest.\textsuperscript{6}

After the rapid growth of car ferry services in the 1960s, the travel along the Swedish-Finnish routes continued to expand up till the early 1990s as shown in figure 1.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{The conveyance of passengers (.000 omitted) between Finland and Sweden 1960-2003.}
\end{figure}

This figure shows that the passenger travel has increased from 0.8 to 9.1 million between 1960 and 2002. We also find that the growth was high in international comparison. However, the steady growth of almost 6 per cent per year underwent a number of shifts. The first phase, recognised as the take-off, occurred between 1965 and 1973. During this period the growth reached almost 16 per cent a year while however, the development was much slower in the years following the first OPEC crisis. Thereafter, the travel expanded again and the growth rate was close to the steady state over the period 1977 to 1985. In the late 1980s, an upswing is observed and between 1985 and 1992, the growth rate reached 6.6 per cent a year. During the following years of the 1990s, the travel developed less progressive and the record-breaking years’ seems to have been out of reach ever since.

The development on the Swedish-Finnish market kept pace with or was more rapid than on other short sea markets across Western Europe. Although the Øresund and the Channel still outnumbered the Swedish-Finnish routes in the mid 1990s, the differences in relative terms had decreased. The Swedish-Finnish traffic had grown faster than that on the routes between Denmark and Sweden. The number of passengers

\textsuperscript{6} Schirach-Szmigel (1979), p 50; SOS shipping 1965.
conveyed across the Øresund was 11 times higher in 1965 and by 1996 this ratio was 2.7. In turn the difference in size remained between the Channel and the Swedish-Finnish market, as the former was over three times greater in 1965 as well as in 1996.⁷

The pattern of travel between Finland and Sweden is also closely mirrored in the conveyance of cars. About ten per cent of the passengers brought their car on the trip. Although this level was somewhat lower in the first years of the period, the share of ten per cent is surprisingly perpetual between 1967 and 2003. One exception from this pattern is the quite extraordinary market development during the economic crisis in the early 1990s. Figure 2 shows the conveyance of cars.

**Figure 2. The conveyance of cars (.000) between Finland and Sweden 1960-2003.**

As figures 2 and 3 show, the long-run trends in traffic flows are quite similar. This close relation between passengers and cars indicate moreover that the travel between Finland and Sweden was affected by of the development of short and long distance traffic by cars and related tourism activities. In that sense, the integration between the sea and the land transport system stimulated traffic flows. In a Nordic perspective, this integration is clearly shown in figures recorded from the permanent ferry lines.⁸ As such, the ferry services between Finland and Sweden captured a share that stood in proportion to the passenger numbers. The cars conveyed across the Øresund were 11 times higher in 1965 and 2.6 in 1996. On the English Channel, the number of cars was 5.3 time higher in 1965 and 6.6 in 1996. The market size in terms of passengers is closely mirrored in the conveyance of cars accordingly.

---

The integration with the land transport system is moreover seen in the conveyance of trucks. Figure 3 shows the number of trucks conveyed between Finland and Sweden. The basic pattern of market growth is seen also in terms of trucks. However, the volume of freight recorded by the number of trucks developed without the characteristic boom and bust periods seen in the cases of passengers and cars. As to truck conveyance we find a gradual increase over time and two periods of higher than average growth. These periods of high growth occurred between 1967 and 1977 and between 1985 and 1995. After 1995, the market seems to have saturated.

Figure 3. Number of trucks conveyed (.000) between Finland and Sweden 1960 to 2003.

![Graph showing the number of trucks conveyed between Finland and Sweden from 1960 to 2003.](image)


The close integration between the road transport network and the ferry services is clearly seen by the conveyance of cars and trucks. We find this pattern on the short sea market between the Nordic countries and between the United Kingdom and the continent. On the latter market the development was especially rapid in first half of the 1960s. However, both the Channel and the Swedish-Finnish market were outnumbered by the remarkable growth on the routes between Denmark and Sweden in the period 1950 to 1965. The scope of these markets changed however over time. By 1996, the number of trucks carried in thousand was the following: the English Channel 1623, Øresund 338 and Sweden-Finland 232. The ferry services operating on the channel are clearly of a different magnitude in terms of passengers, cars and trucks.

---

On the Nordic ferry market, traffic between Denmark and Sweden and Denmark and Germany respectively, was by far the largest. Compared to the latter two, the Swedish-Finnish ferry services have achieved a higher growth rate since the 1960s. The latter market developed more rapidly than that seen on the Øresund. The great differences seen initially have been reduced in terms of passengers, cars and in particular in truck conveyance.

Traffic flows at the Åland Sea and the Gulf of Bothnia

The Swedish-Finnish ferry services centred on two distinct submarkets: the Gulf of Bothnia in the north and the Åland Sea in the south. The ferry network across the Åland Sea connects two main population centres in Sweden and Finland. In Finland the Southwest area is connected. This area encompasses the capital Helsinki and the third largest city Åbo together with the Åland Islands. In Sweden, the ferry routes connect the capital of Stockholm and her suburbs. The ferry network across Gulf of Bothnia connects or has connected mainly four Swedish and two Finnish cities along the shore. These Swedish and Finnish cities are small in comparison. While Helsinki and Stockholm inhabit one million people respectively, the cities along the Gulf of Bothnia have less than 100 thousand people each.\(^\text{10}\)

In conjunction with the overall expansion on short sea markets, the development of ferry services on the Gulf of Bothnia and the Åland sea since 1960 shows the concomitant features of growing numbers of passengers, cars and trucks carried. Although the Gulf of Bothnia lagged somewhat in time, the growth rate and market fluctuations were quite similar. However, as highlighted in table 1, the scope of the two markets was different.

The ferry companies carried the bulk of passengers, cars and trucks across the Åland Sea, about 90 per cent of all passengers. The ferry operators on the Gulf of Bothnia conveyed 13 per cent of the cars and 5 per cent of the trucks in the period 1960 to 2003. However, these proportions were not constant over time. The travel across the Gulf of Bothnia advanced in the early 1970s and during the 1980s while the proportion of car and truck conveyance was higher in the period 1971 to 1987. The figures on traffic flows by sub-markets also show that the Gulf of Bothnia was more dependent on passenger and car conveyance.

\(^{10}\) SOS population census 2000; Finnish Official Statistics (FOS) population census 2000.
Table 1. Number of passengers, cars and trucks conveyed (.000) at the Gulf of Bothnia and the Åland Sea every five year 1960-2000.

<table>
<thead>
<tr>
<th></th>
<th>Gulf of Bothnia</th>
<th>Åland Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Passengers</td>
<td>Cars</td>
</tr>
<tr>
<td>1960</td>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>1965</td>
<td>104</td>
<td>13</td>
</tr>
<tr>
<td>1970</td>
<td>423</td>
<td>41</td>
</tr>
<tr>
<td>1975</td>
<td>428</td>
<td>62</td>
</tr>
<tr>
<td>1980</td>
<td>648</td>
<td>99</td>
</tr>
<tr>
<td>1985</td>
<td>966</td>
<td>101</td>
</tr>
<tr>
<td>1990</td>
<td>1 013</td>
<td>110</td>
</tr>
<tr>
<td>1995</td>
<td>968</td>
<td>86</td>
</tr>
<tr>
<td>2000</td>
<td>267</td>
<td>44</td>
</tr>
</tbody>
</table>


The ferry services was also characterised by substantial seasonality.\(^{11}\) The Swedish-Finnish ferry market is not an exception to that rule. On the contrary one would expect that passengers and thus cars to be subject to seasonality.\(^{12}\) In line with these expectations, we also find that the seasonality was significant in the ferry services across the Gulf of Bothnia and the Åland Sea. At the Gulf of Bothnia about half of the annual passenger volume was carried during the summer months (June, July and August). In the off-peak months during the winter (December, January and February) only about ten per cent of the annual traffic was conveyed.\(^{13}\) In the winter, the traffic was exclusively upheld at the narrowest passage between Umeå and Vasa.\(^{14}\) However, the seasonal fluctuations on the Åland Sea were less significant.\(^{15}\)

Despite high seasonality and business cycles it can be concluded that the growth of traffic between Finland and Sweden gathered a remarkable strength in the post-war period. However, the scope of the local markets differs.

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\(^{13}\) Cruise and ferry info, Halmstad: ShipPax information, 1990-1999. The summer traffic (June, July, August) comprises 40-55 per cent of the annual passenger traffic. The winter traffic (January, February, March) has been fluctuating between 6 and 13 per cent of the annual traffic.

\(^{14}\) During wintertime 1st November – 30th April ice-class (1A) is required. Layton (1981), pp. 51-63.

\(^{15}\) Cruise and ferry info, Halmstad : ShipPax information, 1990-1999. At the Åland Sea, approximately 20 to 22 per cent of the passengers are carried in the off-peak season and 32 to 35 per cent in the peak season.
3. Economic characteristics of ferry services

As seen in the section above, it would appear that the ferry industry combines two distinctive services: the conveyance of passengers and vehicles. As such, the ferry services are part of the market for shipping services together with liner freight services, wet bulk and dry bulk shipping. For the most part, the ferry services resemble the liner services.

The liner freight services provide a fixed service at regular intervals between ports and offer transport to any goods in the catchment area served by those ports.¹⁶ The ferry services are organised in a similar way. Due to the roll-on-roll-off (ro-ro) technique, it is technically related to the liner ro-ro services. However, the ferry services are not organized in conferences and passenger conveyance constitutes a distinctive part of the services.¹⁷

The ferry services between Finland and Sweden are moreover connected to the market of maritime tourism and leisure. Ferries supply onboard services such as shopping, dining and entertainment facilities. Due to that fact, it seems clear that the ferry industry combines three different outputs: the combination of passengers, vehicles and on board services could. In that sense it could well be defined as cruise ferry services.¹⁸ This cruise ferry services comprise two basic elements: the pure transport and the recreation supplied onboard. From this point of view, the cruise ferry services draw attention to the relations with the liner and cruise services. To pinpoint the economic characteristics of ferry services, these relations are outlined in the following part.

From the outset, ferry services seem to be part of the liner freight services due to the ro-ro technique applied and the organisation of the services as both provide a fixed service, at regular intervals between ports; they offer transport to any passenger or vehicle. From an economic viewpoint the way of organising the liner service is associated with capacity inflexibility. However, this capacity inflexibility is not only limited to the inflexibility following a fixed itinerary and scheduled activities. An additional problem is that capacity is not continuous. Capacity is a series of ship-sized increments. This has caused problems for ferry operators in both expanding and decreasing capacity. In addition to business cycles which affect all shipping business, seasonality occurs on many routes, when the traffic is more intense at some times of the year and less so in others. In a situation of growing traffic, the input of new ships is lagged in time and restricted by the service frequency. A

fixed liner service cannot easily increase or reduce the capacity supplied in the short run. Therefore capacity management is an important part of the business.

An additional part of liner service is pricing. Since the company is committed to running the services regardless of cargo volume, the operators tend to bid against each other for available cargo. As they undercut each other the risk for low converge of cost is imminent on a volatile market.\footnote{Stopford (1997), pp. 337-366.}

However, the combination of the pricing problem and the capacity inflexibility featuring the liner services is somewhat different for ferry services. While the capacity management is similar, the principle of pricing in ferry services has two distinctive features. First, the combination of passengers and vehicles leaves the ferry company with an opportunity, by way of pricing, to make a trade-off between passenger and freight revenue. Liner companies are confined to the revenue of freight. Secondly, the pricing of passenger conveyance is not restricted to ticket pricing. A ferry company has the possibility to supply services and commodities onboard. Therefore, we find a feasible trade-off between ticket revenue and onboard revenue accordingly. Due to that reason, parts more often found in the cruise services feature the ferry services.

Similar to cruise services, the management of capacity is crucial for generating sufficient revenue to cover average cost.\footnote{Bull (1996), pp. 28-35.} If the market is not strong enough, neither cruise nor ferry services can reduce the supplied capacity without taking ships out of service. It is therefore preferable to try to maintain passenger numbers in almost any possible way. In addition, the costly capital and labour expenses associated imply the importance of utilizing the efficiency measures that are feasible in this business. However, again it needs to be emphasised that the multi-product structure incurs two obvious gains. From a cost perspective, the multi-product could be efficient in that output lines share the same ships. Different outputs share the costs associated with operating a ship. The basic pricing and capacity problems featuring the ferry industry draw attention to both cruise and liner services respectively.
4. Market organisation and major players

The ferry industry developed into a capital-intensive part of the tourism and shipping market during the post-war period. The investments in car ferries of large size and high quality changed the services supplied. A salient feature was the introduction of luxury ferries, which were more closely related to cruise ships than traditional passenger carriers. In managing these ferries, the companies could charge different prices and combine outputs to cover cost.

In considering capacity and price formation it should be noted that the ferry market is not characterised by perfect competition. On the Swedish-Finnish markets, we find a small number of companies. These companies, by their actions, had the potential to affect traffic performance. To maintain ferry services heavy capital investments are required as well as high liquidity to power and man the ferries. These features could be attained as high costs of entrance in the case that the market is consolidated. In practice, competitors on these markets have used different strategies to secure market positions, such as price competition, concept differentiation or by acquiring competitors. In the following, the competition and co-operation among the companies are outlined.

Operators and strategies on the Åland Sea

Competition and co-operation have for long characterised the relation between ferry companies on the Åland Sea. Prior to the introduction of car ferries in the 1960s, Swedish and Finnish companies worked in close co-operation on the Åland Sea. The three early operators on this market, Finska Ângfartygs AB (later Effoa) and Ângfartygs AB Bore (later Bore Line), and one Swedish company, Rederi AB Svea (later Svea) initiated a cartel co-operation already in 1918. This concurrent effort developed a step further with the funding of the affiliated company Ab Siljarederiet in 1957. The aim was to co-ordinate their actions and to specialised on ferry services between Finland and Sweden. In addition, the parent

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22 The three companies, Finska Ângfartygs AB, Ângfartygs AB Bore and Rederi AB Svea agreed on the so-called “samseglingen” in 1918. This agreement comprised co-operation on the list of sailings, ticket prices, and freight rates. Sörensen (1979), p. 23 and 26.
23 The stocks were divided equally between the funding companies. Sörensen (1979), pp. 76-86.
companies decided to transfer the shipowning function to their affiliated company. Although the investments in tonnage were confined to second hand in early beginning, it soon progressed with the introduction of the first car ferry Skandia in 1961 and her sister ship Nordia in 1962.  

In 1959, two smaller companies entered the market. The Swedish company, Slite AB and one Finnish company Rederi Ab Vikinglinjen (later SF line AB). With support from a third company, Ålandsfärjan Ab (later Rederi AB Sally), a second affiliated company was established on the Åland Sea in 1966. The three companies formed the affiliated company Vikinglinjen_AB and shared the stock equally. The structure of the company is shown in table 2. The three companies co-ordinated their actions within Vikinglinjen_AB such as time schedules, route networks, marketing and accounting. The revenue was shared between the companies. However, unlike Ab Siljarederiet, no shipowning or management functions were transferred to Vikinglinjen_AB. The company activities were also confined to routes connected to the Åland islands in the early years of her existence.  

Table 2. Company structure of Viking line and Silja Line, 1957-1995.

<table>
<thead>
<tr>
<th>Viking Line</th>
<th>Silja Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF Line AB</td>
<td>Effoa AB</td>
</tr>
<tr>
<td>(1966-1993)*</td>
<td>(1957-1995)*</td>
</tr>
<tr>
<td>AB Sally</td>
<td>Bore Line AB</td>
</tr>
<tr>
<td>AB Slite</td>
<td>Svea AB</td>
</tr>
<tr>
<td>(1966-1993)*</td>
<td>(1957-1993)*</td>
</tr>
</tbody>
</table>

Vikinglinjen
AB (1966)**

(SF Line AB)

Viking Line
Abp (1993)**

AB Silja rederiet
(1957)**

Silja Line AB
(1971)**

(Effoa AB)

Silja Line Abp
(1995)**

Note: * Denotes the length of the partnership. ** Denotes the year of establishment. Note that SF line AB changed name to Viking Line in 1993 and Effoa AB changed her name to Silja Line in 1995.


25 The part-owners in Viking Line have been family companies and the ownership was originally in hands of several hundred private persons living on the Åland islands.
The two major players on the emerging market, *Vikinglinjen Ab* and *Ab Siljarederiet*, managed to reach strong positions on the market while the two smaller operators, *Eckerö Linjen* (established in 1960) and *Birka Line* (established in 1971), conveyed a less significant part of the passengers and vehicles. This situation on the market, with two large and two small operators have been surprisingly stable over time, which suggests an early consolidation of the market relations. However, as seen on most other markets, also the companies operating on the Åland Sea were eager to extend their market shares.

Due to this aim, *Ab Siljarederiet* made an attempt in the early 1960s to capture *Vasabåtarna* (operating at the Gulf of Bothnia). However, this venture was not accomplished.\(^{27}\) In turn, *Ab Siljarederiet* carried out large tonnage investments to meet the growing traffic flows across the Åland Sea in the mid 1960s. Despite the investments in larger ferries, the unpredicted growth of demand was simply not met by her growing capacity.\(^{28}\) The other companies kept their shares or advanced, as in the case of *Viking Linjen Ab*.

The market situation changed quite swiftly when *Vikinglinjen Ab*, carried out an offensive strategy for market domination. This company accomplished heavy investment in modern tonnage and introduced a low price policy. *Ab Siljarederiet* adopted the same strategy.\(^{29}\) As a result, an intense competition featured the market in 1968 and ticket prices became eventually the lowest in Northern Europe.\(^{30}\) However, as the market boomed in the late 1960s, the companies’ low price policy was presumably covered by the increase in traffic flows.

To meet the new structure on the market, the parent companies of *Ab Siljarederiet* decided to change name and functions of their affiliated company. In 1971, the shipowning and management functions was abandoned and *Silja Line* turned out to be, likewise as *Vikinglinjen Ab*, confined to the commercial operation of ferries.\(^{31}\)

However, as the commercial opportunities rapidly changed in the early 1970s the position of *Ab Siljarederiet* was weakened. The market development turned out to be in favour to *Vikinglinjen Ab*. This company labelled as *Viking Line* in 1970, extended her business and established traffic between the Swedish and Finnish mainland. Together with new investments, the predominance of *Silja Line* was challenged on the Åland Sea. *Silja Line* eventually lost market shares and for the first time since

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\(^{27}\) Finne och Hagman (1973), pp. 47-50.


\(^{29}\) Schirach-szmigel (1979), p. 122; Sörensen (1979), pp. 142-145.

\(^{30}\) Schirach-szmigel (1979), pp. 116-117.

the 1960s, the balance between these two operators shifted. Viking Line was the largest company and carried close to 2 million passengers across the Åland Sea. The company held 44 per cent of the passenger market while *Silja Line* conveyed 36 per cent of the passengers in 1974.32

Despite this rapid shift in market relations, the situation did not cause a price war. On the contrary, the companies focused mainly on quality instead of price.33 The ferry companies developed the quality and images in terms of the investments in vessels accomplished during the 1970s and 1980s. The modernisation of tonnage increased both the carrying capacity and the capacity of onboard services.

**Table 3. Changes in ferry size by year in *Silja Line* 1960-2000.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Ship</th>
<th>Tonnage (Tons gross)</th>
<th>Passengers</th>
<th>Cars</th>
<th>Length of car deck</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td><em>Skandia</em></td>
<td>5068 (3593)</td>
<td>1200</td>
<td>175</td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td><em>Nordia</em></td>
<td>5631 (3631)</td>
<td>1200</td>
<td>175</td>
<td></td>
</tr>
<tr>
<td>1966</td>
<td><em>Fennia</em></td>
<td>10452 (6178)</td>
<td>1200</td>
<td>165</td>
<td>370</td>
</tr>
<tr>
<td>1967</td>
<td><em>Botnia</em></td>
<td>4291 (3514)</td>
<td>1000</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td><em>Bore 1</em></td>
<td>12281 (8258)</td>
<td>1200</td>
<td>340</td>
<td>500</td>
</tr>
<tr>
<td>1972</td>
<td><em>Svea Regina</em></td>
<td>10341 (8020)</td>
<td>1000</td>
<td>146</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td><em>Aallotar</em></td>
<td>10241 (7800)</td>
<td>1000</td>
<td>146</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td><em>Wasa Queen</em></td>
<td>16546</td>
<td>1600</td>
<td>210</td>
<td>480</td>
</tr>
<tr>
<td>1977</td>
<td><em>Finnjet</em></td>
<td>32940</td>
<td>1781</td>
<td>395</td>
<td>715</td>
</tr>
<tr>
<td>1980</td>
<td><em>Wasa King</em></td>
<td>15600</td>
<td>2000</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td><em>Finlandia</em></td>
<td>33575</td>
<td>1700</td>
<td>450</td>
<td>1.020</td>
</tr>
<tr>
<td>1986</td>
<td><em>Silja Festival</em></td>
<td>34414</td>
<td>1916</td>
<td>306</td>
<td>885</td>
</tr>
<tr>
<td>1990</td>
<td><em>Silja Serenade</em></td>
<td>58376</td>
<td>2500</td>
<td>450</td>
<td>900</td>
</tr>
<tr>
<td>1991</td>
<td><em>Silja Symphony</em></td>
<td>58377</td>
<td>2852</td>
<td>450</td>
<td>900</td>
</tr>
<tr>
<td>1993</td>
<td><em>Silja Europa</em></td>
<td>59912</td>
<td>3123</td>
<td>400</td>
<td>860</td>
</tr>
</tbody>
</table>

*Note:* Ships occasionally employed are not included. The figures on tonnage in tons gross are different between the sources. The figures in brackets are given by Sörensen (1979).


In table 3, changes in ferry size by year in *Silja Line* is outlined. The shifts in tonnage discerned, gives some information on the objectives of capacity management. Obviously, the need to increase carrying capacity is shown by these figures. One perhaps equally important side of the investments was to upgrade the passenger service. The car vessels introduced in the late 1960s clearly captured ideas from cruising vessels, and the materialisation of these ideas in luxury ferries was aimed to

32 *Svensk sjöfartstidning* [Swedish Shipping Gazette] (1975), no. 8 p. 20 and 21.
attract additional passengers. In that sense, the larger capacity and the
greater attraction seem to follow hand in hand.

The ferries were also aimed to meet different market segments. While some ferries offered leisure for children, teenagers and adults other ferries offered restaurants and conference facilities to attract business travel.\textsuperscript{34} Due to that development, consumption onboard became increasingly important, while conveyance became perhaps less obvious. The preferences associated with cruising featured this development of cruise ferry accordingly.

However, the development on the market was such that larger ferries were not always matched by traffic flows. The boom at the market in the late 1960s and early 1970s was challenged by the first OPEC crisis and its aftermath. Hence, the ferry industry met its first recession since the start in 1961. During this downturn, the distribution of market shares changed further. \textit{Silja Line} lost market shares while \textit{Viking Line} gained a stronger position. In 1978, \textit{Viking Line} had about 50 per cent of the passenger and vehicle market.\textsuperscript{35} This new situation on the Åland Sea was later consolidated when the \textit{Bore line} left \textit{Silja Line} in 1980.\textsuperscript{36}

The two remaining owners of \textit{Silja Line} accomplished large tonnage investment in the period 1977 to 1986. The ferry size increased from about 10 000 tons gross to some 30 000 in this period as seen in table 3. \textit{Viking Line} was moving in the same direction as seen by her introduction of so-called jumbo ferries in the 1980s.\textsuperscript{37} The new ships \textit{Rosella} (1980) \textit{Mariella} (1985) and \textit{Olympia} (1986) each carried between 1700 and 2500 passengers.\textsuperscript{38}

The modernisation of tonnage changed not only the capacity but moreover the means to attract passengers. The strategy of price competition, most evident in the late 1960s, was left aside and the competition turned into an issue of product diversification based on quality and images. The concentration on segments on the market helped the operators to develop custom networks and realise rapid rates of growth. In this regard the main operators seems to have distributed the market between each other. The early concept of low price policy, held by \textit{Viking Line}, was put in a new form. The focus changed from attracting all potential passengers to a segment of potential travellers associated with economic cruising. By offering an economic alternative

of foreign travel, the operator attempted to attract families, teenagers and seniors with less spending abilities. On the other side, *Silja Line* created a product concept associated with high quality and luxury. A mix of business cruise and conference facilities emerged. The operator offered a sophisticated service mainly to attract passengers with ample spending abilities and the expanding group of business travellers. The strategy of product diversification arisen in ferry shipping reduced the competition around ticket prices. In turn, this development also meant that the services became a substitute for other recreation and tourist activities.

The growing product diversification together with the boom at the market did not have a strong impact on the market shares. On the contrary, *Viking Line* kept her 50 per cent of the market while *Silja Line* held some 40 per cent. The market seems to have consolidated in the 1980s. With that in mind it is interesting to note that within the *Viking Line*, a number of corporate changes occurred. The parent companies’ had somewhat different interests. *Rederi AB Sally* achieved a good position on the route between Stockholm and Helsinki. The traffic flows on this route contributed with a strong cash flow. In line with sharing the bulk lines, the other companies were keen on breaking into this profitable business. This seems to be one of the reasons why the *SF-Line* and the *Sally* did not agree on the distribution of routes. In 1983, the questioned arrangement ended, and a negotiation took place. However, the distribution of routes could still be a cause of conflict.

By tradition, the shipping companies in *Viking Line* had somewhat independent interests. In the time of establishment and expansion, the interests seem to have fit the organisation. However, in the 1980s the shipping companies held rather different objectives. *Sally* was rather active in expanding her market shares on the Gulf of Bothnia, the English Channel and the Caribbean Sea. Also in the shipping related sectors, the company expanded. Interests held in accommodating services and shipbuilding industries are some examples. The latter became more of a single company affair and the other *Viking Line* companies did not always share the objectives. The conflicting interest was however not equally important as financial difficulties when Sally and Slite left the co-operation in 1988 and 1993.

Despite these corporate changes, *Viking Line* kept a dominant position on the Swedish-Finnish ferry market. SF-line, the largest of the three captured a good part of the tonnage and the traffic as the other two

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41 *Svensk sjöfartstidning* (1982), no. 1-2, p. 44.
The company conveyed 49 per cent of the passengers across the Åland Sea in 1993 while *Silja Line* carried 38 per cent, *Birka Line* 6 per cent and *Eckerö linjen* 7 per cent. *Viking line* also conveyed half of the vehicles on this market. The turbulent time of corporate changes seems not to have challenged the position on the ferry market.

*Silja Line* also underwent a series of changes in corporate structure. Since Bore Line pulled out in 1980, *Effoa* and *Svea* have owned *Silja Line* on a 50 – 50 basis. In 1981, the Svea company was transferred to the Swedish Nordstjernan concern, which became the NCC consortium at the end of the 1980s. Thereafter, Svea’s part was transferred to the Swedish Johnson Line Ab. In 1991, Johnson Line passenger division and EFFOA were merged and in 1995, the Effoa company changed name to *Silja Line*.

In conjunction with the changes in corporate structure, *Silja line* managed to develop its quality and image. The strategy of market segmentation had resulted in a concentration on services such as luxury cruising and business conferences. By offensive marketing and service development *Silja Line* managed to increase the traffic in the off-season. *Silja Line* kept a large share of both vehicle and passenger conveyance and due to the rapid market development in the 1980s. In the second half of the 1990s *Silja Line* eventually captured a larger share of passenger conveyance across the Åland Sea as her market share reached 42 per cent in 1997 while *Viking Line* held 43 per cent.

The market developed slowly in the 1990s. After the boom between 1990 and 1992, the market stagnated due to the economic crisis in Finland and Sweden and the Estonia catastrophe in September 1994. The tonnage investments accomplished by *Silja Line* and *Viking Line* in the period 1990 to 1993 was not seen in the traffic flows. The market of passenger and vehicle conveyance developed less progressively compared to the 1980s. However, the ferry companies managed to cover costs despite the slow market development at the Åland Sea. One

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47 Svensk sjöfartstidning (1985), no 1-2, pp. 32-33.
important reason was the expansion on the Gulf of Finland, between Finland and Estonia. Since the early 1990s, the expansion of passenger conveyance has been the fastest in the Baltic area. Although Tallink was the first operator on the market, Birka, Eckerö, Viking and Silja Line soon followed and expanded their volumes and market shares.\(^{50}\)

The Gulf of Bothnia

The Gulf of Bothnia was from the start of car ferry services in 1965 dominated by one single operator. The Finnish company *Vaasa Umeå AB* (*Wasa Line*) has had a strong position on this market. However, the situation cannot be characterised as monopolistic. In 1969, the minor operator *Jacob lines* started traffic on the north route Skellefteå-Jakobstad/Karleby in the non-ice season, transporting mainly passengers and cars. The operator held a market share of approximately 6 to 12 per cent of the passengers between 1969 and 1980. In the 1980s a formal market division was carried out. The *Jakob lines* focused on the Northern route while *Wasa Line* kept her position on the Southern routes. The agreement consolidated a duopoly market structure.\(^{51}\)

In 1982, the owner of *Wasa Line*, Enso Gutzeit, transferred both the company and the tonnage to *AB Sally*. Despite the new ownership, *Wasa Line* remained an independent company, responsible for the commercial operation of the services. After financial difficulties however, *Silja Line* bought *AB Sally* (2/3 majority) in 1987. Still, *Sally* remained owner of *Wasa Line*. The company consolidated by concentration on the Gulf of Bothnia and the English Channel, and by acquiring *Jakob line*, a monopoly market structure was finally arranged. After new financial difficulties however, *Silja line* acquired *Wasa Line* in 1992 and integrated her with the business activities in 1993.\(^{52}\)

In the period 1960 to 2000, *Wasa Line* developed from a small-scale transport company into a large-scale cruise ferry operator. In the early 1960s, small vessels carrying some 120 to 450 passengers characterised


the ferry service. Growing turnover and high profit rates made possible a new direction. In a few years four car ferries were introduced, and by expanding on new routes, the ferry service was put into a new shape. Investments in port facilities, and relocation of ports made movements of passengers and vehicles more efficient. Wasa line was keen on marketing. In the local press, the company intensively introduced the ferry services to potential travellers. Sales arguments such as discounted ticket prices together with favourable prices on commodities onboard and price differences between Sweden and Finland were frequently mentioned in the advertisements.

The market development was rapid between 1965 and 1973 and the industry showed a high capacity utilisation, when the supply seems to have met the new commercial opportunity in this period. Despite the higher quality of ferries, ticket prices were only modestly adjusted. Instead, the price policy was designed to attract passengers and thus to increase the travel frequency. Discounted ticket prices with low coverage of costs meant that income of onboard shopping grew in importance.

Thanks to the boom at the market, permanent year around traffic was established. The low traffic intensity in the winter month meant however that the costs had to be covered by revenue arrived during the summer. To attract passengers in the off-season, discounted prices, among other things, were adopted and intense marketing and special offers for travel became distinctive parts. By offering transport of half or less of the fairly low regular prices, a very strong interest was shown to stimulate the passenger traffic flows. The concept of leisure and shopping became important for the industry as noted in a study from 1969.

The market development underwent a number of shifts as seen previously in figure 1, 2 and 3 (page 3, 4 and 5). Although the business cycles affected the traffic performance, Wasa Line retained the business concept. During the OPEC crisis in the 1970s, the concepts were kept despite higher operation costs associated with the rising oil prices and

54 The former ferries were permitted to carry between 200 and 450 passengers, the new generation had certificates to carry between 800 and 1000 passengers.
55 Finne och Hagman (1973), pp. 54-73.
56 Advertising material derived two Swedish daily papers. They are both located in the city of Umeå, county of Västerbotten. The first newspaper is labeled Västerbottens Kuriren and the next Västerbottens Folkblad. The search of advertising material was accomplished for the period 1976 to 1998. The selected material comprises one winter month and one summer month each year.
labour costs. The higher operation costs due to a fourfold increase in oil prices, and increased cost of staff, besides discussion of tax-free abolition, led to reduced profitability and great uncertainty in Swedish-Finnish ferry industry.


The ferry service presumably achieved high efficiency of capacity as the traffic flows developed rapidly after the investments in additional tonnage.

In the 1990s, the ferry industry underwent a turbulent period. The boom in the early 1990s and the bust following the economic crisis and the Estonia catastrophe implied that long-term planning became increasingly difficult. Together with the seasonal fluctuations, where the need for extra capacity in the summer season was crucial, the operator seems to have met this uncertain market state by moving ferries across different routes. However, as seen in the traffic figures, the investment in additional tonnage did not materialise in terms of traffic flows. The market development was slow after the boom in the early 1990s.
5. Factors pertinent to the traffic and the industry performance

At the end of the 1950s, the ferry industry gathered strength at the English Channel and at Øresund. The Swedish-Finnish industry was less developed. By the end of the 1960s, the situation had changed. The passenger conveyance had increased from 0.8 to 2.7 million between 1960 and 1970 and the traffic across the Åland Sea had surpassed earlier expectations.\textsuperscript{63} The Swedish-Finnish ferry market became one important offshoot of the developments seen on the English Channel and the Øresund. At this offshoot, the traffic went through a remarkable growth up until the early 1990s when about 10 million passengers a year were conveyed.

Explaining the performance of the industry and the passenger and vehicles conveyance includes many different issues. This pattern of traffic flow could be the result of numerous economic, political and technological changes. In the following section, an attempt is made to discern the impact of potential factors on passenger and vehicles figures.

Advances in transport technology

Sweden and Finland have a transport infrastructure that meets challenges associated with long distances, low population density and cold climate. Water barriers obstruct the transport between the countries.\textsuperscript{64} The geographical situation and the large market share of road transport are however the basis of ferry services.

The integration between land and sea transport systems underwent a number of changes in the post-war period. One significant change was the introduction of ferries equipped with the ro-ro technique. Due to the advances in transport technology, the ferry services could adopt a more cost-efficient organisation. The ferry services could offer fast and scheduled transports at low costs. The ro-ro ferries need limited time for cargo handling. It has also been estimated that the cost of handling general cargo is lower. After the introduction of ro-ro or car ferries the handling costs went down by 50 per cent or more.\textsuperscript{65} Without the advances

\textsuperscript{63} Nordisk utredningsserie (1966:5) pp. 97-112.
\textsuperscript{64} Nord (1987:58), pp. 15-19.
\textsuperscript{65} Schirach-Szmigel (1973), p. 84.
in transport technology and the transport infrastructure, the establishment of car ferry services is difficult to explain.

Bilateral trade

The development of bilateral trade between Finland and Sweden, together with the transit traffic, comprised a growing market for car ferry services. As such, the scope and the composition of this trade were important for the demand of transport services. The total volume is a measure of the total demand while the composition of trade specifies the distribution of this demand between different modes of transport. In the choice of mode the value to volume ratio of commodities, among other things is important. In the decision between transport modes it is shown that a low value per ton gives the bulk carriers a competitive advantage whereas the liner carriers are better suited to carry general cargo. In turn, the trucks on ferries have an advantage in general cargo of a higher value. This latter advantage lies in that the transport time is shorter and that trucks better achieve the flexibility in the door-to-door transport. These advantages of different modes of transport are one indication of how the scope and composition of bilateral trade can affect the conveyance of trucks on ferries.  

The bilateral trade volume between Finland and Sweden grew rapidly during the post-war period. This trade volume increased from 1 million tons in 1960 to 11 million tons in 2000. During the 1960s the volume doubled while, it increased three-fold in the 1970s. The growth was occasionally slower in the 1980s while it turned out to be strong in the 1990s. The boom in bilateral trade flows gives one indication of the growing freight market. However, the distribution between modes is less clear.

The composition of trade changed significantly as the commodities exchanged more and more often originated from the same kind of industry. This trade between industries, the so-called intra-industry trade, gathered strength in the post-war period. Due to the slow growth of bulk goods such as wood and the rapid growth of engineering products it is reasonable to suggest that the general cargo conveyed increased. At a more detailed level, it can be shown that wood products dominated the Finnish export to Sweden after the Second World War. At the end of the 1950s however, the Finnish wood industry stood for almost half of the export to Sweden. By 1980 the situation was largely reversed. The share

of wood products was 13 per cent of the export value and in 2000 it was only 5 per cent. The engineering industry share of Finnish export had increased from 16 per cent in 1960 to 35 per cent in 1980 and 48 per cent in 2000.\textsuperscript{67} The pattern of trade suggests that the demand for bulk shipping services developed slower than that for general carriers.\textsuperscript{68}

Due to the advances in transport technology, the ferry and liner shipping services could match this growing market by lower transport costs and convenient cargo handling. In the case of ferry services, the market of tourism and migration travel also gathered strength in the 1960s and later.

\section*{Tourist travel}

Tourist travel developed into a distinctive market during the post-war period. One important reason was that travel became accessible for a larger part of the population, as levels of income increased.\textsuperscript{69} Improvements in transport and communications also made tourist travel less dependent on the limitations of distance and time.\textsuperscript{70}

Nordic tourism developed into a broad field of activities after the Second World War. Higher standard of living and with longer holidays were two important causes behind the extensive tourist travel in the post-war period.\textsuperscript{71} In Finland and Sweden the growth of income and wealth changed the pattern of consumption. A general movement from basic needs towards more income elastic goods and services can be discerned. In this process, travel and recreation consumption grew rapidly relative to basic needs. Due to the strong growth of incomes, the trend was steep during the 1960s. The expenditures on transport, communications and recreation relative to final consumption have gradually increased from 15 per cent in the early 1960s to roughly 25 per cent in the 1990s in both Finland and Sweden.\textsuperscript{72} By facilitating the movements of passengers and cars, and by supplying an attraction of leisure activities, the ferry industry could meet these changes of demand.

The diffusion of private cars in the post-war period has not only facilitated the everyday transport, it has also changed the accessibility

\textsuperscript{67} Andersson (2004), pp. 8-11.  
\textsuperscript{69} Williams and Shaw (1991), pp.13-40.  
\textsuperscript{70} Williams (1998), pp. 42-57.  
\textsuperscript{72} OECD: National accounts for Finland and Sweden: Households expenditure by purpose 1960-1995.
and pattern of recreational and tourist travel. In the Nordic countries, the car tourism emerged after the Second World War. This new pattern of tourism travel was fuelled by the growth of incomes, the longer holidays and the upgraded road infrastructure. By integrating with this infrastructure, the ferry links met the demand of car conveyance.

One indication of the demand directed to the ferry industry is the scope of car ownership. In both Finland and Sweden we find that the 1960s was the most expansive decade. However, at a closer look into regional figures we find somewhat different trajectories. In the Swedish counties of Västernorrland and Västerbotten the car ownership grew dense in the 1960s while the county of Vaasa developed slower. In turn the diffusion of automobiles was more rapid in Vaasa during the 1970s and 1980s. By 1990, the initial differences were levelled out and the density of cars was about 430 by 1000 inhabitants in both Finland and Sweden. This expansion of car ownership suggests that the access to ferry travel improved rapidly in the 1960s and onwards.

Demographic factors

The ferry industry moreover met the demand following the migration movements between Sweden and Finland. This migration grew intense in the post-war period due to the common Nordic labour market, the Nordic passport union and the demand of labour in Sweden. In figures, we find that the post-war labour migration from Finland to Sweden comprised more than half a million people. Estimation occasional migration indicates that an additional 200 to 300 thousand people were seasonal immigrants. The migration culminated in the late 1960 when 80 thousand Finns a year immigrated to Sweden. In the early 1970s, this situation was reversed. Many of the earlier immigrants returned to Finland. This remigration was important in the early 1970s. The migration was later stabilised and today the labour movement between Finland and Sweden is less important.

The migration had a strong impact on ferry services, as people obviously needed to travel between the countries. An additional impact is

73 Page (1999), pp. 32-34.
that seen in bonds of friendship and family relations. Migrants have good reasons to travel back on holidays and on other occasions.\textsuperscript{78}

The movement of people within the countries could also affect travel patterns. In both Finland and Sweden people have moved from rural areas to urban, from Northern to Southern and from small cities to larger. This migration led to a growth of big city areas such as Stockholm, Helsinki and Åbo. In turn, we find a less rapid population growth along the Gulf of Bothnia. A few cities have grown while others have stagnated compared to the national average.\textsuperscript{79} These differences in population size give an indication of the market size. It seems reasonable to suggest that the small population along the Gulf of Bothnia limited the market for ferry services. Compared to the population centres connected to the Åland Sea, the cities along the Gulf of Bothnia represented a less significant demand for these services.

The tax policy

The Swedish-Finnish ferry industry was issued a tax-free concession since its establishment and up until first July 1999. This right to sell duty free commodities can be traced back to the concession of non-taxation issued on international shipping in the 19th century. The concession was later extended to aviation in the early post-war period. Due to international agreements on taxes, the Chicago convention of 1944 and the New York convention of 1954, the right of duty free sales was issued on both international water and on international airports. Although the convention is international, the regulations on the national level have meant different interpretations and thus implications.\textsuperscript{80}

The Nordic countries have applied strict restrictions on personal private import. Quotas on alcoholic beverages and tobacco have been set to limit this import.\textsuperscript{81} Furthermore, the taxes on especially alcoholic beverages and tobacco were set on a high level. As the Nordic states consider consumption of alcoholic beverages and tobacco products injurious to public health, high excise duties and VAT have been used as

\begin{footnotesize}
\begin{itemize}
\item[\textsuperscript{78}] Häggström, Borgegård och Rosengren, (1990).
\item[\textsuperscript{80}] SOU (1998: 49), pp. 1-15.
\item[\textsuperscript{81}] For quantities regulation see Swedish VAT law (SFS 1994:200), Finnish excise law (1994/1471,1994/1470)
\end{itemize}
\end{footnotesize}
preventive measures. Although, quantity restrictions were applied to limit personal import, the prices without taxes could be set well above the costs. One indication of this margin is the rate of tax issued on domestic alcoholic beverages.

In a number of country surveys of duty levels on spirits and tobacco it is shown that Finland and Sweden issued comparatively restrictive price measures in the period from 1960 to 1999. We find for instance in a Danish survey in 1996 that the duty share of total prices was issued as follows: Tobacco 73-75 per cent, spirits 70-73 per cent, wine 45-55 per cent and beer somewhat lower. The price differences seem to have been small between Finland and Sweden. In 1996 the prices on alcoholic beverages were somewhat higher in Finland than in Sweden while both countries had higher prices than the OECD average. Only Norway and Island had higher prices. The price policy on alcoholic beverages was also quite similar in Finland and Sweden during the period 1974 to 1995. The real prices of spirits, wine and beer grew somewhat faster in Finland while the consumption of alcoholic beverages (measured in 100 % alcohol) increased more rapidly in Finland than in Sweden. Figures from the 1960s also indicate that the excise taxes on alcoholic beverages and tobacco were kept high in Sweden and in Finland, although there were some differences in the relative prices by types of beverages.

As a result of this policy, the alcohol import by tourists has increased since the 1960s. According to drinking habit surveys for Finland, the import in per cent of total recorded consumption was the following: In 1968, 3; 1974, 4; 1984, 6 and 1994, 6 per cent. The unrecorded consumption of approximately 10 per cent of total consumption was in part assumed to originate from tourists’ import. About one-half of the unrecorded consumption in 1976 and 1984 was suggested to derive from import. The import to Sweden was also significant. In an official report from 1974, it was suggested that the supply of alcoholic beverages on Swedish ferries in traffic to Denmark and Finland corresponded to 30 per cent of all restaurants’ supply. The duty free sales onboard were a concern in the strict alcoholic policy issued in Sweden. Although the threat of abolishing this tax-free sale was proposed in an official report of 1974, the strategy turned into a strict personal import policy together with

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83 See e.g. Ahmt, Jensen, and Pødenphant (1996)
85 Nordisk Alkoholtidsskrift (Statistical appendix) Vol. 13, no. 4, p 85 and 87
restrictions on the serving of wine, spirits and beer. Finland and Sweden agreed on such restrictions in 1964 and in 1968 it was extended to the other Nordic countries.  

The mix between national high tax policy and duty free concessions issued on international waters in the period 1960 to 1999 incurred a beneficial pricing opportunity within the ferry industry. The tax policy issued on the ferry industry in Finland and Sweden is suggested to have had an impact on the onboard services. Due to the duty free concession, the ferries could offer services as retail and restaurants at a price level lower than within the country boundaries.

As to the implementation of this policy, it should be noted that the ferry industry supported the attraction of tax-free in different areas. It could work as a motive for travel as seen in marketing activities. The duty free sales also functioned as a significant source of revenue. The latter is clearly seen in financial statements. On the Gulf of Bothnia, the sale of tax-free commodities stood for 78 per cent of total turnover, while ticket income stood for roughly 14 per cent and freight only 4 per cent. The corresponding figure of onboard sales was 50 per cent in Southern Sweden in 1996.

The recent market developments after the harmonization of excise duty and VAT implemented in 1 July 1999 have had an immense impact on Swedish-Finnish ferry services. They have not only jeopardized the profit of the business but also reduced the size of the market. In the second half of 1999, the European ferry market fell by 20 per cent in terms of passenger travel. However, these challenges have been more adverse on the Swedish-Finnish markets. On one of the submarkets, the Gulf of Bothnia, the travel decreased by 84 per cent, while the permanent exception for the Åland Islands, meant that the market development on the Åland Sea not was challenged. The contemporary changes in tax policy give strong reasons to believe that the development of car ferry services since 1961 owed a good deal from the mix between international and national tax policy.

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6. Conclusions

This paper has outlined the historical development of car ferry services between Finland and Sweden. Due to a number of economic, political and technical factors, the small-scale passenger transport activities of the 1950s developed into the capital-intensive cruise ferry services of the 1980s and later. This process incurred a rapid growth of passenger and vehicles conveyance between Finland and Sweden. In analysing the determinants of traffic growth and industry development, the following hypotheses can be formulated on the basis of this survey.

Firstly, the major issue concerning the supply side is associated with the cost structure. The outline above shows that the ferry companies accomplished heavy investments in tonnage and combined three different lines of output. The reason behind is however less clear. Was this development simply the concern of increasing revenue from onboard sales, or were the ferry companies efficient in matching the changes in demand of utility transport and tourism onboard respectively? In line with this question the following hypothesis can be addressed: The investments in larger, more luxury equipped ferries and the multi-output structure can be justified by cost considerations. The analysis of this hypothesis could hopefully give a better clue to understanding the economic features underlying the business and the importance of supply changes in the growth of traffic conveyance. In addition this analysis could help to provide insights to the impact of cost structure on the market organisation.

The second issue concerns the spatial determinants of traffic flows. Due to traffic flows, the passenger conveyance is brought into focus, while the distribution of freight between modes of transport is not concerned in this respect. In terms of passenger traffic flows, a number of demand changes were discerned in the section above. However, the impact of population, real income and distance on passenger is less clear. In addressing this issue, the following hypothesis is addressed: The changes in real income, tax policy, population, and migration had a significant impact on passenger traffic flows over time. The test of this hypothesis can provide empirical evidence on the relation between post-war macro economic, social and policy changes on travel across Finland and Sweden and give us clues of understanding specific prerequisites of regional ferry services.
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ECONOMIC EFFICIENCY OF MULTI-PRODUCT STRUCTURE: EVIDENCE FROM THE BALTIC FERRY INDUSTRY

1. Introduction

Since the late 1960s, the Baltic ferry industry has developed from being a complement to liner shipping, engaged in small-scale passenger transport during the summer, to being a large-scale part of tourism activity and utility transport respectively.¹ The ferry industry of today is one of the major traffic generators and revenue earners in the Baltic Sea and most of the high quality ferries offer many of the facilities of conventional cruise ships. Although, the cruise segments have increased rapidly thanks to the duty free shopping opportunities, the utility transport of passenger and freight has not ceased. Trucks and tourist share the same ferries.² Can this mix of freight and passenger conveyance together with onboard services on increasingly larger and more luxury ships be justified by cost considerations?

This paper seeks of analyse the rationality of the multi-output structure and the growth of ship and business size in the Baltic ferry services between Finland and Sweden. In addition this study seeks to analyse the impact of cost structure on market organisation. The approach taken here is to analyse the cost structure of ferry shipping companies. The cost structure of shipping have previously been analysed by maritime economists for determining optimum ship size and ship size elasticity of cost.³ However, the economic efficiency of multi-output structure have not this far been examined.

² Gernot (1999), pp. 3-38.
The approach taken here is to estimate the presence of economies of scale, scope and density. Generally, economies of scope are a measure of the efficiency of multi-product structure and economies of density seek to capture the relationship between unit costs and the intensity of utilization at a given capacity. Economies of scale exist when long run average costs decrease as output rise. In addressing these issues associated with the cost structure, a transcendental logarithmic (henceforth, translog) cost function is estimated. The required panel data, including a sample of four Finnish ferry firms over a twenty-year period, are elaborated by three output variables and three input variables.

The plan of this paper is as follows: Section 2 reviews the implications of the economies of scale, density and scope in the cruise ferry industry. Section 3 introduces the form of the model for estimating the cost function of multi-product firms. Section 4 contains the estimation results, which address the implication of the cost structure in terms of efficiency and market organisation. The final section concludes.

2. Economies of scale, scope and density: the implications

The relationship between average cost and output can be explained as the relation between physical quantities of input and output summarized in a production function. At given factor prices, some firms consume more inputs, whereas others use fewer inputs per unit of output, as output increases. The efficiency is a question of the technology and production technique utilized.4

This study assumes that economies of density exist when the long-run average cost decreases as output rises, holding the input prices and the network scale fixed. In this definition, economies of density is referred to the impact of expanding all traffic, but holding the network size constant, while economies of scale refers to both product and network expansion.5 Following the definition of density, a specific ferry firm or industry is suggested to increase cost efficiency by running more and or larger ferries on existing routes. Changes in the route network are not considered as the density measure assumes a constant network and aggregated volume-distance measures. The measure of scale on the other hand assumes variation in both network and in production. Increasing returns of scale suggests that a firm, by increasing both network size and production, can reduce average costs. In turn, constant returns of scale

together with increasing returns of density would indicate that traffic should be increased while keeping network constant.

In addition to economies of scale and density, cost savings may arise by simultaneous production of several different outputs in a single firm. There are economies of scope if it is less costly to combine two or more product lines in one form than to produce them separately. The efficiency gains are assumed to arrive by reducing cost by sharing of inputs. In that sense, the Baltic ferry industry cost savings is suggested in the combining of conveyance of vehicles, passenger conveyance and the supply of service onboard. The efficiency of joint production is supposed to arise as three output lines share the same ship.

Hence, the important issue is whether lower operating cost could result from joint production of an output bundle for a firm with large sales, compared with specialized production of the same total output bundle by two smaller firms. This is a question of economies of scale, scope as well as economies density.

3. The translog cost function

It is necessary to estimate a cost function in order to measure the efficiency of production behaviour in a specific firm or industry. In the transport literature, cost function estimations have been frequently applied in the analysis of industry structure, productivity, regulation and in other areas. Among flexible cost functions, the translog cost function is one of the most popular today. One important reason is that some common restrictions in the Cobb-Douglas and the CES function, such as homogeneity, homotheticity and constant elasticity of substitution etc., need not to be enforced a priori. In this study, the rationale of using a translog cost relies in the fact that the presence of and scale, scope density economies can be tested on empirical data.

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9 Berndt (1991), p. 469
Modelling for estimation

The analysis concerns the econometric estimation of the total cost function of four Finnish ferry companies operating mainly at the Baltic Sea and the Åland Sea. In the estimation of a total cost function it is assumed that costs are minimized regarding all the variable inputs of production. Based on these assumptions, the general form of the translog cost function can be written as follows:

\[ TC = TC(P_L, P_O, P_C, Y, Q, S, T) \]  \hspace{1cm} (1)

Where TC is the total cost, Y is passenger carryings, Q is the freight carryings, S is service output, P_L, P_O, P_C are the prices on labour, operation (inputs of material) and capital respectively. T is a variable incorporating technical change. The translog approximation of the general cost function (1) takes the following form:

\[
\ln TC = \alpha_o + \alpha_L \ln P_L + \alpha_o \ln P_O + \alpha_c \ln P_C + \beta_Y \ln Y + \beta_Q \ln Q + \beta_S \ln S + \gamma_T \ln T \\
+ \frac{1}{2} \alpha_{LL} (\ln P_L)^2 + \alpha_{LQ} \ln P_L \ln Q + \alpha_{LC} \ln P_L \ln P_C + \frac{1}{2} \alpha_{OO} (\ln P_O)^2 + \alpha_{OC} \ln P_O \ln P_C \\
+ \frac{1}{2} \alpha_{CC} (\ln P_C)^2 + \theta_{LT} \ln P_L \ln Y + \theta_{OT} \ln P_O \ln Y + \theta_{CT} \ln P_C \ln Y + \lambda_{LT} \ln P_L \ln Q \\
+ \lambda_{OQ} \ln P_O \ln Q + \lambda_{CQ} \ln P_C \ln Q + \eta_{LS} \ln P_L \ln S + \eta_{LS} \ln P_O \ln S + \eta_{CS} \ln P_C \ln S \\
+ \rho_{LT} \ln P_L \ln T + \rho_{OQ} \ln P_O \ln T + \rho_{CT} \ln P_C \ln T + \frac{1}{2} \psi_{YY} (\ln Y)^2 + \frac{1}{2} \psi_{QQ} (\ln Q)^2 \\
+ \frac{1}{2} \psi_{SS} (\ln S)^2 + \frac{1}{2} \gamma_{TT} (\ln T)^2 + \delta_{QQ} \ln Y \ln Q + \tau_{YT} \ln Y \ln T + \omega_{QT} \ln Q \ln T \\
+ \mu_{SY} \ln Y \ln S + \pi_{QO} \ln Q \ln S + \nu_{ST} \ln T \ln S 
\]  \hspace{1cm} (2)

Obviously, the independent variables included in (1) assume values that are clearly greater than unity. In that sense, the translog function better approximates the underlying cost function if all variables in (2) are divided by their sample mean before taking their logarithms.\(^{10}\)

Equation (2) consists of two outputs, three factor prices and one technical change parameter, which thereby require 28 coefficients to be estimated. The estimation of the parameters is not free. Firstly, the

\(^{10}\) Christensen, Jorgenson and Lawrence (1973), pp. 28-45.
underlying microeconomic theory requires that the translog cost function is homogenous of degree 1 in input prices.\textsuperscript{11} This implies the following restrictions on equation (2):

\[
\begin{align*}
\alpha_L + \alpha_O + \alpha_C &= 1; \quad \alpha_{LL} + \alpha_{LO} + \alpha_{LC} = 0; \quad \alpha_{CC} + \alpha_{CL} + \alpha_{CO} = 0; \\
\alpha_{OO} + \alpha_{OL} + \alpha_{OC} &= 0; \quad \theta_{LY} + \theta_{OY} + \theta_{CY} = 0; \quad \lambda_{LQ} + \lambda_{OQ} + \lambda_{CQ} = 0; \\
\eta_{LS} + \eta_{OS} + \pi_{CS} &= 0; \quad \rho_{LT} + \rho_{OT} + \rho_{CT} = 0.
\end{align*}
\] (3)

In addition, the coefficients of the translog are constrained to be symmetric so that the cost function is well behaved in its second derivates. The condition \( \alpha_{ij} = \alpha_{ji} \) (i,j=L, M, C) is imposed with the analogous conditions for the other coefficients.

Equation (2) could be estimated directly, or jointly with cost share equations. This study estimates the total cost function and the cost share equations jointly. The rationale behind this is that gains in precision can be attained by the latter approach.\textsuperscript{12}

The cost share equations (4) are obtained using Shepard's lemma. The cost share for input (i) is to be derived by partially differentiating the translog total cost function with respect to each factor price.\textsuperscript{13} The dependent variable is the cost share of each input category. The independent variables are the differentiated variables derived from equation (2). Cost share equations to be estimated are expressed as follows:

\[
\begin{align*}
SH_L &= \frac{\partial \ln TC}{\partial \ln P_L} \\
&= \alpha_L + \alpha_{LL} \ln P_L + \alpha_{LO} \ln P_O + \alpha_{LC} \ln P_C + \theta_{LY} \ln Y + \lambda_{LQ} \ln Q + \eta_{LS} + \ln S + \rho_{LT} \ln T \\
SH_O &= \frac{\partial \ln TC}{\partial \ln P_O} \\
&= \alpha_O + \alpha_{oo} \ln P_o + \alpha_{ol} \ln P_L + \alpha_{oc} \ln P_C + \theta_{ot} \ln Y + \lambda_{oq} \ln Q + \eta_{os} \ln S + \rho_{ot} \ln T
\end{align*}
\] (4)

Note that the symmetry restrictions mean that no additional parameters from equation (2) are estimated in equation (4). Furthermore, the cost share equations reduced to two, as the shares sum up to unity. In this study is the capital share equation abolished. To obtain a non-singular

\textsuperscript{11} Laurits and Cristensen (1973), pp. 28-45.
\textsuperscript{13} Shephard (1970).
system one most drop any of the above equations and estimate the resulting equation system.\textsuperscript{14}

**Estimation of scale, scope and density**

The estimated parameters in the equations above form the basis for different microeconomic interpretations. In the field of transport economics focusing on production and industry structure, the concepts of density, scope and scale economies, are frequently employed.\textsuperscript{15} In line of this research, this study applies economics of scale, scope and density.

The operation necessary to obtain these measures could in short be expressed as follows. To start with, we find that economies of density, generally is a measure of the relationship between unit costs and the intensity of utilization of a given capacity. It could be defined as the proportional increase in the total cost resulting from a proportional increase in outputs, where the input prices and the network scale are fixed. In line with that, the existence of economies of density implies that the average cost of a ferry company decreases as outputs increase through running more or larger ferries on the established routs. Following earlier studies on economies of density, the equation for the multi-output case are given by:

\[
ED = 1 - \frac{\partial \ln TC}{\partial \ln Y} + \frac{\partial \ln TC}{\partial \ln Q}
\]  

(5)

And where a value less then zero indicates diseconomies of density and a value above indicates the presence of economies of density.

In measuring economies of scale, we find that it could be expressed as the inverse of the sum of all cost elasticities with respect to each output component. However, since this study utilizes aggregated transport output variables, additional operations are necessary as suggested in recent developments in the research area. One conclusion is that output aggregates should be controlled for how the basic variables building up the aggregate behave. To measure the extent of scale economies (S), we should look at the behaviour of both the aggregates and the basic variables.

\textsuperscript{14} William (2003), p. 368
The basis for using aggregates $\tilde{Y}$ is that most of the aggregate components $\tilde{y}_j$’s are constructions from the components of $Y$. This is evident in the case of ton-kilometres or passenger-kilometres, which simply is the summation over all $y_i$. Thus, if $\tilde{y}_j$ is an implicit function of that, then the estimated $\tilde{C}(p, \tilde{Y})$ is an implicit representation $\hat{C}$ of $(C(p,Y))^{16}$.

In line of this argumentation, the cost elasticity should be calculated together with the elasticity of aggregation. Given that, economies of scale in transport production could be expressed as follows:

$$S_e = \left[ \sum_{i=1}^{n} \frac{\partial \tilde{y}_j \cdot C}{\partial y \cdot y_i} \right]^{-1} = \left[ \sum_{i=1}^{n} \alpha_j \tilde{y}_j \right]^{-1}$$

$$\alpha_j = \sum_{i=1}^{n} \frac{\partial \tilde{y}_j \cdot y_i}{\partial y \cdot \tilde{y}_j}$$

where $\alpha$ is the cost elasticity associated with aggregate $j$ in $\tilde{Y}$ and $\alpha_j$ is the corresponding elasticity of the aggregate output variable.

When $S_e$ is greater than one, firms exhibit decreasing returns to scale. This holds since costs rise proportionately more than output. If $S_e$ equals one, the firms will experience constant returns of scale. In the case that $S_e$ is less than one, this indicates increasing returns of scale.

In addition to economies of density in a firm’s production, there is also possible that cost savings may result from simultaneous production of different outputs. That is, there exist economies resulting from the scope of a firm’s operation. Formally, economies of scope can be described as follows in a multi output case:

$$SC_e = \frac{\sum_{i=1}^{n} C(y_i) - C(y)}{C(y)}$$

$$SC_e = \frac{(c(y_1,0,0) + c(0,y_2,0) + c(0,0,y_3) - c(y_1,y_2,y_3))}{c(y_1,y_2,y_3)}$$

Equation (7) is calculated using the estimated values from the cost function in equation (2). $C(y_i)$ denotes the cost incurred in the production of only $y_i$. $C(y)$ denotes the cost of producing two output series. When the estimated value is negative, the firms experience

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diseconomies of scope. If $SC_e$ is above zero, this indicates economies of scope. Firms supplying output combinations satisfying economies of scope, enjoy jointiness in their production.$^{17}$

Although the translog cost function is frequently employed, due to the simplicity of estimation and reliability of the results, this function has a shortcoming in that it cannot explain the case when the output is zero.$^{18}$ To overcome this problem, one needs an approximation in estimating the $SC_e$. That is when a 10 per cent of the sample mean output of each sample is used as a reference point instead of zero.$^{19}$

**Data and variables**

Observations for the variables included in the cost function were compiled on a yearly basis for the period 1983-2003. Four ferry companies were included; *Silja line*,$^{20}$ *Viking line*,$^{21}$ *Birka line* and *Eckerö Linjen*. The panel data set consists of 75 observations. The data is derived from annual financial statements, i.e. the balance sheets and the income statements of the four ferry companies.

The services supplied by the ferry industry, the conveyance of passengers and freight, are measured by a combined quantity and distance component. As commonly applied in the transport literature, the output is defined as the product of a capacity (number of passenger and freight units) and a distance measure (km). Passenger output ($Y$) and freight output ($Q$) is thus measured by passenger-kilometres and freight unit-kilometres respectively.$^{22}$

An additional output variable is onboard service. The considerably large supply of commodities onboard indicates that ferry services are featured by elements more often recognised in cruise services. The retail services are embedded in the transport services. To measure the output

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$^{17}$ Youngha Cho (2003), pp. 337-355.
$^{18}$ Cristensen (1973), pp. 28-45.
$^{19}$ H Youn Kim (1986), pp. 221-222.
$^{22}$ Freight unit defined as lane meters freight. This measure is employed to include different modes of vehicles in a single unit.
of retail service a traditional production approach could be utilized. However, since data on service output only can be derived from employment data an historical national account approach is applied. The output is measured by data on personnel employed in onboard service, adjusted for productivity increase. The productivity adjustment is induced by measuring the revenue per employed at fixed prices.

The cost function encompasses three input variables. The input variables of labour, operation supplies and capital outlined in the previous section is measured by the unit price. The measures of input prices are in principle arrived at dividing the outlay for the factor by the quantity consumed by the same factor.

The unit price of labour \((P_L)\) is defined as the expenses for personnel divided by number of employed. Personnel expenses involve wages, pension costs and other costs. The personnel expenses are assumed to more accurately capture the labour costs than a measure on wages only. This follows from the reasoning on gross costs, in which the input variables as far as possible cover all costs incurred by the supply of the ferry services.

An additional variable employed is input material. The number of passengers was divided with this component. The unit price of material \((P_O)\) is an approximation of the operation costs.

The unit price of equipment should ideally require a measure of the capital stock of ferry equipment and the cost attributable to the use of that stock. In this study, the value of ship assets is employed. The value share of other equipments is not included since this value is only a small share and the depreciation rate is not equal to ships.

The data on ship value attained from the balance sheet is reported as purchase value and as value after depreciation. In general, the accountancy practice is to depreciate merchant ships down to scrap over 15 to 20 year. The ferry companies covered in the dataset apply different depreciation rates. Based on information of the life of a ship, the depreciation rate for ships is fixed at 5 per cent. The unit price of equipment \(P_E\) is defined in as follows: \(P_E = P_1(r+d)\), where \(P_1\) is the purchase price of a ship, \(r\) is interest rate and \(d\) is depreciation rate. The purchase price of a ships is however, a crude simplification of changes in the fleet. In the empirical material we find that the ships grow bigger and are more luxury equipped today compared to the early 1980s. To

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25 The Eckerö Rederiaktiebolag depreciates ships (newly built) down to scrap over 8-12 years, Birka Line 16-10 years, Silja Line 8-30 years, and Viking Line 25 years.
attain a more precise measure, tons gross are employed instead of number of ships.

4. RESULT AND ANALYSIS

In this section I present the whole set of estimation results obtained according to the model introduced in the previous section. The issue of cost estimation is outlined in the following section. Based on the result from this section, the analysis of the market structure is complied

Cost estimation

In the case where the disturbance terms are (independently and identically) normally distributed, the most common procedure for estimating the parameters of a regression model is using the ordinary least square (OLS) method. However, since the model applied in this study includes three models, it is not plausible that the underlying assumptions of homoscedasticity and uncorrelatedness across observations for disturbances do actually hold.

In this study, the OLS method, applied equation by equation, produces inefficient estimates. In a number of different works, it has been shown that the three stages least squares and the full information maximum likelihood should be selected as a much more efficient techniques as is allows for cross-equation correlation of the disturbance term. However, both methods involves solving non-linear equations and may suffer from a lack of degrees of freedom in the estimation procedure. As suggested in more earlier works, the seemingly unrelated regression (SUR) model, is far easier to carry out.

In recent studies, the translog cost function have most commonly been estimated by applying the SUR model also called joint generalized least squared (JGLS) or Zellner estimation after the originator. Like OLS, the SUR method assumes that all the regressors are independent variables, but SUR uses the correlation among the errors in different equations to improve the regression estimated. Moreover, I gain additional degrees of freedom by estimating the total cost function and the derived cost share equations together as a multiple regression

system, since the cost share equation do not introduce any additional unknown parameters into the estimation. The system estimation method is more convenient compared to a single equation estimates generated by the total cost function alone. The SYSLIN procedure in the SAS statistical programme was used.29

**Estimation results**

Estimation is carried out for the entire sample of ferry companies. The model is fairly precisely estimated. On the whole, we find that the adjusted $R^2$ value is .99. About two-thirds of the 36 coefficient estimates are statically significant at the 1 per cent level, two on the 5 per cent level and five on the ten percent level. Five coefficients are not significant.

The total cost and the independent variables in the translog cost function are in natural logarithms and have been normalized. By that reason can the first-order coefficient be interpreted as the cost elasticities evaluated at the point-of-means. Following this interpretation, table 1 shows that, as the output variables increase, the total cost also increases. We find that a 1 per cent increase in passenger-kilometres increases the total cost by 0.63 per cent, while a one per cent increase in freight unit-kilometres output increases total cost by 0.74 and a one per cent increase in service output end up in a 0.85 per cent increase in total cost.

Furthermore we find that the price coefficients are all positive and significant with one exception. At the sample means, the elasticity of total cost with respect to the price of labour is equal to 0.26 per cent and the corresponding elasticity for operating and capital are equal to 0.65 and 0.08 respectively. As the cost elasticities with respect to factor prices are evaluated at the point-of-means are equal to the corresponding factor shares.

The coefficient on technology is negative, but not significant at a reasonably p-value. However, this fact recognize that the total cost of ferry services have to decrease as far as cost saving technology is added into the operation. Still, a better approximation of cost saving technology can offer more reliability to account for such improvements.

---

| Variable                      | Coefficient | Estimate | Error  | t Value | Pr > |t| |
|-------------------------------|-------------|----------|--------|---------|-------|---|
| Intercept                    | α₀          | 0.178428 | 0.043766 | 4.08    | 0.0002|
| LnPl (labour costs)          | α₇Lo       | 0.246049 | 0.009352 | 26.31   | <.0001|
| LnPo (Operation costs)       | α₀o        | 0.654305 | 0.009300 | 70.35   | <.0001|
| LnPc (Capital costs)         | α₇ac       | 0.099646 | 0.005285 | 18.85   | <.0001|
| LnY (Passenger-kilometres)   | β₇Y        | 0.62972  | 0.187738 | -3.35   | 0.0018|
| LnQ (Vehicles-kilometres)    | β₇Q        | 0.740707 | 0.099197 | 7.47    | <.0001|
| LnS (Services output)        | β₇S        | 0.848901 | 0.243379 | 3.49    | 0.0012|
| LnT (Technology)             | β₇T        | 0.103055 | 0.054973 | 1.87    | 0.0683|
| LnPl²                        | α₇LL       | 0.102126 | 0.013760 | 7.42    | <.0001|
| LnPo²                        | α₇OO       | 0.105530 | 0.022110 | 4.77    | <.0001|
| LnPc²                        | α₇CC       | 0.068570 | 0.006753 | 10.15   | <.0001|
| LnY²                         | ψ₇YY       | -0.57452 | 0.189243 | -3.04   | 0.0043|
| LnQ²                         | ψ₇QQ       | -0.02194 | 0.033176 | -0.66   | 0.5123|
| LnS²                         | ψ₇SS       | -0.65324 | 0.215523 | -3.03   | 0.0043|
| LnT²                         | γ₇TT       | 0.043606 | 0.016507 | 2.64    | 0.0118|
| LnPlLnPo                     | α₇LO       | -0.06954 | 0.014540 | -4.78   | <.0001|
| LnPlLnPc                     | α₇LC       | -0.03258 | 0.009849 | -3.31   | 0.0020|
| LnPolnPc                     | α₇OC       | -0.03599 | 0.012446 | -2.89   | 0.0062|
| LnPlLnY                      | θ₇LY       | -0.08757 | 0.017319 | -5.06   | <.0001|
| LnPolnY                      | θ₇OY       | 0.113311 | 0.020082 | 5.64    | <.0001|
| LnPclnY                      | θ₇CY       | -0.02574 | 0.010720 | -2.40   | 0.0212|
| LnPlLnQ                      | λ₇LQ       | 0.020835 | 0.005970 | 3.49    | 0.0012|
| LnPolnQ                      | λ₇OQ       | -0.03472 | 0.007149 | -4.86   | <.0001|
| LnPclnQ                      | λ₇CQ       | 0.013888 | 0.003760 | 3.69    | 0.0007|
| LnPlnS                       | η₇LS       | 0.058363 | 0.042631 | 1.37    | 0.1788|
| LnPolnS                       | η₇OS      | -0.04629 | 0.041022 | -1.13   | 0.2660|
| LnPclnS                       | η₇CS      | -0.01207 | 0.024927 | -0.48   | 0.6309|
| LnPlnT                       | σ₇LT       | -0.01236 | 0.005262 | -2.35   | 0.0240|
| LnPolnT                       | σ₇OT      | -0.00059 | 0.006351 | -0.09   | 0.9263|
| LnPclnT                       | σ₇CT      | 0.012948 | 0.003337 | 3.88    | 0.0004|
| LnYlnT                       | τ₇YT      | 0.077754 | 0.086181 | 0.90    | 0.3725|
| LnYlnQ                       | δ₇YQ      | 0.369031 | 0.137563 | 2.68    | 0.0107|
| LnQlnT                       | ω₇QT      | -0.03309 | 0.032076 | -1.03   | 0.3086|
| LnYlnS                       | μ₇YS      | 1.053213 | 0.398732 | 2.64    | 0.0118|
| LnQlnS                       | π₇QS      | -0.25571 | 0.145289 | -1.76   | 0.0863|
| LnTlnS                       | ν₇TS      | -0.09104 | 0.099042 | -0.92   | 0.3636|
A further analysis of the result is added by measuring the Allen-Uzawa partial elasticities. The own-elasticities of substitution need to be negative, otherwise is the estimated cost function not showing an adequate cost structure.\textsuperscript{30} The elasticities can be calculated as follows:

\[
\sigma_{ii} = \frac{\alpha_{ii} + S_i^2 - S_i}{S_i^2}
\]

(8)

where the employed parameters are derived from the cost share equations (4). The $\alpha_{ii}$ is the estimated coefficient of the $i$th input price and $S_i$ is the average share ratio of the $i$th factor in the cost function. The result of the calculation is shown in table 2.

**Table 2. Allen-Uzawa partial substitution elasticities of each input factor.**

<table>
<thead>
<tr>
<th>Input</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>-0.882</td>
</tr>
<tr>
<td>Material</td>
<td>-0.654</td>
</tr>
<tr>
<td>Capital</td>
<td>-0.854</td>
</tr>
</tbody>
</table>

The elasticities must be estimated as negative to satisfy the symmetry condition imposed. Therefore, we may consider the cost functions are estimated adequately and that the coefficient of this function can be employed to derive efficiency measures.

**Economies of scale, scope and density**

Based on the coefficients estimated in Eq. (2), economies of scale, scope and density can be obtained as expressed in Eq. (5), (6) and (7). Table 3 summarise the results of the efficiency measures. For the total sample, the measure of economies of scale is 1.48. As this value is more than one, we can interpretate it as diseconomies of scale. This result holds for all firms although the diseconomies of scale are somewhat different among the firms.

Table 3 also shows the results of economies of scope. For the total sample, economies of scope are estimated as being greater than zero. Economies of scope are clearly lower for two companies, i.e. *Birka line*

\textsuperscript{30} Diewet Wales (1987), pp. 43-68.
and Eckerö Linjen. However, the two larger firms Silja Line and Viking line show higher scope economies. These results indicate that the total cost is lower for a company, which combine two or more production lines in one firm than to produce them separately. A single firm can operate the three output lines at a lower cost than the aggregated cost of other firms, which specialise and attempted to produce one single output. The result is supporting the existing multi-product structure seen in the Baltic ferry industry. On the whole, the obtained results indicate that combining both transport and service are more cost efficient that specialized production in either output.

Table 3. Economies of scale, scope and density for ferry companies.

<table>
<thead>
<tr>
<th>Company</th>
<th>Economies of density</th>
<th>Economies of scale</th>
<th>Economies of scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>All firms</td>
<td>1.34</td>
<td>1.48</td>
<td>0.89</td>
</tr>
<tr>
<td>Birka Line</td>
<td>2.5</td>
<td>2.05</td>
<td>0.25</td>
</tr>
<tr>
<td>Silja Line</td>
<td>-0.79</td>
<td>1.37</td>
<td>1.91</td>
</tr>
<tr>
<td>Viking Line</td>
<td>-0.06</td>
<td>1.27</td>
<td>1.86</td>
</tr>
<tr>
<td>Eckerö Linjen</td>
<td>2.62</td>
<td>1.18</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Note: SC < 0, diseconomies of scope 0= constant economies of scope, >0 economics of scope. S < 1, increasing returns of scale; S =1, constant returns of scale, S>1, decreasing returns of scale. D < 0, diseconomies of density 0= constant economies of density, >0 economics of density.

The third measure of efficiency shows the existence of economies of density. This result suggests that the average cost of ferry companies decreases as output increase through running more and or larger ferries on existing routes. By reason of decreasing returns of scale, together with increasing returns of density, firms would change the traffic intensity while keeping network constant. However, the result is not evident for all companies. We find that two companies, Silja Line and Viking Line are operating with diseconomies of density. This result suggests that under the current cost structure, the four ferry companies exhibit economies of scope or economies of density, but not both at the same time. However, in comparing economies of density and scope, one should not that there is not concluded a specific relationship between the two measures.31

The estimated economies of scale, scope and density differ by firm size category. The two largest sized firms exhibit the greatest economies of scope while the two smaller firms have greater economies of density.

This suggests that there may be an optimal range of firm size where economies of scope and density independently are enjoyed at different range of firm size. To capture the size of the firms in the sample, stylised facts of the companies are summarized in table 4. In this table, we find that Silja Line and Viking Line clearly dominate the market. The conveyance of passenger and freight together with onboard service exceeds the two smaller companies. It is hardly surprising the total tonnage employed and the ship size is larger in two large companies.

The size of ships increased rapidly during the 1980s and early 1990s. The ships also featured a growing demand of services due to shopping, entertainment and conferences. This underlines its cruise appeal. Due to investments in new ships, the Silja Line and Viking Line outstripped the two smaller companies during the 1980s. In the 1990s, Birka Line moved into the cruise segment while the smallest, Eckerö Linjen, still employed smaller ships. Despite the differences in ships size, the cost implications are surprisingly similar in these two small companies. In turn, the business size seems to have a larger impact on the cost structure.

Table 4. Average sales, output and tonnage in the ferry companies.

<table>
<thead>
<tr>
<th>Company</th>
<th>Sales in million FIM (fixed prices)</th>
<th>Passenger-Kilometres (.000 omitted)</th>
<th>Freight-kilometres (.000 omitted)</th>
<th>Service index</th>
<th>Ship size in tons gross</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birka Line</td>
<td>138</td>
<td>49</td>
<td>3</td>
<td>325</td>
<td>18881</td>
</tr>
<tr>
<td>Silja Line</td>
<td>1439</td>
<td>6751</td>
<td>5907</td>
<td>3215</td>
<td>35939</td>
</tr>
<tr>
<td>Viking Line</td>
<td>728</td>
<td>3701</td>
<td>2824</td>
<td>1691</td>
<td>26940</td>
</tr>
<tr>
<td>Eckerö Linjen</td>
<td>62</td>
<td>40</td>
<td>45</td>
<td>117</td>
<td>5048</td>
</tr>
</tbody>
</table>

Note: FIM; Finnish mark (The national currency of Finland).

The further implications when comparing table 3 and 4, could be recognized in the trade off between density and scope. Looking at the firm’s sales figures, we find that the two small firms, Birka line and Eckerö Linjen at most reach some 138 and 62 million FIM in average sale measured in fixed prices. In turn, we find how Viking line and Silja line falls within the range 728 and 1439 million FIM. We find big
differences in business size. Given the results shown above, the efficiency in different business size is reasonably strong, as the small firms gain large density by sales while small scope in sales. Firms with comparatively large business size have lower economies of density while the economies of scope in turn are larger. In that sense, the result gives some clues into understanding the optimal size of business. Given the results above, we find that both small and large companies can exist simultaneously, as economies of scope and density arise at different range of sales. For the range displayed, the efficiency of a multi-product structure is present together with a decreasing average unit cost as output increases. The result indicate that the cruise ferry industry is a highly efficiency organized and operated.

5. Conclusions

In this paper I have estimated a translog cost function encompassing four Finnish ferry firms operating at the Baltic Sea, within the period 1983 to 2003. The set of variables, which specify the cost function, includes measure of aggregate output for freight, passenger and onboard services, the prices of factors of production (labour, equipment and capital) and a constant variable seeking to capture technical change.

The obtained results indicate that the model exhibit the expected features of the cost structure. First, the properties of concavity in factor prices and monotonicity are satisfied, so that the cost function represents a good representation of the underlying technology. Second, the first-order price and output coefficient are all positive and significant meaning that the total cost are an increasing function of the freight, passengers and onboard service volumes, as well as factor prices. Third, the factor demand elasticities have the required negative sign.

The estimated cost function has been utilized on three efficiency measures; economies of scale, scope and density. This study shows that the ferry companies are operated with scope and density economies respectively. The density measures show that cost efficiency is reached for firms with small sales. On the contrary, the scope measures show the highest cost efficiency for large sales. One important conclusion is that a trade off between density and scope economies exists as the sales increase. In that sense, the optimal business size can be recognized in a wide range of sales. The increase in ship and business size together with joint production can be justified by cost considerations.
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1. Introduction

Over the past forty years, the ferry industry has played a significant role for freight and passenger conveyance between the Nordic countries and on short sea route markets across Europe. In their capacity as transport links across water barriers, the ferry service is an integral part of the transport infrastructure and moreover as noted in a recent study, part of the tourism and leisure industry. As such, the ferry service is open to all passengers and vehicles; it meets the demand for a common carrier.

In terms of demand for passenger travel, recent studies highlight the significance of macroeconomic development, service quality and price together with inter-modality in stimulating the growth of traffic flows. It is not surprising that the need for transportation has continuously increased over time due to the expansion of domestic and international travel. However, the determinants of travel on regional markets are less known. While previous studies have pointed out factors that might stimulate traffic performance, there is no clear empirical evidence on the importance of spatial determinants.

This study addresses this situation and provides an analysis of the determinants of passenger travel by ferries through a gravity equation approach. The data is derived from 4 Swedish-Finnish ferry routes for the 42 years 1960-2002. To overcome influence from other variables, a traffic area with similar supply characteristics across routes was taken into account. The study of this submarket, the Gulf of Bothnia, is further

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3 Wang and Mcowan (2000), pp. 221-251
4 See e.g. Schirach-Szmigiel (1979).
motivated by the current challenges following the abolition of tax-free in 1999.

By providing a historical and analytical context to interpret the current challenges of ferry services, this study could contribute with important insights for industry regulators, legislators and other with a business or policy interest in this transport service.

The following text is organised as follows. Section 2 outlines the past traffic performance in the ferry network across Finland and Sweden. In the third section, the gravity equation approach is outlined. Section 4 presents the results and the last section concludes.

2. The past performance

The development of combined ferry services between Sweden and Finland took off in the 1960s. Due to the advances in transport technology seen in the new car ferries, the quality of ferry services improved and the capacity increased.\(^5\) Together with the development of tourism and utility traffic, the investments in tonnage were soon matched by traffic flows.

During the take off phase, the passenger travel was characterised by the migration from Finland to Sweden and the growth of tourist trips between the countries. The development of cruise ferry services effectively met this latter segment of tourism and leisure travel.\(^6\) Thanks to the tax-free concession, the ferry companies could offer extensive shopping and entertainment opportunities. These unique features of the services stimulated the travel and by the early 1970s, close to 5 million passengers were conveyed annually. The market development was however challenged in 1973 as the OPEC crisis affected the oil prices and the economic growth in Finland and Sweden as well as in other countries. During this crisis and in its aftermath, the ferry industry experienced the first downturn since 1960. After a few years however, the market progressed and judging from travel figures, one can conclude that the market flourished in the 1980s and early 1990s. About 10 million passengers were conveyed between Finland and Sweden in 1991. The rapid growth of this market was all the more remarkable for the fact that car ferry services had begun only 30 years earlier. The traffic flow in the

\(^5\) The first car ferry, Skandia, was built for Silja line in 1961. The ship could carry 1200 passengers and 175 cars. Sörensen (1979), p. 100

\(^6\) Ferry services offering onboard facilities associated with cruise services together with passenger and vehicles conveyance is defined as cruise ferry services. Dearing and Wild (2000), p. 317.
1990s was less progressive as the severe economic crisis in Finland and Sweden and the Estonia tragedy in 1994 challenged the market development.

However, the greatest challenge of all that have faced the ferry companies was the loss of tax-free sales in July 1999. This not only led to loss of profit, but to reduction of the market size as well. The European ferry market fell by 20 per cent in the second half of 1999 and on one of the Swedish-Finnish ferry submarkets the loss of duty free sales had an additionally impact. On the Gulf of Bothnia, the passenger travel was reduced by 84 per cent and the market size went back to that seen in the early 1960. On the Åland Sea, the tax-free concession was kept due to the permanent exception issued on the Åland Islands. By entering the Åland Islands, the ferries are given the right to offer tax-free sales. Chart 1 shows the great differences between the submarkets.

**Chart 1. The number of passengers (.000 omitted) conveyed across the Åland Sea and Gulf of Bothnia, 1960-2002.**

![Chart showing passenger numbers across the Åland Sea and Gulf of Bothnia](image)

*Source: SOS, Shipping 1965-2000; FOS, Shipping, Series 1B b 1960-1964.*

The chart also demonstrates that the historical development turned out to be rather different at the Åland Sea compared to the Gulf of Bothnia. Although there are similarities in terms of growth rates, the

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scope of the two markets differs. The Åland Sea was the largest market. While at most one million passengers a year travelled on the Gulf of Bothnia, the ferry companies on the Åland Sea carried nine million passengers in 2002.

At a more detailed level, we find that the historical development of passenger conveyance on the Gulf of Bothnia can be traced by the expansion of the route network and in the pattern of travel within this network. In their capacity to link local markets, the network of ferry routes is one indication of the anticipation of local demand. The significance of the derived demand is what materialises in travel figures. To give an overview of this interrelation, the development of the ferry network is first outlined.

Figure 1. Ferry routes on the Gulf of Bothnia.

Ferry routes on the Gulf of Bothnia

1. Luleå - Uleåborg
2. Skellefteå - Jakobstad
3. Umeå - Vasa
4. Örnsköldsvik - Vasa
5. Härnösand - Vasa
6. Sundsvall - Vasa
7. Sundsvall - Björneborg
8. Gävle - Kaskö

In the development of ferry services, the network has been subject to a number of changes. During the 1960s, we find a strong ambition to connect a large number of cities with ferry links. Figure 1 illustrates the ferry network at its maximum in the 1960s.

On the four main routes (2, 3, 4, 6) across the Gulf of Bothnia, the traffic development turned out to be less promising than that on the Åland Sea. The local markets have been smaller and less stable as far as travel figures are concerned. In these figures, we find that the fluctuations on the markets occurred more frequently and were of greater amplitude. This pattern also seems be more pertinent for the routes with less significant traffic flows.

Table 1 summarises the historical development of passenger travel by routes on the Gulf of Bothnia. From the start of car ferry services the travel has been concentrated to one major route. More than half of all traffic across the Gulf of Bothnia was concentrated to the Umeå and Vasa link. The next route in order of travel frequency is the one between the cities of Sundsvall and Vasa. At this link, the conveyance of passengers followed the growth pattern mentioned above, with exception for an unexpected peak in the early 1980s. The next two routes are small in comparison. Less than 200 thousand passengers travelled at most between the cities Skellefteå-Jakobstad and Örnsköldsvik-Vasa respectively. The great differences are notable given the fact that the distance is less than the route between Sundsvall and Vasa. Still, the historical record in terms of traffic performance is remarkable.

<table>
<thead>
<tr>
<th>Route</th>
<th>Year</th>
<th>1960</th>
<th>1970</th>
<th>1980</th>
<th>1990</th>
<th>Distance (Nautical miles)</th>
<th>Travel time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Umeå-Vasa</td>
<td></td>
<td>29.3</td>
<td>256</td>
<td>370</td>
<td>650</td>
<td>54</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.2</td>
<td>104</td>
<td>214</td>
<td>175</td>
<td>134</td>
<td>9</td>
</tr>
<tr>
<td>Sundsvall-Vasa</td>
<td></td>
<td>9</td>
<td>32</td>
<td>64</td>
<td>133</td>
<td>75 / 73</td>
<td>6</td>
</tr>
<tr>
<td>Skellefteå-Jakobstad/Karleby</td>
<td>6.5</td>
<td>31</td>
<td>-</td>
<td>55.3</td>
<td>91</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Örnsköldsvik-Vasa</td>
<td></td>
<td>6.5</td>
<td>31</td>
<td>-</td>
<td>55.3</td>
<td>91</td>
<td>7</td>
</tr>
</tbody>
</table>


The difference of travel frequency by route is notable given the fact that the development of route network, the vessels and services offered
shared equal characteristics independently of routes. The similarities on
the supply side seen in the companies’ business concepts and use of
tonnage together with the subsequent attempts to introduce or revive
occasional routes, suggest that the commercial opportunities have been
different.

To analyse how these “business opportunities” have influenced the
traffic performance this study focuses on the spatial determinants of
travel. The method is to estimate a gravity equation in order to analyse
the spatial interaction of people on the Gulf of Bothnia.

3. The gravity equation

The origin and interpretation

The gravity equation is well known and gravity models belong to the
most frequently used tools in the study of spatial interaction. One reason
is that spatial interaction is an important phenomenon in the regional
economy and therefore a significant topic in regional research. In studies
with a regional approach such as human and economic geography,
transport planning and consumer behaviour, the gravity models have
proved to be a useful way of analysing phenomena of spatial
interaction. The gravity equation stems from the category of economic and
social “laws” borrowed from natural science. The law of gravity was
defined by Newton in the 17th century and scholars interpreted this
concept of gravity on social phenomena a few centuries later. In applying
the concept of gravity, the multiplicative formulation of the law has
generally been kept, while the definitions of distance and mass have been
reinterpreted according to the phenomena concerned.

In the economic literature on trade flows these concepts have been
interpreted in the following ways: (1) The force stated in the law of
gravity is often defined as the amount of goods or passengers exchanged
or conveyed bilaterally. (2) The concept of mass is in general translated
into physical units such as gross domestic product (GDP) and population.
(3) Distance is a more debated concept as the simple solution of using the
minimum distance between countries has several shortcomings. The
shortest way might not be used and different routes might be employed in
conveying goods between the countries of concern. The distance could

---

10 Sen and Smith (1995); Andersson (1979), p. 106.
furthermore be subject to non-geographic impacts such as history, culture and language.\textsuperscript{11}

The gravity approach has proved to be empirically robust in a number of studies on trade flows. However, the theoretical basis seems to be less robust. The question why distance, GDP and population would have an impact on trade flows needs to be handled accordingly. Similarly, the questions of why travel patterns occur need theoretical foundations related to human behaviour.\textsuperscript{12}

\textbf{Travel studies and gravity}

The key mechanism behind the spatial interaction across the Gulf of Bothnia could be summarised by the following question: Why do people travel? The short answer is that people are concerned with moving from point A to B. However, as highlighted in recent studies on the Baltic ferry service, the passenger could well be travelling for pleasure. This pleasure derives from the tax-free cruise and shopping opportunities offered on board.\textsuperscript{13} Therefore, the motive for travel is a mix between pure transport and on board activities in combination with tourism or leisure.

The latter motive of travel is moreover shown by the fact that after the abolition of duty free sales in 1999, the number of passengers conveyed across the Gulf of Bothnia declined by 84 per cent, as mentioned above. The recent market developments give one indication of the significance of tourism transport, while the present figures are not representative for the past. This study assumes that the motives are mixed and that the impact on the pattern of travel is derived from both travel and tourism. With that in mind, the implications for interpretation of the gravity model are concerned.

The motive of travel is a multi-faceted issue. We can hardly tell the pure reason behind the recent single trip without questionnaires and neither is the motive for people travelling more than thirty years ago accessible. However, the economic determinants of travel give clues to understanding why people tend to travel. In essence, the ability or access to travel is determined by income and price. As the Engel’s law states, the budget share spent on foodstuff tends to decrease as income increase. The significance of this concept is that demand for commodities that

\textsuperscript{13} Tesch (1999), pp. 3-38.
meet basic needs is relatively unchanging while demand for luxury goods such as holiday and pleasure is subject to changes in prices and income.\textsuperscript{14} This explanation is reminding of a behavioural theory called Maslows’ hierarchy of motivation.\textsuperscript{15} In turn, the motive of utility transport is not linked to tourism \textit{per se}. Despite the difference in individuals’ motivation of travel, the economic determinants do not necessarily differ. In the transport literature, the concomitant feature of economic growth and expansion of transport is well known. Although the elasticity might be different, we can assume a positive sign. Therefore, the mass in the gravity equation could be translated to income. To this income, population is added, as it tells us something of the market size.

Specific motives for travel can be expected due to social and cultural proximity.\textsuperscript{16} However, the results of trade or tourism studies are difficult to link to the specific case of the Gulf of Bothnia. In this area, migration from Finland to Sweden together with Swedish speaking minorities in Finland give reason to believe that there were specific preferences for travel. This study expects, in line with findings in the migration literature, that family ties and friendship imply strong motives of travel.\textsuperscript{17} Finnish immigrants living in Sweden are therefore considered, while the Swedish-speaking minority living in Finland is left aside. Family relations are hazardous to interpret in terms of language and the motive of travel connected to language is difficult to interpret in terms of travel motives.

The difficult part in linking the gravity equation to findings in tourism transport studies is the translation of distance. In the transport literature, the effect of distance could be explained as a barrier for travel. For practical reasons, we tend to travel shorter distances more often than longer. In the case of tourism transport, this distance effect could play a role if we compare ferry tourism traffic with other tourism opportunities.\textsuperscript{18} However, the motive for taking a shorter ferry trip rather than a longer trip is more difficult to motivate. On occasion, this might reflect motive factors such as that a round trip on a ferry can be made on one day or even one night instead of a longer stay if the only reason is recreational shopping. Recent figures on onboard sales support this interpretation.\textsuperscript{19}

\textsuperscript{15} Maslow (1970), pp 97-104.
\textsuperscript{16} Ryan (2002), pp. 952-971.
\textsuperscript{17} See eg. Häggström (1990).
\textsuperscript{18} Halsall (1992), pp. 156-175.
Specification of the model

This study employs a traditional gravity model augmented by one policy variable to account for the traffic performance by route on the Gulf of Bothnia. The model takes into account four ferry routes over a period of 42 years (1960 to 2002). The gravity equation is expressed in an additive form using natural logarithmic transformations as follows:

\[
\ln(travel)_{ijt} = \beta_0 + \beta_1 \ln(inc)_{it} + \beta_2 \ln(inc)_{jt} + \beta_3 \ln(pop)_{it} + \beta_4 \ln(pop)_{jt} + \beta_5 \ln(fin)_{it} + \beta_6 \ln(dis)_{ij} + \beta_7 \text{tax}_t + \epsilon_{ijt}
\]

where the intensity travel \(\ln(travel)_{ijt}\) denotes the number of passengers carried between city \(i\) and \(j\) in year \(t\) while the right hand side denote income, demographic, distance and taxation variables. The operational definitions of the variables employed for the estimation is shown in table 2.

<table>
<thead>
<tr>
<th>Table 2. The variables in estimating the gravity equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>(travel)_{ijt}</td>
</tr>
<tr>
<td>(inc)_{it}</td>
</tr>
<tr>
<td>(inc)_{jt}</td>
</tr>
<tr>
<td>(pop)_{it}</td>
</tr>
<tr>
<td>(pop)_{jt}</td>
</tr>
<tr>
<td>(fin)_{it}</td>
</tr>
<tr>
<td>(dis)_{ij}</td>
</tr>
<tr>
<td>(tax)_{t}</td>
</tr>
</tbody>
</table>

The data set is derived from official statistical sources in Finland and Sweden. This data covers the dependent variable (traffic) on the four lines and the independent variables (income, demographic and distance) on six cities. The panel data set contains 168 observations.\(^{20}\)

The trade flow variable contains the passengers conveyed between city \(i\) and \(j\) during one year. Income is expressed as the real per capita income.\(^{21}\) However, the real income is not accessible for the cities. Therefore, the national real per capita income is taken as a substitute. The

\(^{20}\) The ferry route between Örnsköldsvik and Vasa was occasionally closed in a few years during the 1970s and 1990s. To avoid extreme values the closed years are interpolated. The interpolation is based on the passenger traffic flows on the Gulf of Bothnia.

\(^{21}\) The real income is expressed in GDP/capita 1990 Geary-Khamis international dollar.
national average can bias the result if large regional income differences exist. Studies on convergence over counties suggest that the real income differences tend to level out over time.\textsuperscript{22} A recent survey on real income by counties indicates that small differences exist between the cities.\textsuperscript{23}

Population is measured as the number of people living within a presumed traffic generating area. The area is limited to a range between five and six thousand square kilometres. The rational of this size is twofold. Firstly, the major population centres are covered within these catchment areas. Secondly, the catchment areas are located side by side along the shore. This means that the cities along the shore are subordinated to the closest port. The distance to the port has been the guiding principle. Measured in time, the access to the port is achieved within approximately one-hour range. In table 3, the population size and the size of the catchment areas is shown.

The size of population by catchment area falls within the range of 55 and 163 thousand. The largest catchment area by land is Skellefteå (6838 km\textsuperscript{2}) and the smallest is Jakobstad (5016 km\textsuperscript{2}). Since the population centres are scattered over a large area of land in Skellefteå and Örnsköldsvik, the spatial movement within such an area is presumably different from that densely populated area. The need to overcome longer distances in everyday life due to commuting is assumed to affect the spatial movement connected to ferry services. Therefore a larger catchment area is considered as an acceptable approximation.

The other demographic variable considered is the number of Finnish immigrants in selected Swedish municipalities. Table 3 shows that the largest group of Finnish immigrants lived in Umeå (4236) and the smallest group lived in Skellefteå (1025) in 2002.

\textsuperscript{22} Persson (1997), pp. 1847-1851; Kangasharju and Arhippainen (1999), pp. 31-38.
\textsuperscript{23} The PPS index (EU15=100) presented in 1994 shows the following values; Finland (91); Sweden (98); Vasa kustregion (94); Västerbotten (93); Västernorrland (98).
Table 3. Demographic data by catchment areas in 2002.

<table>
<thead>
<tr>
<th>Catchment area</th>
<th>Population</th>
<th>Land area in km²</th>
<th>Finnish born and citizens by selected Swedish municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sundsvall</td>
<td>136229</td>
<td>5058</td>
<td>3508</td>
</tr>
<tr>
<td>Umeå</td>
<td>129745</td>
<td>5382</td>
<td>4236</td>
</tr>
<tr>
<td>Skellefteå</td>
<td>71813</td>
<td>6838</td>
<td>1025</td>
</tr>
<tr>
<td>Örnsköldsvik</td>
<td>55047</td>
<td>6418</td>
<td>1125</td>
</tr>
<tr>
<td>Vasa</td>
<td>162999</td>
<td>5128</td>
<td></td>
</tr>
<tr>
<td>Jakobstad</td>
<td>105937</td>
<td>5016</td>
<td></td>
</tr>
</tbody>
</table>

Note: The catchment area of Sundsvall encompasses the municipalities of Sundsvall, Timrå and Härnösand and the Umeå area covers the municipalities of Robertsfors, Vännäs, Nordmaling and Umeå. The catchment area of Vasa embraces the municipalities of Ilmajoki, Nurmo, Seinäjoki, Ylistaro, Iso-kyrö, Korsnäs, Laihia, Maalahti, Maksamaa, Mustasaari, Oravainen, Vaasa, Vähäiskyrö, Yöyri. The catchment area of Jakobstad includes the following municipalities; Kruunupyy, Luoto, Pedersören kunta, Pietarsaari, Uusikaarlepyy, Himanka, Kannus, Kokkola, Kälviä, Lohtaja, Kaustinen and Ullava.

Source: SOS; population census 2002, FOS, population census 2002.

The translation of distance in the gravity equation is accomplished by measuring the geographic distance between the ports of concern. This distance is expressed in nautical miles. Table 1 shows the figures on geographic distance. The distance might also be translated into travel time. However, in terms of gravity, the travel time is difficult to interpretate as it is a time span and not a distance. Due to the policy held by the operators, the travel time might also be biased by considerations such as fuel saving, accommodation and specific offers etc. In turn, the geographic distance meet the requirements of the gravity model and can be precisely measured.

Additional variables due to the frequency of service and the ticket prices are omitted in this study. Firstly, the frequency is assumed to be an anticipation of local demand. As the ferry operators have made several attempts to expand the network and the service frequency within the network, it is hard to believe that local demand not have been exploited. Secondly, the ticket price is assumed to be an outcome of geographic distance as one previous study have shown that ticket price tend to increase with distance.\(^\text{24}\)

The significance of the variables defined above is estimated in line with the specification of the gravity equation. The autoregressive (AUTOREG) procedure is used to estimate the regression model. This

\(^{24}\) Bäckström (1969), pp. 61-64.
autoregressive error procedure is applied when the errors are autocorrelated or heteroscedastic. As the time series data might be autocorrelated or heteroscedastic the assumptions on which the classical linear model is based could be violated. The test for these assumptions indicates significant heteroscedasticity. The testing also shows a non-presence of autocorrelation Therefore, a generalized autoregressive conditional heteroscedasticity (GARCH) model is employed in the analysis. The SAS software programme was employed in the estimation of this model. In the next section, the result from the estimation is shown.

4. Results

The estimation is carried out for the entire sample of permanent ferry routes and over the period 1960 to 2002. Table 4 reports the first result. It indicates that the model is fairly precisely estimated. Of all eight coefficient estimates are seven significant at the .001 level. The total R-square value is .88. The GARCH model successfully approached the heteroscedastic errors in the time series data.

| Variable | Parameter | Estimate | Standard Error | t Value | Approx Pr > |t| |
|----------|-----------|----------|----------------|---------|-------------|---|
| Intercept | $\beta_0$ | -49.7313 | 3.0546 | -16.28 | <.0001 |
| $\ln(inc)_it$ | $\beta_1$ | 1.8888 | 0.7327 | 2.58 | 0.0099 |
| $\ln(inc)_jt$ | $\beta_2$ | 0.3975 | 0.4680 | 0.85 | 0.3956 |
| $\ln(pop)_it$ | $\beta_3$ | 2.1933 | 0.0677 | 32.37 | <.0001 |
| $\ln(pop)_jt$ | $\beta_4$ | 0.8338 | 0.0710 | 11.75 | <.0001 |
| $\ln(fin)_it$ | $\beta_5$ | 0.1976 | 0.0476 | 4.15 | <.0001 |
| $\ln(dis)_{ij}$ | $\beta_6$ | -1.8361 | 0.0401 | -45.76 | <.0001 |
| Tax$_i$ | $\beta_7$ | 3.8512 | 0.0711 | 54.14 | <.0001 |

Note; Total R-Square 0.88

The results are consistent with the expectations presented earlier. The signs of real income per capita are positive for Sweden. However, the corresponding parameter estimate of Finland ($\beta_2$) is not statistically significant. This explanatory variable was therefore scrutinized. At a closer look it was noticed that the Finnish real income tended to overlap the effect of the Swedish real income. The supplementary information was not significant. Testing for multicollinearity shows that the two variables were highly correlated (.99). In the case where two explanatory

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25 See e.g. Heiberger (2004)
variables are measuring similar aspects of a phenomenon one could leave one of them out. However, as they are measuring the Finnish side on the one hand and the Swedish side on the other it is assumed that the cost of including both are lower than the cost of leaving them out. By excluding either one, the specification of the model would be biased. To overcome the risk of specification bias, the coefficient estimate was restricted. As the values of the two variables are reasonably similar it was assumed that they could be restricted to the same coefficient estimate.\textsuperscript{26} A second estimation was accomplished to test if this assumption holds.

The second estimation of the entire sample is reported in table 5. The result indicates that all eight parameter estimates are significant at the .001 level. The total R\textsuperscript{2} value is .92. The second estimate is assumed to be a better approximation of the gravity equation.

Table 5. Second garch estimates.

| Variable | Parameter | Estimate | Standard Error | t Value | Approx Pr > |t| |
|----------|-----------|----------|----------------|---------|--------------|-------|
| Intercept | $\beta_0$ | -45.5415 | 3.0572         | -14.90  | <.0001       |
| ln(inc)\textsubscript{it} | $\beta_1$ | 0.9349   | 0.0549         | 17.04   | <.0001       |
| ln(inc)\textsubscript{jt} | $\beta_2$ | 0.9349   | 0.0549         | 17.04   | <.0001       |
| ln(pop)\textsubscript{it} | $\beta_3$ | 2.0945   | 0.1378         | 15.20   | <.0001       |
| ln(pop)\textsubscript{jt} | $\beta_4$ | 0.9178   | 0.1886         | 4.87    | <.0001       |
| ln(fin)\textsubscript{it} | $\beta_5$ | 0.3445   | 0.0974         | 3.54    | 0.0004       |
| Ln(dis)\textsubscript{ij} | $\beta_6$ | -2.0222  | 0.0727         | -27.82  | <.0001       |
| Tax\textsubscript{i} | $\beta_7$ | 3.6403   | 0.0921         | 39.54   | <.0001       |

Note; Total R-Square 0.92

The two regression models indicate similar parameter estimates. For all variables, the signs meet the expectations presented in the earlier section. The real income coefficient estimates are positive, showing that the ability to travel is materialised in terms of traffic flows. The propensity to travel by ferries is growing as incomes increase. This result supports earlier findings on determinants of tourism demand.\textsuperscript{27} It also shows that the growth of income has an overall impact on the travel on all the routes across the Gulf of Bothnia.

Also, the parameter estimate on the population variables has the expected positive sign. This result shows that the travel is positively dependent on population. The impact of population on travel gives one clue to understanding the differences between routes as the scope of

\textsuperscript{26} The parameters for the variables ln(inc)\textsubscript{it} and ln(inc)\textsubscript{jt} were constrained as follows: $\beta_1 = \beta_2$.

\textsuperscript{27} Crouch and Shaw (1992), pp. 175-207.
travel is running together with the size of population. The population figures give an indication of how the market size at the local link has developed. In the case of Skellefteå and Örnsköldsvik, the small population presumably causes the moderate traffic figures. Over the period 1960 to 2002, the population was actually reduced by on average 0,1 per cent annually in Skellefteå and 0,3 in Örnsköldsvik. In turn, the population increased in the other catchment areas. In Umeå, we find a remarkable growth from 80 to 130 thousand during the period 1960 to 2002.28

Due to the distribution of traffic and population, the impact of the demographic variables should also show a positive sign. The expected travel motivated by family ties and bounds of friendship also suggests that travel would grow more intense. As shown from the estimates this presumed expectation holds. Finnish immigrants tend to travel more often accordingly. This gives a further impact on the population differences across the catchment areas. As also Sundsvall and Umeå inhabit the largest population of Finnish immigrants, the more intense traffic relative to Örnsköldsvik and Skellefteå is given a further explanation.

Travel across the Gulf of Bothnia is negatively correlated to geographic distance. The greater the distance, the smaller the traffic flows. This result is highly expected given the specification of the gravity equation and the stylised facts on travel and distance. We find the most significant distance effect by comparing the routes Umeå-Vasa to Sundsvall-Vasa. From the outset we find quite similar prerequisites due to e.g. income and population. However, the traffic is two times larger at the most narrow passage. This is a strong indication that is supported by the parameter estimates.

Finally the impact of duty free sale is tested. The parameter estimate is significant and the concession of tax-free gives a strong stimulation for travel. In the gravity framework, the impact could be interpreted as if the force of gravity is amplified by an exogenous variable. This result confirms the historical analysis of Bothnian’ ferry services as significantly dependent on the tax-free concession. As shown by the traffic performance at the turn of the century, only the strongest link across the Gulf of Bothnia is active at present.

The parameter estimates indicate that future conveyance of passengers across the Gulf of Bothnia is dependent on how real income, population and Finnish immigration develop. This study also shows that

the policy issued on the ferry traffic is crucial for the further possibilities to secure the travel across the Gulf of Bothnia.

5. Conclusions

This article has provided an historical overview of the growth of passenger conveyance between Finland and Sweden. In the specific study on the Gulf of Bothnia this transformation of travel underscores how ferry operators have matched the demand for recreation and tourism travel. The ferry operators could also, thanks to tax-free, develop a concept more closely associated with cruise services than pure transport services.

The tax-free concession issued on ferry services had a strong impact on the growth of travel. Firstly it meant an attraction, which domestic substitutes hardly could compete with and secondly that an additional income receipts was given to the ferry companies. In turn, the adherence to the business concept conducted to the tax-free concession proved to be less successful as shown by the current situation at the Gulf of Bothnia.

However, the development of cruise ferry services needs to be considered in a wider context. Market density and general level of economic development are important factors for the diversity of the economy and thus for the demand for consumer goods and services. The contemporary transformation of consumption patterns recognised by the rapid diffusion of consumer durables and tourist services such as cruise ferry services have grown concurrently with income. From that perspective, income changes over time, market density and favourable geographical prerequisites, are good measures of business opportunities for the regional ferry industry at the Gulf of Bothnia. At the level of local links, specific features such as distance of routes, population size and Finnish immigrants had a significant impact on traffic performance. This result indicates that the performance on a submarket featured with a low population density in the catchment areas, as the Gulf of Bothnia, became a less significant market compared to other short sea route markets as the Åland Sea, the Gulf of Finland and the South Baltic.
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