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Trade and FDI: Substitutability vs. Complementarity Revisited

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Trade and FDI:
Substitutability vs. Complementarity Revisited

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EXECUTIVE SUMMARY: This study examines how Foreign Direct Investments (FDI) and international trade are related, examining the impact of a growing and increasingly integrated world economy on Swedish exports and the foreign affiliate production of Swedish multinational firms.

The findings are used to discuss in what way, if any, outward FDI by Swedish multinational enterprises may have contributed to the decline in the market share of Swedish exports in world merchandise trade.

The analysis is based on a three-country model of FDI with heterogeneous firms, which is estimated on firm-level data on Swedish multinational firms.

We show that a growing world economy increases Swedish exports as well as foreign direct investments. However, world income growth promotes FDI more than exports from Sweden, by increasing both affiliate production directed towards the local market and affiliate exports.

We further show that the steady decline in trade barriers that has occurred during the last few decades does not only increase the exports of Swedish firms but also export platform FDI. However, these two effects neutralize each other.

Since world income growth then causes a decline in exports from Sweden as a share of firms' foreign sales, we would expect a similar declining trend in both the Swedish share of world merchandise exports and the Swedish share of world income.

Such a process is likely since not only MNEs will expand in growing markets, there will also be entry by indigenous firms, thereby increasing the competition on international markets.

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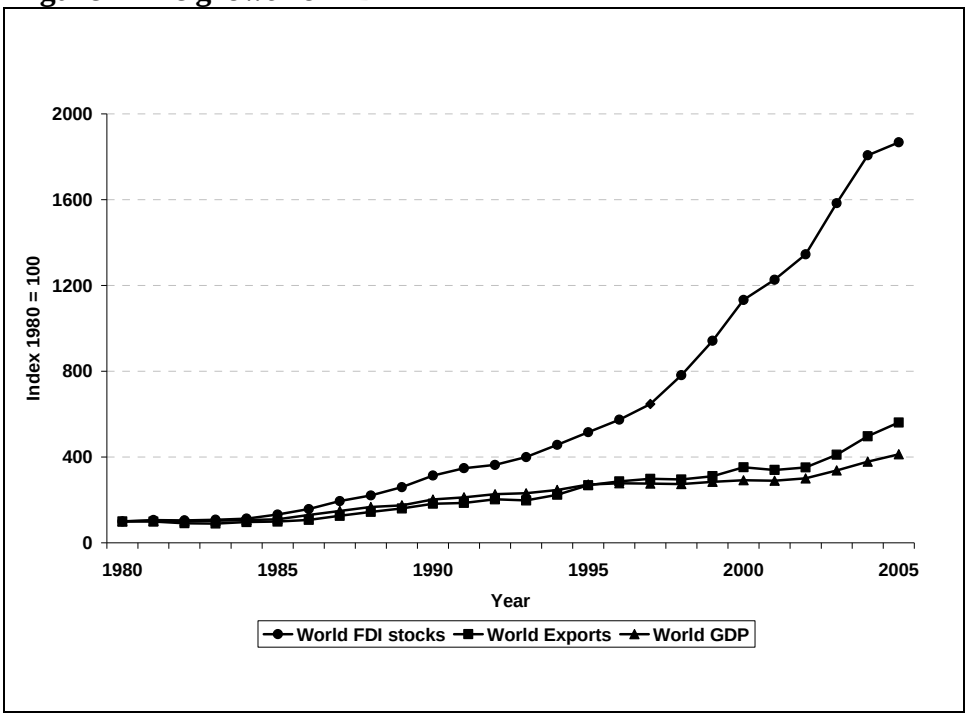
1 Introduction

In the last few decades of globalization, there has been a substantial growth in world income and world trade. Still, as illustrated in Figure 1, one of the most striking features of the globalization process is the rise in foreign direct investment (FDI) by multinational enterprises (MNEs).[2] Over the period 1980 to 2005, FDI increased 18 times over its initial value, while merchandise trade and domestic production increased 6 and 4 times, respectively.[3]

Figure 1 The growth of FDI



Source: World Bank, World Development Indicators.
Note: Index numbers, 1980=100.

[2] A multinational firm refers to a firm which has a controlling right, typically more than 50 % of the equity share, in a subsidiary or affiliate in a country other than the country of the parent company. The controlling right implies a "lasting interest" in the management of that enterprise, enabling the MNE to create, expand or develop the activities of the affiliate. A detailed definition of FDI and MNEs can be found in the Appendix.
[3] The amplified surge of FDI could be further depicted by the significant increase in negotiated Bilateral Investment Treaties (BITs), going from 134 to approximately 2500, between 1980 and 2005.

Today, there are 77000 MNEs (parent firms) world wide, with around 770000 affiliates in foreign countries (UNCTAD, 2006), which shape the world economy through their central position in international trade, information technology, internationalization of production and global FDI. Foreign owned-MNEs employ about one out of five workers in European manufacturing (Barba-Navatti and Venables, 2004). MNEs – the parents and their affiliates taken together – account for up to two thirds of world commodity trade and as much as one third of world trade takes place within multinationals (UNCTAD, 1996 and Helpman, 2006). Multinational firms are further more productive, pay higher wages and have access to technologies, marketing and know-how not available to local firms (Barba-Navaretti and Venables, 2004).

FDI by multinational firms is thus important in the globalization process as it creates significant economic benefits for both the receiving host economy and the sending home economy. But there are also some concerns. For the home countries of multinational firms, there is often a fear that outward FDI takes place at the expense of home-country exports and production activities and hence, that foreign expansion can lead to structural adjustment costs in the home country.

The effects of outward FDI on production and exports are particularly important for a small country like Sweden where the industry is dominated by a small number of large firms.

Recent research (Nordström, 2005) has presented empirical evidence of a declining world market share of Swedish exports in merchandise trade. This coincides with an increased degree of internationalization in the Swedish firm production networks. Swedish outward FDI stocks increased from 3.57 to 202.8 billion USD between 1980 and 2005, and as a share of GDP, Swedish outward FDI stocks grew from 2.75 % to 56.52 %.

From a policy standpoint, the fear is that the declining world market share of Swedish exports could imply a decline in Swedish competitiveness, thus undermining the basis for future Swedish prosperity.

Besides such a dramatic interpretation, there may also be less dramatic ones. For example, Swedish firms may have changed their mode of serving foreign markets. Instead of exporting to foreign destinations, they may have shifted the assembly of goods to the sales destinations while concentrating know-how related activities such as management, R&D and marketing at home.[4]

[4] The trade balance may thus contain merchandise trade, which increasingly takes place abroad. But it does not contain the counterbalancing intangible knowledge service flows into which Sweden specializes.

In this report, we will:

- Present stylized facts on both international trade and FDI in order to acquire a deeper understanding of the two components and other issues, which are related to the internationalization of firms;
- Shed some light on the relationship between international trade and FDI in order to examine whether trade and investments are complements or substitutes by addressing the relevant literature and empirically assessing the linkage between exports and foreign affiliate sales.
- Use the findings on the relationship between trade and investments to discuss in what way, if any, outward FDI by Swedish MNEs may have contributed to the decline of the market share of exports for the exports of Sweden in world merchandise trade.

This report confines its analysis to manufacturing, excluding services.[5] It only discusses the effects of FDI and trade on the host and home country, such as labor market effects, to a very small extent. The focus will be on how FDI and home-country exports are related within a firm (so-called off-shoring). The analysis will not discuss how FDI affects contractual relationships outside the firm (so-called outsourcing). Further, this study will only focus on Swedish exports as a world market share, thus excluding the performance of other countries.

The empirical analysis of this report rests on both data aggregated at the country level and disaggregated at the firm level. The former are taken from United Nations Conference on Trade and Development (UNCTAD), Organization for Economic Co-operation and Development (OECD), and United Nations Commodity Trade Statistics Database. The latter are taken from the Research Institute of Industrial Economics (the IFN database), which contains almost all Swedish MNEs in the manufacturing sector and is available for the years: 1965, 1970, 1974, 1978, 1986, 1990, 1994, 1998 and 2003.

To capture the relation between FDI and international trade, we attempt to understand the underlying forces that drive both international trade and FDI, using micro data on Swedish multinational firms. Encompassing the recent theoretical and empirical literature, this study focuses on the role played by the growth of the world economy and the substantial fall in trade cost over time.

[5] The quantitative analysis will be conducted on firms within the manufacturing sector.

The main audience for the report will be policy makers in the area of trade and investment, but also general economic policy makers who want to get a non-technical, yet rigorous insight into the up-to-date knowledge on how international trade and FDI interact and a discussion of to what extent this outward FDI has contribute to a decline in the Swedish share of world merchandise exports.

Chapter 2 presents the basic theory of FDI and a general review of the current state of empirical research on the relationship between trade and FDI. Chapter 3 examines the pattern of outward FDI by Swedish firms, illustrating the degree of internationalization in Swedish production. Chapter 4 presents stylized facts on the relationship between exports and FDI within Swedish MNEs. Chapter 5 presents an empirical examination of the relationship between trade and FDI, using econometric analysis, and chapter 6 summarizes the conclusions.

2 The relationship between FDI and trade

To discuss the relationship between trade and FDI, we first need to explain the mechanisms for why firms invest abroad, which is the purpose of this chapter.[6]

The theoretical literature on multinational firms rests on the seminal work by Dunning (1974, 1985, and 1988) in the so-called OLI approach, which was one of the first contributions in theoretical analyses of multinational firms.[7] Briefly, the OLI approach argues that multinational operations are determined by three factors

- *(O) ownership-specific advantages*, where firms of one nationality possess advantages relative to those of another nationality in sourcing a market. This could be in terms of firm-specific assets such as patents, technologies, know-how or a brand name;
- *(L) location-specific advantages*, where it is profitable to combine the use of internalized ownership-specific advantages in a foreign country rather than in the home country;
- *(I) internalization-specific advantages*, where firms find it profitable to use these advantages themselves through affiliates rather than leasing them to firms in foreign countries.

The OLI framework has been formalized later on, for instance in Markusen (1984, 1997, 2002), Horstmann and Markusen (1992), Markusen and Venables (1998, 2000), Helpman (1984, 1985), Ethier (1986), Ethier and Markusen (1996) and Grossman and Helpman (2002). A detailed description of the literature can be found in Barba-Navaretti and Venables (2004).

Below, we will give a simple overview of how the theoretical work on multinational enterprises and FDI has been applied and then show how we can use the theory to make predictions about the relationship between international trade and FDI.

[6] See also Herzing, Norbäck and Persson (2007).

[7] The OLI approach is a combination of the "Structural Market Imperfection Theory" by Kindleberger (1969) and Hymer (1976) and the "Natural Market Imperfection Theory" developed by Buckly and Casson (1976), where both theories argued that firms become multinational due to market imperfections.

2.1 Horizontal FDI – getting better market access

In the public debate, there is often the view that FDI flows from developed high-wage countries to developing low-wage countries are associated with jobs being relocated from high-wage countries to low-wage countries. Looking at FDI flows, it is true that it is predominantly firms from developed countries that invest abroad. However, these investments are most likely to be destined to other rich countries. This can be seen in Table 1 and 2, where we note that Western European countries and the US are simultaneously the largest investors as well as the largest recipients of FDI flows.

Another stylized fact is that MNEs are often large firms with advanced products that are active in high-tech sectors. The starting point for this explanation of FDI is that within high-tech or knowledge intensive industries, a significant part of a firm's total costs can be attributed to costs associated with developing or inventing new products or technologies. *The theory of horizontal FDI seeks to explain precisely why FDI flows between rich countries in knowledge intensive industries.*

The starting point for this explanation of FDI is that within high-tech or knowledge-intensive industries, a significant part of a firm's total costs can be attributed to costs associated with developing or inventing new products or technologies.

A simple example:

Imagine a truck producer in a developed country H ("Home") who plans to develop, manufacture and sell a new model. This may involve years of research and development (R&D) with significant fixed costs incurred. To ensure that the new model will be a profitable investment, the firm needs to ensure a sufficiently large volume of sales.

One way for the firm of increasing its sales is to expand its activities beyond the domestic market, and begin to export to a foreign country, which we refer to as country F. This is shown in Figure 2.

Suppose now that there are significant trade barriers to the export market in country F (marked out as t_{FH} in Figure 2), for instance, emerging through tariffs on imported trucks or transport costs. If the firm invests in an additional plant in country F and produces the model for the local market in a foreign affiliate, it can further increase its sales by avoiding trade costs. This is shown in Figure 3 where the investment refers to the same activity, i.e. the production of trucks, taking place at home and abroad.

Figure 2 International Expansion: Exports

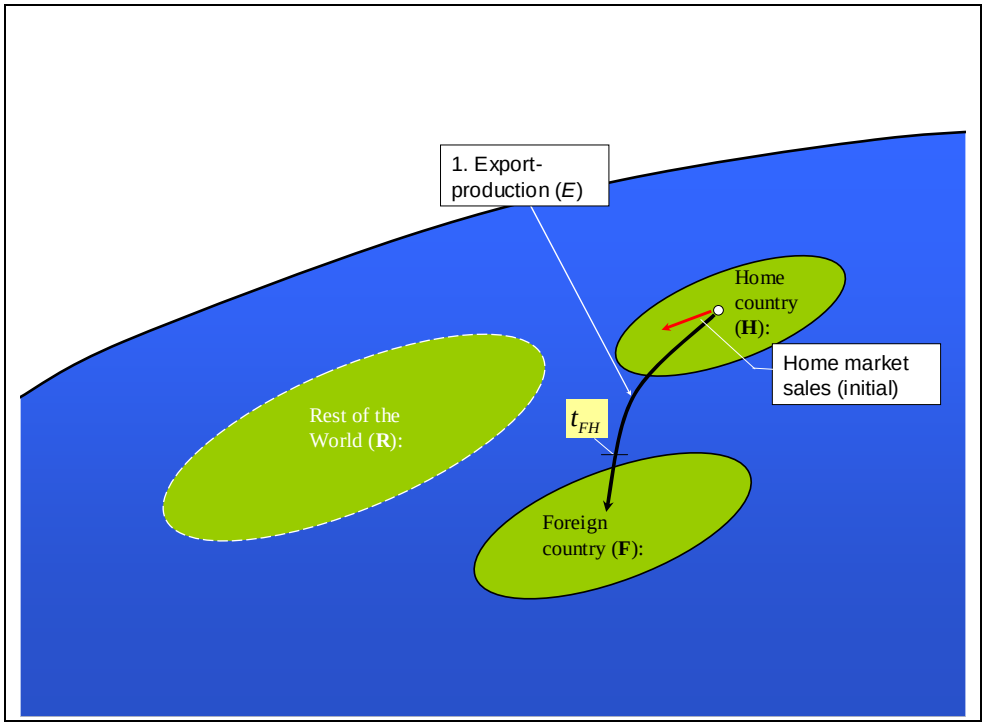
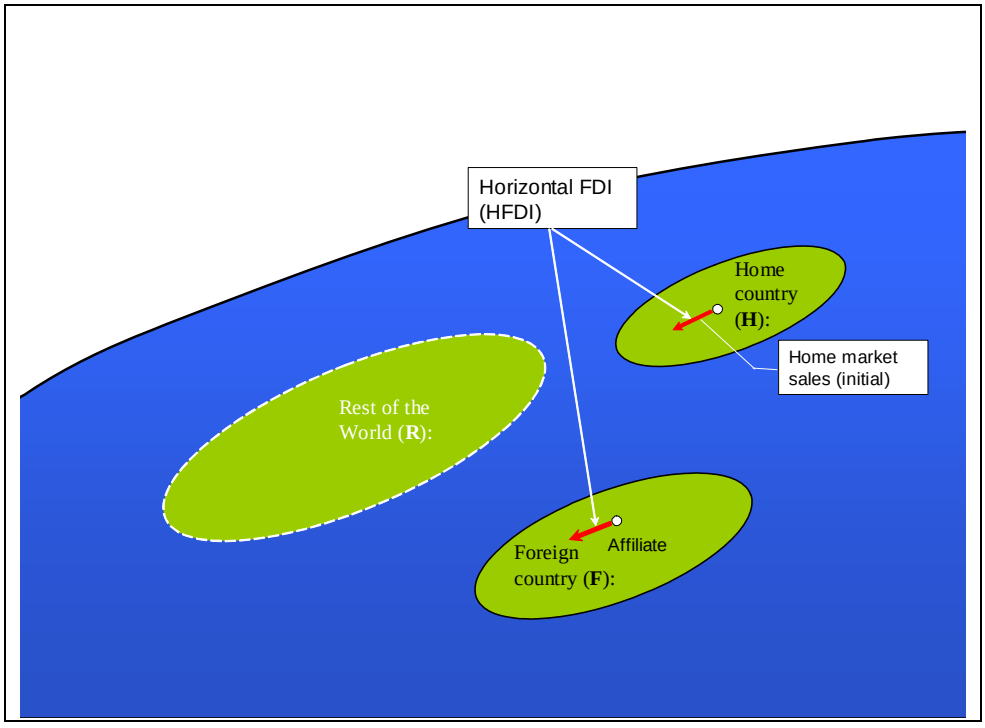


Figure 3 International Expansion: Horizontal FDI



The firm's decision between concentrating production in the home country H (and selling to the foreign market in country F with exports) and FDI (where production and sales in the foreign market take place in an affiliate in country F) will be given from how much is gained by increasing sales by avoiding the trade costs associated with exports t_{FH} and how much is lost in scale economies with FDI. In this context, proximity to consumers will be more important in large markets where consumers have a high willingness to pay since the savings on trade costs will increase in the amount of sales in the market.

Table 1 Distribution of outward FDI stocks

Region/economy	1980	1985	1990	1995	2000	2005
World (Million US dollars)	**571 228**	**755 622**	**1 791 092**	**2 949 168**	**6 471 435**	**10 671 889**
Regional distribution						
Developed economies	**87.3%**	**88.4%**	**91.7%**	**88.5%**	**86.2%**	**86.9%**
Europe	41.1%	44.1%	49.5%	50.5%	56.3%	58.5%
European Union	37.2%	40.7%	45.2%	44.9%	47.1%	51.3%
Other developed Europe	3.9%	3.5%	4.3%	5.6%	9.2%	7.2%
North America	41.9%	37.3%	28.8%	27.7%	24.0%	23.0%
Other developed countries	4.4%	7.0%	13.4%	10.3%	5.9%	5.4%
Developing economies	**12.7%**	**11.6%**	**8.3%**	**11.4%**	**13.5%**	**11.9%**
Africa	1.3%	1.5%	1.1%	1.1%	0.7%	0.5%
Latin Am. and the Carib.	8.5%	7.0%	3.4%	3.1%	3.3%	3.2%
Asia and Oceania	2.9%	3.2%	3.8%	7.2%	9.5%	8.2%
South-East Europe and the CIS	**0.0%**	**0.0%**	**0.0%**	**0.1%**	**0.3%**	**1.2%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: UNCTAD, World Investment Report, various issues.

Table 2 Distribution of inward FDI stocks

Region/economy	1980	1985	1990	1995	2000	2005
World (Million US dollars)	**561 403**	**814 481**	**1 789 303**	**2 766 114**	**5 802 933**	**10 129 739**
Regional distribution						
Developed economies	**75.6%**	**72.7%**	**79.3%**	**74.7%**	**68.5%**	**70.3%**
Europe	45.2%	37.6%	45.6%	44.8%	39.6%	46.7%
European Union	42.5%	35.4%	42.9%	42.0%	37.6%	44.4%
Other developed Europe	2.7%	2.2%	2.6%	2.8%	2.0%	2.3%
North America	24.4%	30.6%	28.4%	23.8%	25.3%	19.6%
Other developed countries	6.0%	4.5%	5.4%	6.1%	3.6%	4.0%
Developing economies	**24.4%**	**27.3%**	**20.7%**	**25.0%**	**30.3%**	**27.2%**
Africa	6.9%	5.0%	3.3%	3.1%	2.6%	2.6%
Latin Am. and the Carib.	7.1%	8.5%	6.6%	7.1%	9.3%	9.3%
Asia and Oceania	10.5%	13.8%	10.8%	14.8%	18.4%	15.4%
South-East Europe and the CIS	**0.0%**	**0.0%**	**0.0%**	**0.3%**	**1.2%**	**2.5%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: UNCTAD, World Investment Report, various issues.

Intangible assets

The knowledge of how to produce and sell the new truck – its design, technology and brand – can be viewed as an *intangible asset* which can be transferred and used in production and sales in the affiliate in the foreign country. Therefore, FDI can be seen as a source of firm-level scale economies, since no duplication of the costs for the usage of intangible assets arises when expanding sales and production across borders.

The fact that such knowledge capital is easily transferred across units may also be a reason for the firm to keep production and sales internally within a subsidiary in a foreign country. By not licensing the technology or production to local firms or agents, the firms can reduce the risk of leakage of the new technology to competitors. The firm may also more easily monitor the quality in production.

The relationship between trade and FDI in the horizontal FDI model

What is then the relationship between FDI and trade predicted by the horizontal FDI model? A comparison of Figures 2 and 3 gives the following observation.

Observation 1: *Horizontal FDI is, in general, a substitute to home-country exports, since foreign production in an affiliate in country F replaces production and exports from the home country H.*

Hence, in the horizontal FDI model, firms will prefer FDI over exports to supply goods and services, as the proximity gains from locating near consumers are higher than the concentration gains created by allocating production in a single location.

That is, FDI arising from the motive of achieving better market access will, in general, replace the exports of final goods from the home country. A remark is due, however: Foreign production may also generate new export possibilities from the home country since imported inputs and parts may be exported to final production abroad. Such complementary effects will be discussed in the next section. Note also that while foreign production fully replaces home exports of goods, the home part of the firm still "exports" the services of its intangible assets: to produce abroad there is a need for headquarter services such as R&D and marketing which are often located in the home country of the MNE. As these intangible assets are difficult to measure, the substitution effect may be overestimated.

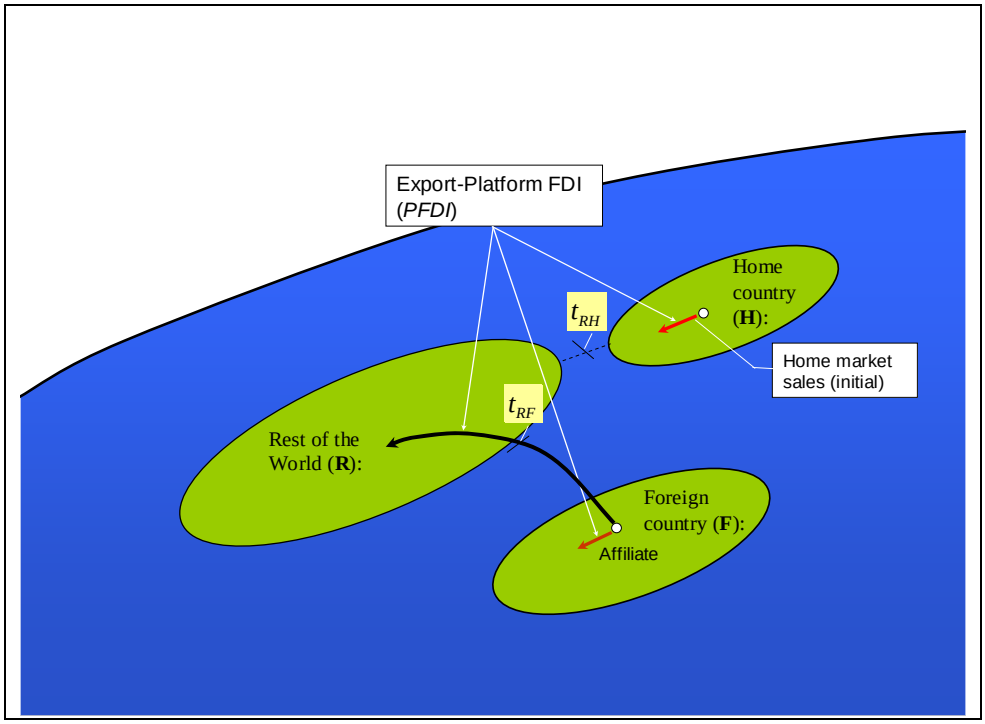
2.1.1 Platform FDI: export-driven FDI

Platform FDI can be seen as a more complex form of horizontal FDI. Platform FDI is market-access driven investments where the MNE locates production in a foreign country positioned in proximity to the export market, as a platform, in order to facilitate affiliate exports to that market. Therefore, platform FDI generates exports from foreign affiliates. This is shown in Figure 4.

A simple example

Suppose that the truck producer also wants to target the market in a third country, which we label country R ("Rest of the World"). The truck producer may then place the affiliate in country F ("Foreign") in order to sell to the market in country R. This will be profitable if country F is located close to country R, so that the trade costs (and other operating costs) for supplying the market in country R from country F (marked out as t_{RF} in Figure 4) are lower than the trade costs for serving country R from the home country (marked out as t_{RH} in Figure 4).

Figure 4 International Expansion: Platform FDI



The importance and presence of this mode of FDI, which gives an additional explanation to why firms invest abroad, have been well documented in Hanson, Mataloni, and Slaughter (2005), which concluded that there has been a growing presence of export platform FDI integration strategies after the establishment of the North American Free Trade Agreement (NAFTA).

The relationship between trade and FDI in the platform FDI model

It follows that when FDI is of the "platform" type, the following observation arises:

Observation 2: *Platform FDI can complement international trade. While production in the host country F can reduce exports from home country H, it may generate affiliate exports from country F to country R.*

FDI is predominantly driven by market-access motives

There is ample evidence on more disaggregate data of market-access driven FDI being a prime explanation for investing abroad.

For instance, Japanese car producers like Honda, Nissan and Toyota have placed car production in the United Kingdom in response to tariffs and trade costs in the EU market (Barba-Navaretti and Venables, 2004).

Several studies (for instance, Brainard, 1997 and Braconier, Norbäck and Urban, 2005a) find that the size of the market – either measured through the size of host country GDP, or market access to nearby markets, has a significant effect on FDI by US and Swedish MNEs.

Summing up the theory of horizontal FDI, which also includes platform FDI, explains why similar products are produced locally by MNEs in different parts of the world. The theory concludes that local production can increase the sales volume by avoiding trade costs in exports. The theory further concludes that in large markets with high incomes and a high willingness to pay, new investments in additional plants for local production and sales will be profitable, despite the additional investment costs. Thus, the theory of horizontal FDI explains why investments predominantly flow between rich countries. Finally, and most importantly, horizontal investments, made in order to increase market access, are likely to replace exports from the home country.

2.2 Vertical FDI – access to cheap factors of production

In recent years, there is evidence of developing countries receiving a larger share of FDI. In Figure 6, we note that FDI flows to developing countries have increased from about 3.9 billion USD (16 % of World FDI flows) in 1980 to about 373 billion USD (36 % of World FDI flows) in 2005. These investments are thus likely to be driven by access to lower factor costs in production.

Vertical FDI refers to investments where the production process, or the value chain, is fragmented into different parts in order to take advantage of differences in factor prices between countries or regions.

In general, we can consider the organization of production and sales within MNEs as a production network, where different parts of the production process are located in different countries in order to take advantage of factor price differences.

This geographical dispersion of production will reduce the production costs. Since different production stages require different intensities of skilled labor, and factor prices may differ across countries, it will be profitable to locate production stages which make intensive use of less skilled labor in less developed countries (where less skilled labor is relatively abundant and therefore cheap). Likewise, activities which make intensive use of skilled labor, such as research and development (R&D), are located where there are abundant resources of skilled labor in developed countries, thus making them relatively cheap there.

WTO (1998) provides a telling example of a production network.

- 38 % of the production value of a typical American car originate from the US.
- In foreign activities, assembly takes place in South Korea and represents 30 % of the production value.
- Components and advance parts originate from Japan and account for 17.5 %.
- Design of the car is done in Germany, accounting for 7.5 %.
- Smaller parts are sourced from Taiwan and Singapore at 4 % of the production value.
- Marketing and advertising are carried out in the UK at 2.5 % of the production value.
- Finally, computer services are carried out in Ireland and Barbados accounting for 1.5 % of the production value.

A simple example

For instance, if the investment by the truck producer in our example is made in country F, and the primary motive is to reap the benefits of lower factor (wage) costs, we would define this investment as a vertical FDI. This is shown in Figure 4 where the firm shuts down its production in the home country H and concentrates its production in F, from which it supplies the local market and exports back to the home market.

Figure 5 International Expansion: (Simple) Vertical FDI

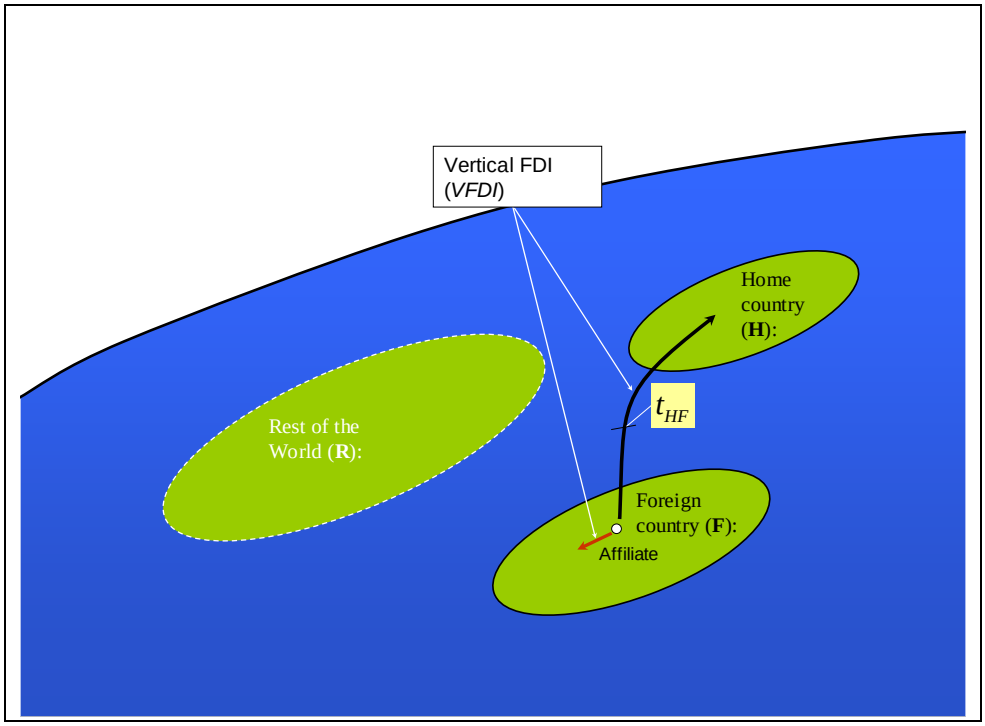
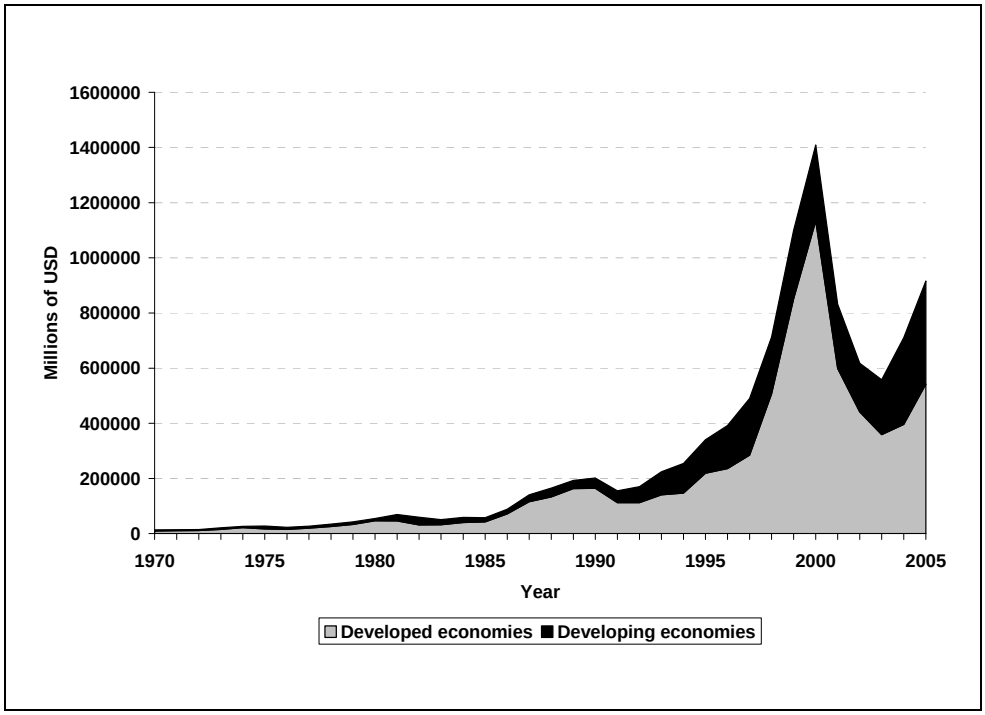


Figure 6 World FDI inflows to developed and developing economies



Source UNCTAD, various issues.

Trade and FDI in the vertical FDI model

Since vertical FDI implies a geographical separation of the production process, this type of FDI will initiate trade through intra-firm trade in terms of exporting and importing intermediate goods from other parts of the firm (or from external suppliers).

In our example with the truck production, even if the assembly of trucks is moved to a plant abroad, this can generate increased exports from the home country of intermediate inputs such as engines. If the firm can increase its sales due to production in the local market, increased exports of intermediate inputs from the home country can compensate for the loss of assembly.

Thus, the following observation states:

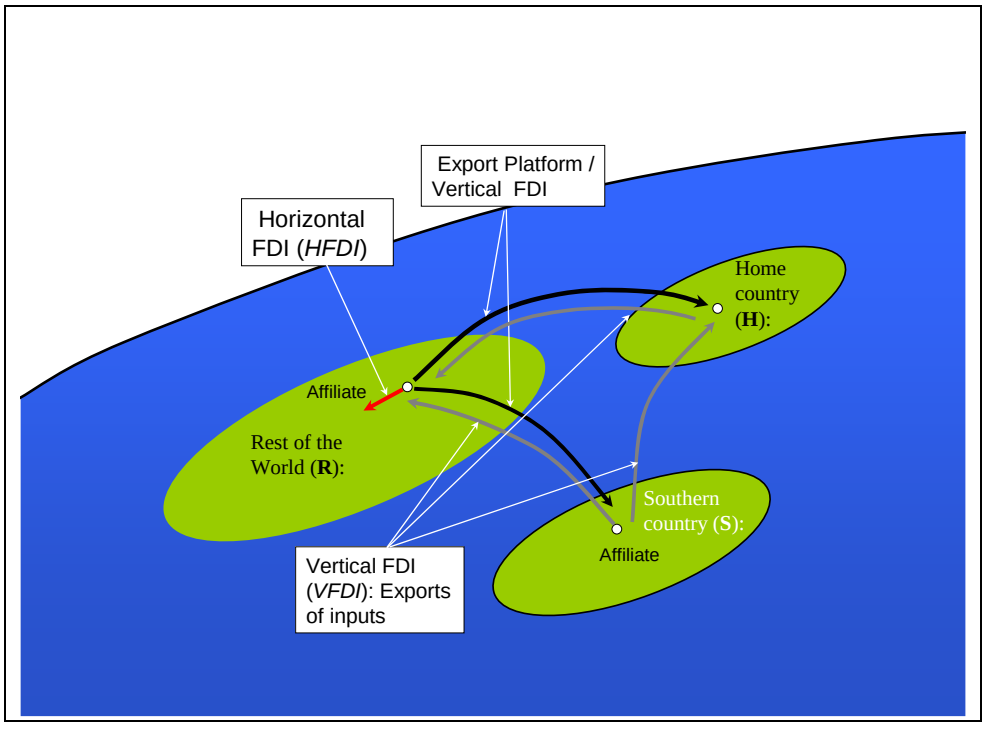
Observation 3: *Vertical FDI can be a complement to international trade by increasing intra-firm trade. For instance, locating the assembly of final products abroad may increase the demand for and the exports of intermediate inputs from the home country.*

2.3 Complex FDI

To highlight the mechanism behind different types of investments, we have discussed vertical and horizontal investments separately. While this is useful, investments may, in reality, be simultaneously driven by both market access and factor cost motives and the two motives may interact.

For instance, suppose that the truck producer locates the production of parts in country S in order to take advantage of lower factor costs. With lower production costs for intermediate inputs, the cost of producing the truck decreases. But this implies that the trade costs become relatively more important when serving the foreign market in Country R, and the "vertical" investment in country S may then induce the truck producer to locate assembly to country R (Yeaple, 2003). This type of "vertical specialization", or complex strategy FDI, is illustrated in Figure 7.

Figure 7 International Expansion: Complex strategy FDI



The more complex investments have increased in importance in the last few decades. For example, Feinberg and Keane (2003) find that as much as 69 percent of the US firms aim at more complex strategies.[8]

There are several plausible explanations for this:

- One explanation relates to the fact that several large developing countries, such as China and India, with abundant resources of less skilled labor as well as an increased market, have been integrated into the world economy. The fall of the Iron Curtain has also integrated the Eastern European countries with the Western European economies. NAFTA has made the Mexican labor force accessible to production for the North American market.
- Vertical fragmentation of production across countries has benefited from the liberalization of international trade and has improved transport technologies and transport systems. This has decreased the costs of transporting final goods or intermediate goods between the different parts of the firm. Empirical studies also show that there has been an increase in the share of intermediate inputs in world trade (see Yeats, 1998 and Hummels, 2007).[9]
- The significant impact and increasing presence of the information and communications technology (ICT) in the global economy has made it possible for firms to become more effective in organizing production. Managing a complex production network such as the "Vertical Specialization Structure" is therefore feasible.

2.4 Home-country exports and FDI: substitutes or complements?

This section will briefly review empirical studies which have examined the relationship between FDI and exports from the home country.[10]

The theory in the previous section provides the following predicted relationships:

[8] Hanson, Mataloni, and Slaughter (2005) and Braconier, Norbäck and Urban (2005a) provide some recent empirical evidence of cost driven vertical FDI.
[9] Improved materials have, for example, increased the size of ships, thus shrinking the variable cost of transport. There has been a drastic decrease in the reliability of transport networks due to modern information technology.
[10] For a survey of the literature, see Blomström and Kokko (1994) and Forte (2004).

- *Horizontal investments*, seeking to establish foreign production to secure better access to foreign markets, can replace exports from the home country (Observations 1 and 2).
- *Vertical investments* seeking to exploit factor price differences between countries by dividing the production chain promote intra-firm trade and can thereby benefit home-country exports (Observation 3).

Given the fact that FDI mostly flows between developed countries, it appears that FDI should predominantly be horizontal or market seeking in nature. Thus, it is expected from theory that FDI replaces home-country exports (Observations 1 and 2). However, evidence from the empirical literature is far from conclusive and the majority of the previous studies do, in fact, find a positive complementary relationship where foreign direct investments promote home-country exports, and vice versa.

Empirical economic research on whether foreign production promotes or substitutes exports from the home country can be categorized into four groups; country-, industry-, firm- and product level studies. A few of the important papers in this field will be highlighted below.

Country-level studies

Grubert and Mutti (1991) find results in favor of a positive relationship when evaluating the relationship between FDI and trade. Based on bilateral trade data for more than 30 countries, they find that outward US FDI (where US firms invest overseas) promotes US exports and imports. Moreover, Clausing (2000) shows that multinational activity and trade are complementary activities, especially concerning intra-firm trade, when using two separate panel-data sets on foreign operations of US MNEs and foreign MNEs in the US.

Some empirical findings further argue that the relationship is, by nature, dynamic and determined by various factors such as time and economic growth. Studying the variation among US firms, Bergsten et al. (1978) find that an initial complementary effect between FDI and exports is turned into a negative substitution effect as the internationalization advances to a high degree and, hence, operations in host countries become more competitive (Observation 1).[11]

[11] Using firm-level data, Pearce (1982) also finds that trade between affiliates in different host countries will gradually replace trade between the home country and affiliates.

Industry-level studies

Turning to industry-level studies, Lipsey and Weiss (1981) also find a positive relationship between US exports and foreign affiliate production, when examining U.S. investments in foreign markets, using cross-section data, by industry, for 44 countries.

Brainard (1997) for the U.S. and Co (1997) for Japan also find evidence in favor of a positive relationship. Brainard (1997) examines the relationship between trade and FDI on cross-section data in 63 industries and 27 countries. Sachs and Shatz (1994) estimate that a 10 % increase in the share of intra-firm bilateral trade led to a 40 % increase in trade with the country considered. Pfaffermayr (1996) concludes a similar pattern for Austria.

Lai and Zhu (2004) examine the relationship between U.S. exports and MNE production abroad in a setting where exports from the affiliates to third markets are incorporated in the analysis. In other words, they include platform FDI in the analysis, which makes the study an interesting contribution to the studies in this field. See Figure 4 in Section 2. In the empirical analysis, they estimate exports and affiliate production independently, as a function of trade and production costs as well as other micro and macro variables, rather than estimating trade as a function of FDI (affiliate sales and/or production).

An econometric problem faced in their study and all studies examining the relationship between FDI and international trade is that exports and foreign production are, to a large extent, determined by the same variables.[12] To deal with this endogeneity problem, estimations were made in a two-equation-system applying the Maximum Likelihood (ML) method and a Generalized Method of Moments (GMM) estimator.

Based on the structural estimates, Lai and Zhu simulate the effects of trade liberalization. We can illustrate this exercise in terms of the simple example with the truck producer in Section 2. Trade liberalization involves removing the trade barriers for exports from the home country H to country R (t_{HR} in Figure 4) and the trade barrier for exports from country F to country R (t_{FR} in Figure 4). Lai and Zhu conclude that trade liberalization has a positive effect on both US exports and foreign production. However, the effect is much stronger for the overseas production. In particular, they find that complete trade liberalization would increase US exports by 3 %, while the increase in FDI is much stronger at 23 %. Thus, taking into account that trade liberalization makes the host country a better export platform to nearby markets, trade liberalization may produce a substitution relationship between FDI and trade (Observation 2).

[12] If the researcher finds a positive relationship between trade and FDI, given that an increase in some factor cannot be fully measured by the researcher, it would be incorrect to attribute the increase in exports to the increase in FDI.

Firm-level studies

Turning to firm level studies, most of these have been undertaken on US, Japanese and Swedish firms. Lipsey and Weiss (1984) and Lipsey et al. (1999) present results in favor of a positive relationship between trade and FDI when examining U.S. and Japanese MNEs, respectively.

For example, Lipsey and Weiss (1984) find results arguing for a complementary relationship as the parent firm's exports increase to the country in which the affiliate production takes place. They argue that foreign production increases total demand for a firm's products, some of which are exported from the home country. Foreign production may then advertise the firm's full set of products, including products originating from the home country. Export sales from the home country can also reap the benefits of more efficient distribution and delivery created by direct investments.

Outward FDI can also increase home-country exports, as foreign production may increase the demand for intermediate inputs produced in the home country (Observation 3). Examining the relationship for Sweden, based on the database set up by the Research Institute for Industrial Economics (IFN), Swedenborg (1979, 1982) found that the additional exports of intermediate goods, and the complementary supply of finished goods, outweighed the substitution effect on the exports of finished goods.

Head and Ries (2001) present similar results, using Japanese firm-level data, including 932 Japanese firms during a 25-year period.

Svensson (1996) re-investigates the pattern of trade and FDI for Swedish firms using the IFN data and finds that the positive relationship was overturned for Swedish Multinationals in the 1980s. An interesting feature in Svensson's analysis is that the switch from a positive to a negative relationship was not visible in the bilateral trade relations between the parent firm and the affiliates in the host countries, but emerged when consideration was given to the replacement of home exports to other third markets by exports from affiliate production to those markets. His results thus provide some evidence that Platform FDI may replace exports from the parent firm in the home country (Observation 2).

Norbäck (2001) examines the role of R&D activities for the choice between exporting from Sweden and FDI, as measured by foreign production. Norbäck shows that high-tech firms, as measured by high R&D expenditures as a share of total sales will, on the margin, choose exporting from Sweden rather than producing in an affiliate abroad. This result shows that while foreign production can replace home exports, this seems less likely for R&D intensive production.

Product-level studies

We have seen that market-access driven (horizontal) FDI tends to substitute home exports in final goods, whereas FDI driven by the motive of reducing production costs (vertical FDI) may serve to increase home-country exports in intermediate goods. The diversity in results provided by different studies may be related to the fact that most empirical work is performed on highly aggregated data, which might conceal substitution and complementary effects (Head and Ries, 2001).

Blonigen (2001) attempts to identify these effects by using highly disaggregated product-level data on exports from Japan. He finds substantial evidence for the presence of both substitution and complementary relationships when decomposing the empirical findings on basis of the foreign affiliate activity and the specific stage in the production.

Blonigen decomposes trade into processed/final products and input/intermediate products. From his detailed trade and FDI data on Japanese production in the US and Japanese exports to the US, Blonigen concludes that FDI in the US by Japanese MNEs increases Japanese exports of intermediate goods (Observation 3), but decreases Japanese exports of final goods (Observation 1).

Conclusion

Summing up, the relationship between FDI and home-country exports is complex and the empirical literature does not deliver any clear cut answers.

If we look at this relationship at an industry, national and global level, trade and FDI promote each other in the empirical literature, indicating that the trade-creating effect of FDI tends to outweigh the trade-replacing effect for the home country. However, FDI can substitute for trade in a single product or firm. This is partly the reason for the belief that trade and FDI are substitutes.

These discrepancies in the empirical literature are most likely due to two fundamental problems in identifying the relationship between FDI and trade.

- *First, theory tells us that FDI and exports may be driven by the same underlying factors,* such as market demand. Hence, the relationship between FDI and trade depends on which underlying factors determine both of them. This fact, encompassing a new complex economic surrounding, is not often applied in more recent research.

- *Second, theory also tells us that whether FDI and exports are substitutes or complements is closely related to the type of activity we examine.* FDI may increase the demand for intermediate inputs from the home country but reduce the exports of final goods. To identify these different effects, the empirical analysis must be done with sufficiently disaggregated data, distinguishing final and intermediate goods within narrowly defined industries or product categories.

3 The Foreign Operations of Swedish Multinational firms

To empirically analyze the relationship between trade and investments, it is helpful to first review a few stylized facts and interesting trends concerning the operations of Swedish multinational enterprises. This section aims at doing this using both aggregated data and micro firm-level data.

3.1 Aggregate data

Similar to global patterns, Swedish firms have increased their investments abroad during the last few decades. This can be seen in Figure 8, which presents the growth of Swedish outward FDI stocks, Swedish merchandise exports and Swedish GDP between 1980 and 2005. As can be seen, Swedish outward FDI outgrew both exports and income during that period. Whereas domestic production increased by a factor of 1.7 and exports increased by a factor of 3.3, outward FDI stocks increased by a factor of 55 between 1980 and 2005. In other words, FDI increased 55 times over its initial value from 1980 to 2005.

Figure 9 examines Swedish investments abroad in more detail. The stocks of FDI by Swedish MNEs are the filled bars corresponding to the left-hand vertical axis and Swedish MNEs' share of world outward FDI stocks is the line depicted on the right-hand vertical axis.

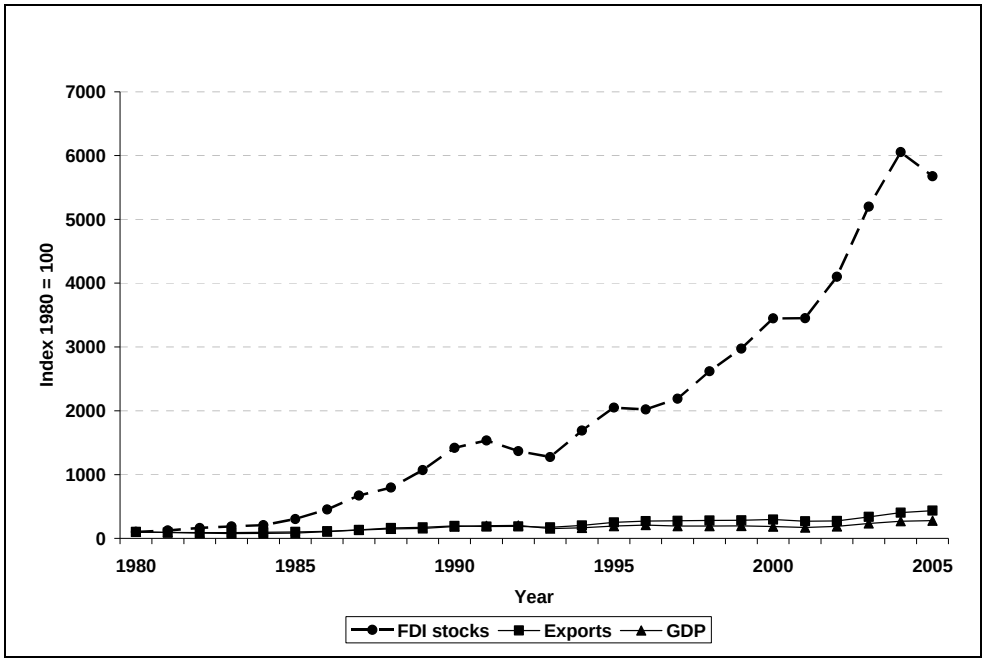
As can be seen, Swedish outward FDI stocks have increased in magnitude from an initial value of 3.5 billion USD in 1980 to almost 200 billion USD in 2005. In addition, Sweden has increased its world market share of outward FDI stocks from 0.6 % in 1980 to 1.9 % in 2005 (right-hand axis). In comparison, the Swedish world market share in merchandise exports decreased by 23 percent in the same period.

In Figure 10, we compare the growth of the Swedish world market share in the world-wide stock of outward FDI to some other countries. As can be seen, Sweden has had a lower growth rate as compared to Finland, but a higher or similar growth rate than Germany, the EU15 average, and Denmark.

The absolute values of the world market shares in outward FDI stocks for Sweden, Finland and Denmark can be seen in the Appendix.[13]

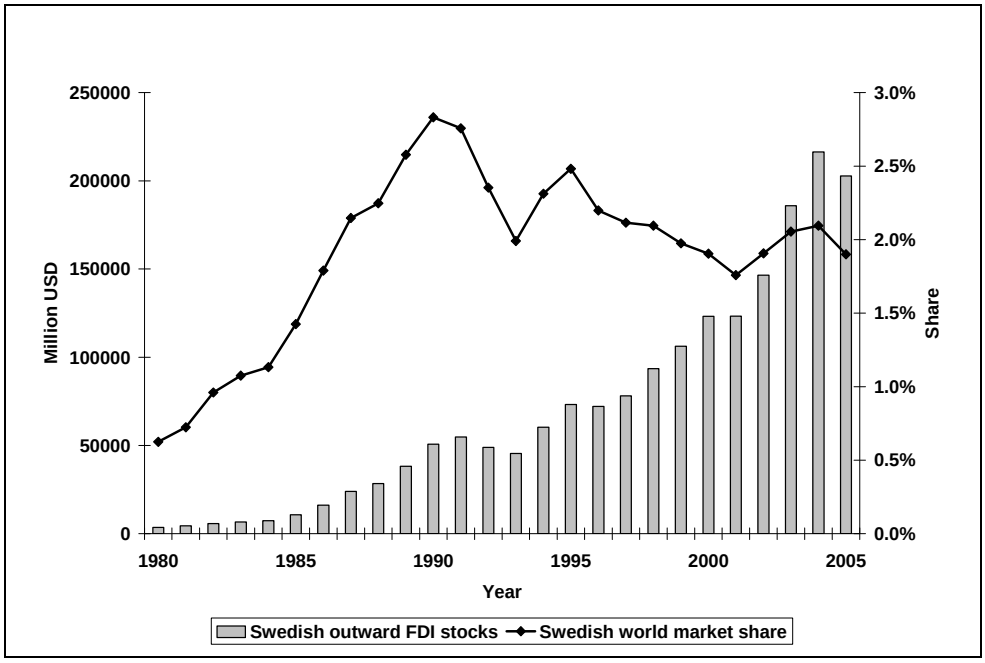
[13] As can be seen, the Swedish world market share in 2005 is approximately two and three times the size of the Danish and Finnish world market share, respectively.

Figure 8 Swedish outward FDI stocks, Exports and GDP, 1980-2005



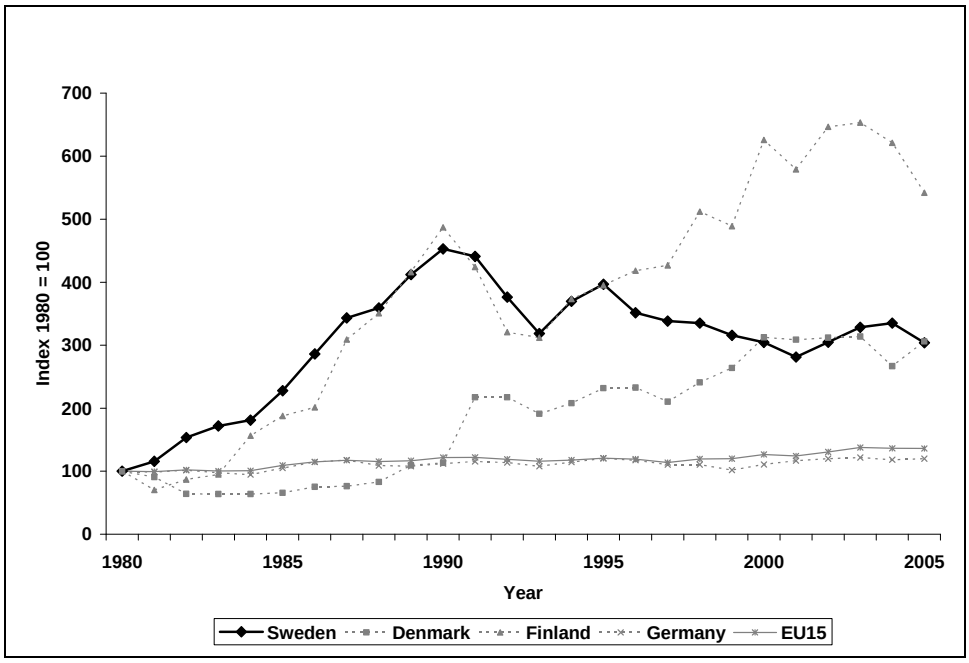
Source: UN Comtrade, UNCTAD, Statistics Sweden & own calculations, current prices.
Note: Index numbers, 1980=100.

Figure 9 Swedish outward FDI stocks: Million USD and World Market Share



Source: UNCTAD & own calculations.
Note: Current prices.

Figure 10 Outward FDI stocks for Sweden and selected countries, as a World Market Share index



Source: UNCTAD & own calculations.
Note: Current prices.

Foreign acquisitions of Swedish MNEs in the 1990s

A noteworthy feature in Figure 9 (as well as in Figure 10 for Sweden) is the upward trend in the world market share of outward FDI of Sweden between 1980 and 1990, which is replaced by a downward trend between 1990 and 2005. One explanation for this cutoff is the foreign acquisitions of large Swedish multinational firms which started in the 1990s.

After the World War II, governments in most developed economies, including Sweden, had a relatively large influence on the economy. At that time, the economy was heavily regulated and comprised numerous state monopolies. However, as of the late 1970s and the early 1980s, the majority of the developed countries started to shift their economic policy towards a more liberal stand including Sweden which began liberalizing its economy. The Swedish business sector was rapidly liberalized from the mid-1980s and onwards. The Swedish credit market became completely deregulated in 1986 and the Swedish capital market became fully deregulated in 1993, removing all restrictions on foreign ownership of Swedish firms and real estate (Henrekson and Jakobsson, 2003). Simultaneously, Sweden applied for EU membership in 1991 and joined as a full member in 1995. In addition, Sweden was forced to unlock its fixed exchange rate due to massive speculations against the Swedish currency in November 1992.

These reforms and events initiated a substantial inflow of foreign investments in the Swedish corporate sector. For example, ASEA became foreign owned in 1987, Alfa Laval in 1991, Autoliv in 1996, Astra in 1998, Saab Automobile AB in 1998, and Volvo Cars in 1999 etc. Between 1989 and 1999, there was an increase in the foreign ownership share of listed shares at the Stockholm Stock Exchange from 7 % to 40 % (Sundin and Sundqvist, 2001).

This shift can be seen in the first section in Table 3 where Swedish inward FDI stocks increased as a percentage from the mid 1990s and onwards. At the beginning of the 1980s, the stocks of Swedish inward FDI as a percentage of GDP were, in fact, lower than the EU average. However, in 2005, Sweden had surpassed the EU average and the other benchmarking economies.

Thus, it is then likely that the foreign ownership of large former Swedish MNEs can explain some of the relative decrease in Swedish outward FDI stocks seen in Figure 9. That is, former Swedish MNEs and their affiliates are no longer recorded as Swedish after a foreign takeover.

Table 3 Inward and outward FDI stocks, % of GDP

	Inward FDI stock % of GDP, 1980 - 2005						Outward FDI stocks % of GDP, 1980 - 2005					
Region/economy	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**
Sweden	2.2	4.1	5.3	12.5	39.2	47.8	2.8	10.3	21.1	29.5	51.4	56.5
Denmark	6.1	6.0	6.9	13.2	46.5	39.1	3.0	3.0	5.5	13.7	46.2	45.5
Finland	1.0	2.5	3.7	6.5	20.2	27.3	1.4	3.4	8.2	11.6	43.5	38.5
Germany	4.1	5.4	6.7	6.7	14.5	18.0	4.8	8.7	9.1	10.9	29.0	34.6
European Union	6.7	9.9	10.9	13.0	26.3	33.5	6.0	10.6	11.5	14.8	36.8	40.7
Developed econ	5.3	6.4	8.2	8.9	16.2	21.4	6.2	7.3	9.6	11.3	22.8	27.9
World	5.3	6.9	8.5	9.4	18.3	22.7	5.7	6.5	8.6	10.0	20.5	23.9

Source: UNCTAD.

3.2 The IFN survey

In order to more closely analyze trade and investment patterns, we will make use of "The Research Institute of Industrial Economics" (IFN) database, which includes almost all Swedish MNEs in the manufacturing sector and is available for the years 1965, 1970, 1974, 1978, 1986, 1990, 1994, 1998 and 2003. The micro data contains detailed information on Swedish MNEs and the producing foreign affiliates on variables such as employment, production, internal and external trade flows, and R&D.[14]

[14] A more detailed description of the data is available in Swedenborg (1979, 1982) and Braunerhjelm and Ekholm (1998).

The survey

Table 4 describes the number of firms participating in the surveys, the number of producing affiliates and the number of employees abroad and the number of employees in foreign affiliates with production.

Table 4 Number of firms participating in the surveys

Year	Parents answering Questionnaire A	Affiliates answering Questionnaire A	Affiliates' employees according to A**	Affiliates' employees according to B***
1974	108	480	290200	221111
1978	122	567	309030	227149
1986	108	646	363383	259823
1990	120	871	654167	440879
1994	132	1378	370257	531994
1998	118	703*	424850	223061
2003	62	1579*	456619	404268

Source: IFN database.
Note: * Includes observations from one MNE that reported data per country instead of per affiliate. ** Total number of employees abroad as reported in A. *** Sum of reporting affiliates.

It can be noted that the number of participating firms decreased in the last surveys in 1998 and 2003. This fall in the number of firms can be traced to the foreign acquisitions of former Swedish MNEs and a lower response rate. In particular, while the response rate was above 90 % in the surveys before 1990, it had fallen to 77 % in 1998 and to about 30 % in 2003. Due to the low response rate in 2003, the 2003 survey year will not be used in the quantitative analysis in the next chapter.

The degree of internationalization in production

The degree of internationalization in the production of Swedish MNEs can be illustrated in Figure 11, which depicts how much of total firm sales and their total employment that foreign operations account for.

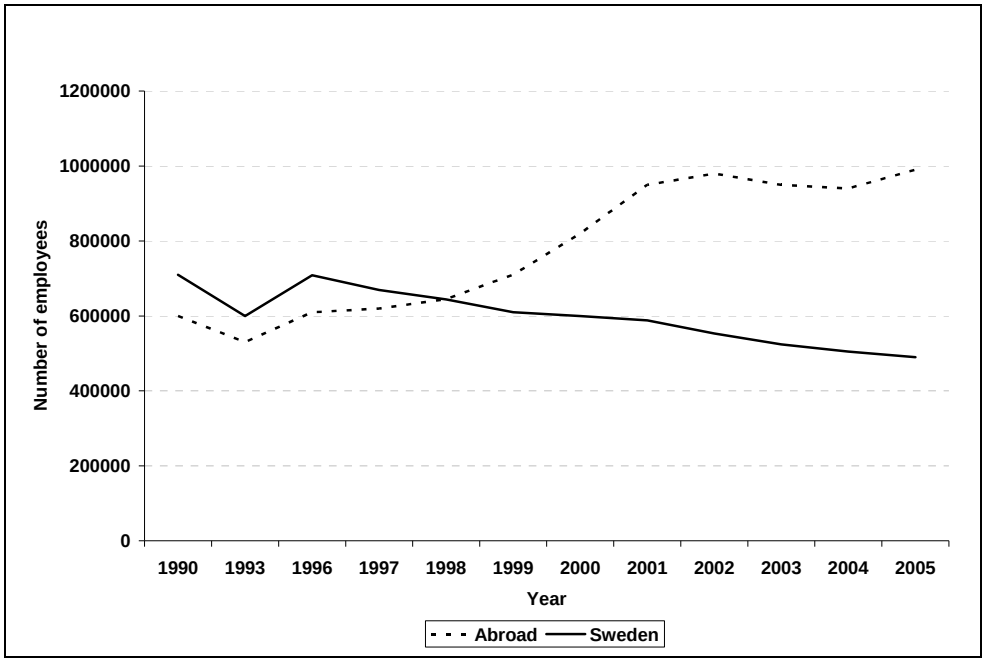
Figure 11 Share of foreign affiliate sales out of total group sales by Swedish MNEs and the share of employees in Swedish Mnfcs [ska Mnfcs stå här?] MNEs

Source: IFN dataset.

The share of foreign affiliate sales out of total firm sales has increased from 25 % to 65 % between 1965 and 2003. That is, approximately 2/3 of the sales can be allocated to sales by foreign affiliates, and the remaining 1/3 is produced and exported from Sweden or sold in the Swedish home market. The share of employees in Swedish MNEs stationed abroad displays a similar pattern.

The IFN dataset only comprises firms in the manufacturing sector. Nevertheless, including services does not change the general view, as is illustrated in Figure 12 which depicts the number of employees in Swedish-owned MNEs with foreign activities for all sectors. As can be seen, approximately 55 % of the workforce were employed abroad in 1990 as compared to 67 % in 2005. Thus, the number of employees stationed abroad in 2005 mimics the pattern of the MNEs in the manufacturing sector.

Figure 12 Number of employees in Swedish MNEs 1990-2005



Source: ITPS (2006).

Where do Swedish firms invest?

Let us now examine the geographical pattern of Swedish outward investments. Table 5 explores the geographical distribution of affiliate employment for Swedish MNEs during the time period 1974 to 2003, listing the most important locations for affiliate employment. As can be seen, developed countries attract the bulk of investments which suggests that Swedish investments abroad are predominantly horizontal in nature.

Table 5 Most important countries for affiliate employment (share in total employment abroad)

		1974	1978	1986	1990	1994	1998	2003
1	USA	6.0	9.2	19.1	20.4	22.3	22.1	22.1
2	Germany	15.3	13.5	10.7	16.8	12.1	13.3	8.5
3	France	13.0	10.3	6.9	4.8	5.6	6.0	8.5
4	Italy	8.1	6.9	11.6	9.3	11.0	10.0	6.1
5	United Kingdom	7.0	9.6	6.2	9.4	8.4	5.3	5.6
6	Brazil	9.0	10.6	5.8	3.9	4.0	4.8	4.0
7	Finland	3.7	3.4	2.9	2.4	1.3	2.2	3.0
8	Norway	1.6	1.5	2.3	3.4	2.2	1.0	2.8
9	Poland				0.1	0.9	1.7	2.8
10	Belgium	3.7	4.1	3.4	2.3	3.4	3.6	2.6
11	Spain	2.7	2.9	3.1	3.1	2.9	2.1	2.6
12	China					0.7	1.3	2.5
13	Czech Republic					0.6	0.3	2.5
14	Denmark	3.5	3.3	4.1	3.6	3.0	2.7	2.4
15	India	5.7	1.5	1.8	1.0	1.8	2.2	2.4
16	Australia	3.0	1.9	2.5	1.8	1.6	1.0	2.3
17	Netherlands	3.8	5.8	3.0	2.8	3.4	2.4	2.1
18	Canada	1.7	1.8	1.6	1.9	1.3	3.5	2.0
19	Mexico	2.1	2.0	2.6	1.8	1.5	2.1	2.0
20	Argentina	1.2	1.6	1.1	0.8	0.9	0.9	1.5
21	Hungary				0.1	1.9	1.4	1.1

Source: IFN database.

In 2003, about one out of five foreign workers in Swedish MNEs had their employment in an affiliate in the US. Other important locations for foreign employment were the large Western European countries: Germany, France, Italy and UK. The share of employment in the European countries has decreased over time, whereas the importance of the US market has increased. These changes in employment shares are likely to be driven by the increasing importance of the US market.

As concerns developing countries, Swedish firms have traditionally had significant investments in Latin America, in particular Brazil, in response to import-substitution policies. Hence, in this case, FDI was a substitute for export.

In the 1990s, there is evidence of cost-driven (vertical) FDI growing in importance and we note that affiliate employment is emerging in the Eastern European countries such as Estonia, Hungary, Poland and the Czech Republic. Swedish firms are also starting to locate investments in China and to increase their traditionally large share in India.

4 The relationship between home-country exports and foreign production within Swedish MNEs

In this section, we will use the IFN data and examine the relationship between foreign production and home-country exports for Swedish multinational firms.

In Table 5, we noted that in terms of employment, Swedish MNEs predominantly invest in other developed countries such as the EU and the US. Thus, investments by Swedish firms are likely to be predominantly market-seeking.

With investments by Swedish firms explained from the horizontal FDI model, Observations 1 and 2 suggest that foreign production and exports from Sweden of final goods should be substitutes. What type of pattern describing the relationship between foreign production through FDI and exports from Sweden should we then expect to find?

One way of looking at this question is to examine how Swedish MNEs have responded to the globalization process.

If we define globalization as a growing world economy which is becoming increasingly integrated due to the liberalization of trade and improvements in transport- and communications technologies, the theory in Section 2 gives the following predictions:

Prediction 1: ***Lower trade costs should promote exports from Sweden****; when Swedish goods can be shipped to foreign markets at lower trade costs, there is less incentive to take on additional fixed costs to set up new overseas plants.*

Prediction 2: ***Growing markets should attract market-seeking horizontal FDI****; since sales are higher in larger markets, the potential savings on trade costs through local production are more significant in large and growing markets.*

Prediction 3: ***Growing markets and decreasing trade costs simultaneously benefit Platform FDI****; since countries located in proximity to important export destination markets may be increasingly used as platforms for affiliate exports.*

How can we then measure the effect of globalization on a firm's choice between foreign production and exports?

One option would be to study the aggregate data given in the previous section. However, these measures are likely to be driven by the behavior of the largest firms. In particular, the effect of the foreign acquisitions of large Swedish MNEs, discussed in the previous section, will then have a strong effect on the aggregate pattern.

To control for differences between firms and to at least to some extent for changes in the sample, this study will instead examine the pattern of FDI and home-country exports *within firms*. It will then be convenient to distinguish between what is called *the extensive margin and the intensive margin of FDI.*

Examining the extensive margin of FDI, measures of a firm's decision to invest are examined, i.e. the choice between either selling to a market through exports from Sweden or establishing an affiliate to produce locally.

Examining the intensive margin of FDI, the pattern of exports and foreign production is examined, given that a firm has established local production in a country.

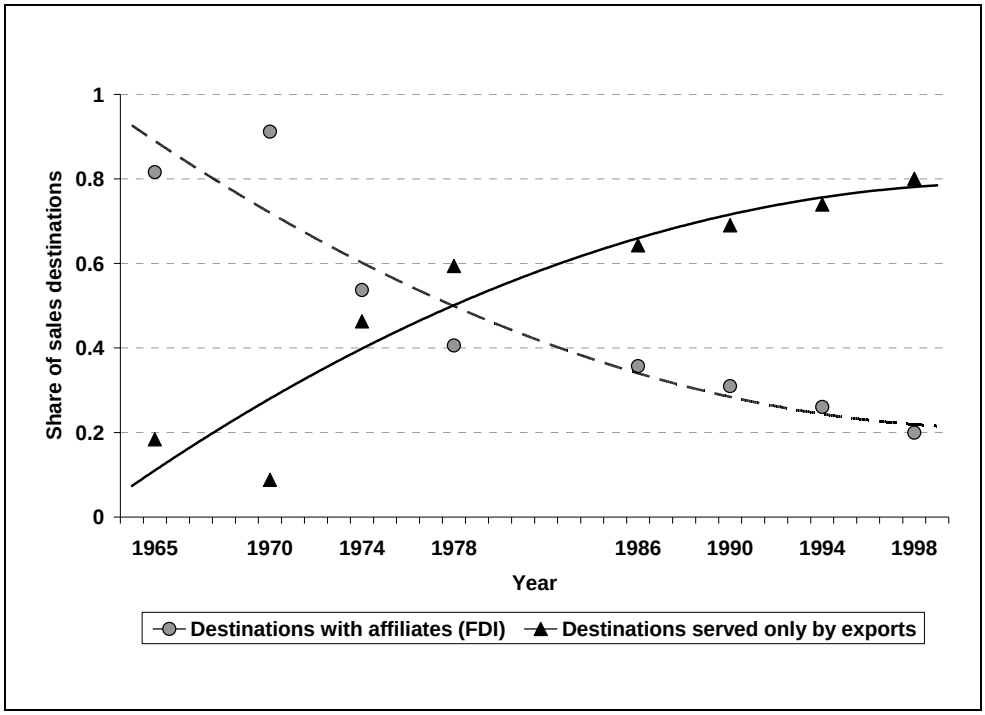
A measure of the extensive margin of FDI

Let us start with the discrete decision of whether to sell to a market by exports or produce and sell locally in an affiliate. For each firm, we examine the destination countries of a firm's foreign sales, and then calculate the proportion of markets purely served through exports from Sweden (which contain no affiliates). We can consider this measure as an "Export propensity" for the firm. Then, we calculate the average share of destination markets purely served by exports over all firms in the IFN data for each survey year.

The average share of destination markets purely served by exports is given in Figure 13. This figure shows that within the IFN sample, the propensity to export from Sweden is increasing over time and hence, the propensity to invest abroad is decreasing over time.

As will be documented in the next section, there has been a substantial fall in trade costs during the last few decades. As suggested by Prediction 1 above, lower trade costs then appear to explain the increase in the propensity to export and the subsequent decline in the propensity to invest abroad.

Figure 13 The average propensity for FDI and Exports



Source: IFN database.

However, we should be careful in stating that the increased export propensity is caused by falling trade costs:

The IFN sample consists of Swedish firms with at least one producing affiliate abroad. So we are dealing with a sample of multinational firms as there are no pure exporting firms in the data. The information on exports from Sweden is also given for a subset of countries, mostly the largest countries, except for the survey in 1998 which has a more extensive coverage of countries. The destination region is reported for about 10 % of the export observations in the data only.

Inspecting the data, there also seems to be a change in the composition of the sample over the survey years. The median number of producing affiliates operated by firms in the sample has decreased from about 8 in 1985 to below 2 in 1998. An alternative explanation for the increased export propensity (and hence the decreased FDI propensity) may then be that the globalization process with market growth and trade liberalization has allowed smaller firms, with a smaller number of producing affiliates, to expand abroad through investments.[15]

Summing up, we find an increasing share of destination markets purely served by exports from Sweden. This is consistent with the globalization process where trade costs are reduced.

The intensive margin of FDI

Let us now examine a firm's decision for how much to produce locally and how much to export from Sweden, given that the firm has already established foreign production. This is a measure of the intensive margin of FDI.

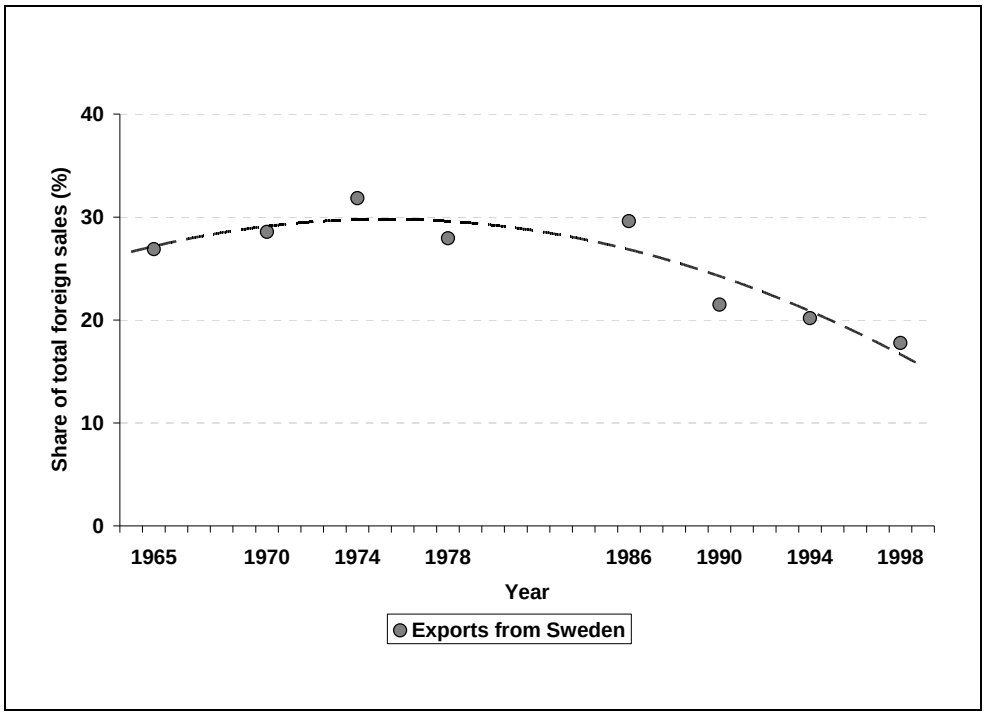
To proceed, we calculate the firms' average exports to a host country, as a share of the firms' total sales in, and from, a host country. To obtain this, we add each firm's invoiced sales from exports to the total sales of its affiliates producing in the host country (including foreign affiliate third country exports to the rest of the world). Then, we calculate the average over all firms for each survey in Table 4 and label this measure the (average) export intensity from Sweden.

The (average) export intensity from Sweden is shown in Figure 14 with the circles. In that figure, we have also fitted a quadratic curve to show the evolution over time.

By decomposing the revenues as average shares over all MNEs and countries, the results are less sensitive to various firms being dropped from the sample of , which implies that we avoid some of the sample problems faced when dealing with aggregated data.

[15] Inspecting the data, there may also be a change in the composition of the sample over the survey years. This can be shown in the data, for instance noting that the median number of producing affiliates operated by firms in the sample has decreased from about 8 in 1985 to below 2 in 1998. An alternative explanation for the increased export propensity (and hence, the decreased FDI propensity) may then be that the globalization process with market growth and trade liberalization has allowed smaller firms, with a smaller number of producing affiliates, to expand abroad through investments.

Figure 14 The average share of total foreign sales which is exported from Sweden



Source: IFN database.

Note that the export intensity from Sweden has a slight inversely U-shaped time pattern, with exports from Sweden expanding more than foreign sales from affiliates in 1970s. However, from the mid 1980s, foreign sales by affiliates expanded more than exports from Sweden and we see that there is a fall in the export intensity from Sweden.

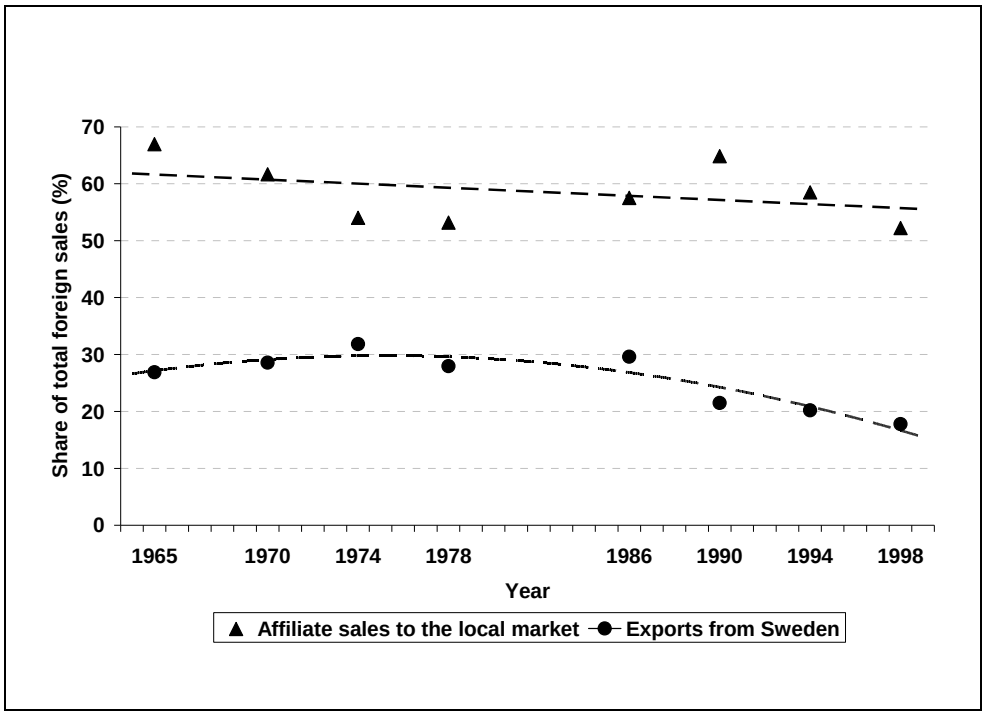
In 1965, on average about 25 % of the foreign sales of a Swedish MNE were delivered as exports from Sweden. In the 1970s, there was a peak at roughly 30 %. In the 1990s, the average share of sales abroad exported from Sweden reaches its lowest level, below 20%.

Let us now try to relate this time pattern to the theory. The fact that the export share from Sweden is increasing in the 1970s suggests that the effect of reductions in trade costs dominates the advantage of producing locally in this period. This is also consistent with the evolution of the average share of sales destination purely served by exports, illustrated in Figure 13.

But why is then Swedish export intensity decreasing in the 1990s? The theory suggests two channels in terms of Predictions 1 and 2. Prediction 2 would suggest that the decrease in the Swedish export share can be explained by world income increasing more than the trade costs are reduced, leading to horizontal trade-cost jumping investments.

To measure the extent of horizontal FDI aiming at supplying local demand in the host country, we examine the average share of a firm's total foreign sales which are sold by foreign affiliates to the local market. Inspecting Figure 15, we observe that a decline (increase) in the share of exports from Sweden is by and large mirrored by an increase (decline) in the share of sales supplied by affiliates.

Figure 15 The average share of total foreign sales sold by affiliates to the local market

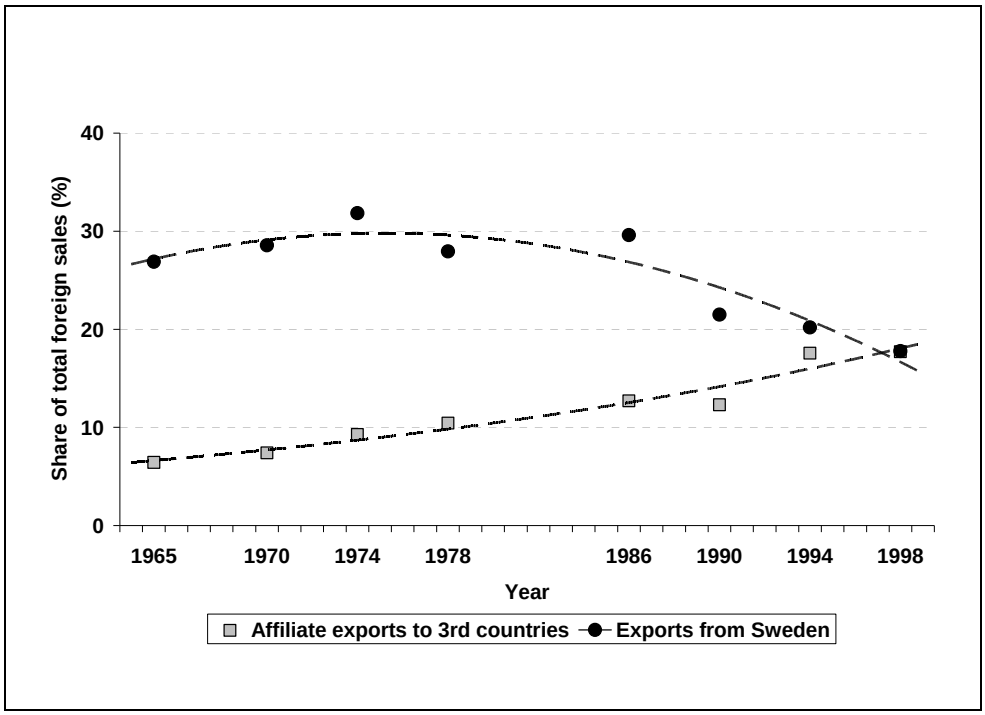


Source: IFN database.

Inspecting Figure 14 and 15 more closely, however, we see a decline in the share of exports from Sweden, as well as in the share of sales supplied by affiliates to the local market in the 1990s. This implies that some other source of affiliate sales must be increasing in importance.

Therefore, we turn to investigating affiliate exports. Indeed, Prediction 3 suggests that globalization in terms of reductions in trade costs and growth of the world economy will promote platform FDI. To examine this in more detail, Figure 16 displays affiliate export intensity defined as the average share of total sales in a host country which is exported to other countries than Sweden.

Figure 16 The average share of total foreign sales which is exported to third countries (RoW)



Source: IFN database.

As expected, Figure 16 displays a clear pattern of an increasing export intensity of affiliates. This suggests that Swedish firms are increasingly using affiliates in countries located in proximity to important export destination markets as export-platforms.

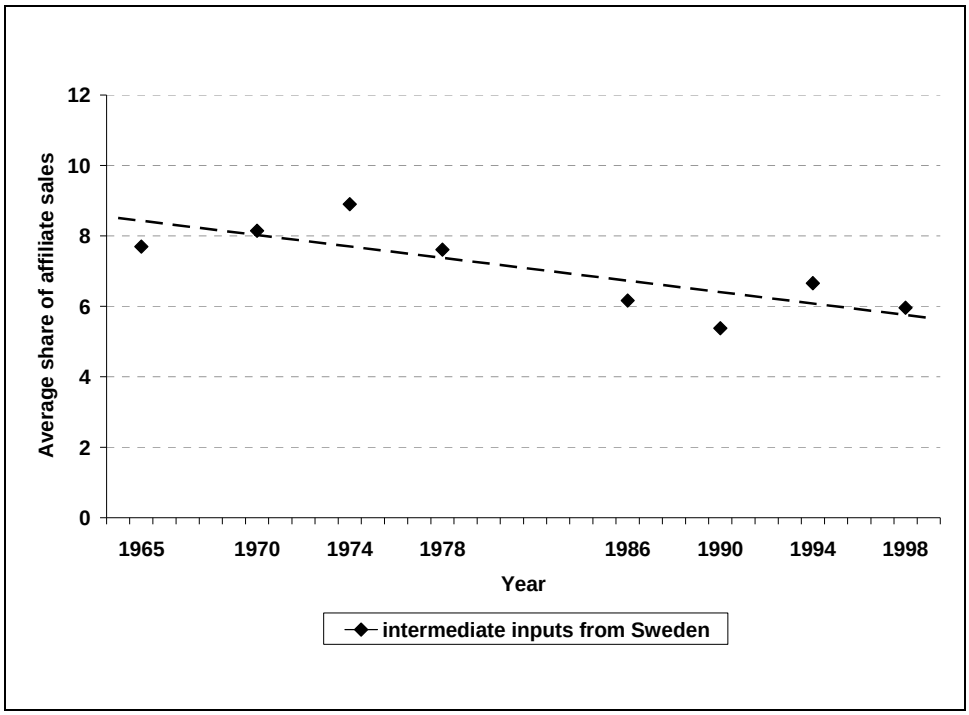
Vertical FDI

Let us end this section and investigate sales measures related to vertical FDI.

Ideally, we would like data on all sales flows within a production network, as shown in Figure 7. Such data are rare and the RIIE data are no exception. Only two measures are available which can proxy for vertical FDI. First, we examine exports of intermediate inputs from Sweden. Then, we examine exports back to Sweden, which is a simple measure of vertical FDI.

Figure 17 investigates the average size of intermediate inputs measured as a share of affiliate sales. As shown, there is a decreasing trend which implies that exports of intermediate inputs do not seem to have kept up with foreign expansion in terms of affiliate sales.

Figure 17 The average exports of intermediate inputs as a share of affiliate sales



Source: IFN database.

5 Econometric analysis

In this section, we estimate an econometric model to examine the relationship between exports from Sweden and foreign production.

We use the estimated econometric model in order to quantify how globalization in terms of reductions in trade barriers and a growing world economy is related to the development in Swedish merchandise exports within Swedish multinational firms. With this information in hand, we also discuss possible explanations for the development of the Swedish world market share of exports.

We derive the estimation equations using a three-country model of FDI with heterogeneous firms which builds on Norbäck, Urban and Westerberg (2007). This model is described in Appendix 8.2 and illustrated in Figure 18.

In the model, there is a set of firms originating from country H, Sweden in our case. Firms have an initial capacity in H which is served from a pre-existing home plant. For international expansion, firms can choose between three strategies:

- *Export production* where production from the home country H serves countries R and F through exports,
- *Horizontal FDI* where a firm invests in plants in countries R and F which serve these countries locally and, finally,
- *Platform FDI* where countries R and F are served from country F.

In foreign production, the parent must also supply the foreign affiliates with intermediate inputs.

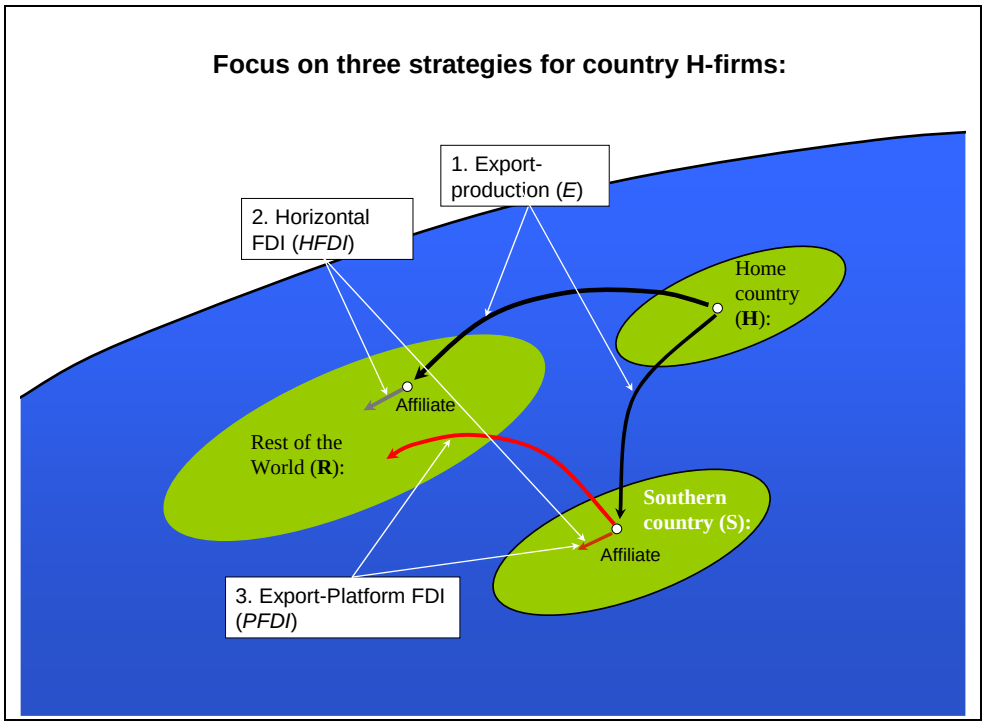
The theory provides estimation equations both for a firm's decision to invest in an affiliate/plant (the extensive margin of FDI) and for the level of sales in terms of exports from the home country, affiliate production for sale in the local market, and affiliate exports from the host country to the rest of the world (the intensive margin of FDI).

In what follows, we will only estimate the equations representing the intensive margin, i.e. affiliate sales flows.

The IFN data contain information on the industries where affiliates abroad are active. However, for exports from Sweden, the industries where the firm is active are only reported for the firm as an aggregate.

Thus, while we know how much each firm exports to different countries, we do not know the product composition by destination country. Since we cannot identify the country destination for different product categories, we cannot estimate firms' decisions to invest (the extensive margin of FDI with any precision). The lack of information on the product composition of exports by destination country also implies limitations when we estimate the intensive margin. This is briefly discussed below.

Figure 18 A three-country model of FDI



[till figuren ovan – jag skulle skriva "country-H firms"]

To estimate the econometric model, we need information on market size, trade costs and firm characteristics. Size of markets can easily be measured from GDP data. There is abundant information on firm characteristics in the IFN data. It is more problematic to obtain data on trade costs , in particular given the long time period for which the IFN data are available.

Estimating trade costs

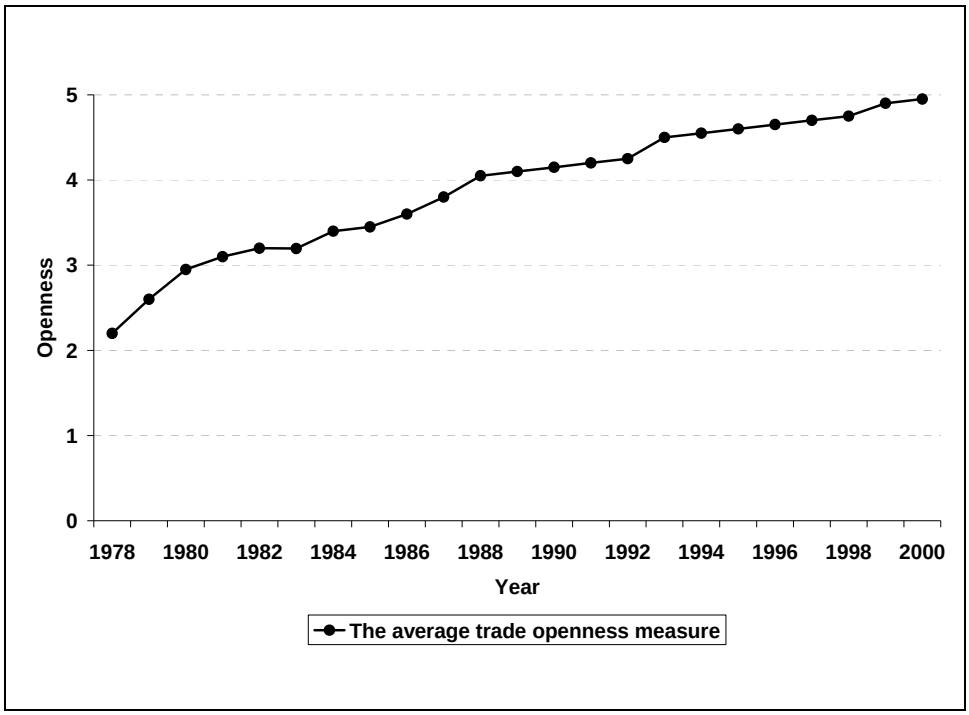
To obtain data on trade costs, we therefore estimate a so-called gravity regression at the industry level for each survey year using annual data from Nicita and Olarreaga (2006) on bilateral imports by 28 manufacturing industries of up to 158 countries over the period between 1978 and 2000.

From the estimates of the gravity regression, we take the score over distance, common border and common language, other geography variables such as whether a country is an island or landlocked, and dummies on common regional trade agreements among trading partners.

In Appendix 8.3, we show that this score variable can be seen as a proxy for the trade openness of a country, also varying over industries and years. The change in the score over time expresses how much additional trade is generated in terms of a growth rate by lifting existing trade barriers (if the sign is positive) or destroyed by imposing additional trade barriers (if the sign is negative). Hence, from now on, we use this score variable as a proxy for the inverse of trade barriers, i.e. trade openness. A technical discussion of the construction of this variable and its meaning is given in the Appendix.

To demonstrate this new measure of predicted trade openness, Figure 19 depicts the average trade openness over all manufacturing industries facing Swedish exports abroad in each year in the sample.

Figure 19 The average trade openness measure faced by Swedish exporters



Source: Bilateral industry trade data from the World Bank and own calculations.

This shows that there has been an increase in trade openness (i.e. there has been a continuous decrease in the trade costs over time). Inspecting the causes of the reduction in trade costs shows that the trade cost per unit of distance decreased, but the increasing number of trade agreements also contributed to the trend.

The estimated trade costs are matched to the industry where the firm is active. Thus, we can obtain empirical measures of the trade barriers which host countries raise against Swedish exports (t_{HR} in Figure 4), at the same time as we get an empirical measure of the trade barriers to affiliate exports faced by third countries [är det så du menar?] (t_{SR} in Figure 4).

To use the information on trade cost when estimating exports from Sweden, we need to assume that Swedish exports to each host country have the same product composition as the mother firm production structure.

Export of final goods from Sweden:

Exports of final goods from Sweden can be explained by the following regression model:

$$Swedish\_exp_{ijkt} = \alpha_0 + \underset{(+)}{\alpha_1} trade\_openess_{kjt} + \underset{(+)}{\alpha_2} gdp_{jt} + \chi' X + \varepsilon_{ijkt}$$

where $Swedish\_exp_{ijkt}$ is the export of firm *i* to country *j* of a product in industry *k* at time *t*. The industry classification is the one at the 3-digit ISIC-level, corresponding to 28 manufacturing industries. The variable $trade\_openess_{kjt}$ is the measure of trade openness predicted from the gravity regressions. Both trade openness and market size in terms of gdp_{jt} should increase the exports from Sweden (indicated with a (+) below the regression coefficients).

The vector *X* includes a number of control variables at the affiliate-, firm-, industry-, and country level. From the theory presented in the Appendix, we control for size of the host country, whether it is member of a trade region and distance between Sweden and the destination country and the size of the Swedish parent firm (reflecting heterogeneity between firms). In addition, we also control for R&D expenditure of the parent company, whether the parent has previous experience of local production in a host country and GDP per capita. A detailed list is given in the Appendix. All variables except dummy (binary) variables are measured in logarithms.

Horizontal FDI

$$local\_sales_{ijkt} = \alpha_0 + \underset{(+)}{\alpha_1}\, gdp_{jt} + \chi' X + \varepsilon_{ijkt}$$

As a measure for Horizontal FDI, we use the sales by an affiliate *i* directed towards the local market in country *j* of a product in industry *k* at time *t*. Once a firm produces locally in a host country, the trade costs should not be of any significant importance. Thus, the main variable of interest here is the size of the local market as measured by host country GDP.

Platform FDI

As a measure of platform FDI, we use the exports of an affiliate *i* to destination countries other than Sweden from country *j* of a product in industry *h* at time *t*. Here, we include estimated trade openness to the trading partners of host countries, labeled *trade_open_neighbour*. Since we do not know exactly to which countries such affiliate sales are directed, we take an average over all bilateral trade openness measures from a host country to its trading partners, but assign a weight proportional to its distance.

$$Affiliate\_exports_{ijkt} = \alpha_0 + \alpha_1 trade\_open\_neighbour_{kjt} + \alpha_2 Market\_potential_{jt} + \chi' X + \varepsilon_{ijkt}$$

To obtain a demand measure, we follow Hanson (1998) and use a distance weighted average of the GDP of the countries which import goods from the host country, which is labeled *Market-potential*.

5.1 Regression results

The regression results can be seen in Table 6 to 9. Each table consists of four specifications, where each specification employs a different set of fixed effects. Specification (1) uses year fixed effects, (2) employs year and industry fixed effects formed by the ISIC2/3 classification, (3) applies year, industry and firm-specific effects, whereas (4) includes year and industry fixed effects drawing from the more detailed SNI92 classification.[16]

[16] The fixed effects method is a tool that can be used to remove omitted variable bias, i.e., unobserved heterogeneity.

Table 6 shows the results on exports from Sweden. As expected, a larger size of the host country market, measured by *GDP*, increases the exports from Sweden. An increase in host country *GDP* by 1 % increases exports from Sweden by about 0.5 %. As expected, *trade openness* also increases exports from Sweden. Larger firms (*size*) and more *R&D* intensive firms have significantly higher exports, which is consistent with new theories emphasizing heterogeneity among firms. Increased *distance* significantly reduces exports. Former Eastern-European countries (*CEFTA* countries) receive significantly lower exports than non-CEFTA countries, while the opposite holds for *Mercosur* countries. In addition, there are more exports to countries with a larger *GDP per capita*, reflecting that the bulk of international trade is among industrialized countries.

Table 6 Regression results: Exports from Sweden

	Parent Exports			
	(1)	**(2)**	**(3)**	**(4)**
GDP	0.477***	0.490***	0.503***	0.506***
	(12.23)	(14.77)	(15.17)	(14.89)
GDP/cap	0.670***	0.600***	0.637***	0.623***
	(7.60)	(7.89)	(8.21)	(8.02)
Trade openness (host)	-0.018	0.313***	0.321***	0.314***
	(0.48)	(2.70)	(2.73)	(2.65)
Firm size	0.596***	0.565***	0.367***	0.632***
	(26.71)	(27.44)	(5.09)	(23.34)
R&D	0.102***	0.121***	-0.014	0.052***
	(4.77)	(6.19)	(0.94)	(3.10)
Previous exp.	0.640***	0.689***	0.687***	0.592***
	(6.75)	(7.59)	(10.34)	(8.49)
Distance	-0.826***	-0.399***	-0.403***	-0.430***
	(8.72)	(2.69)	(2.67)	(2.79)
CEFTA	-0.658***	-0.395**	-0.394***	-0.366**
	(4.71)	(2.58)	(2.96)	(2.51)
EU	-0.082	-0.071	-0.096	-0.069
	(0.64)	(0.57)	(0.84)	(0.58)
NAFTA	0.101	0.181	0.126	0.160
	(0.72)	(1.44)	(0.96)	(1.15)
ASEAN	0.348*	0.356	0.540*	0.564**
	(1.71)	(1.64)	(1.97)	(2.20)
MERCOSUR	0.696***	0.736***	0.641***	0.724***
	(3.78)	(4.34)	(3.83)	(4.20)
Year effects	Yes	Yes	Yes	Yes
ISIC2_3dig effects		Yes	Yes	Yes
Firm effects			Yes	
Industry effects				Yes
Observations	9998	9998	9998	9939
R-squared	0.45	0.49	0.62	0.59

Notes: Robust t statistics in parentheses, clustered on export destination countries
* significant at 10%; ** significant at 5%; *** significant at 1% level

In Table 7, we now examine the results on affiliate local sales, which is a proxy for horizontal FDI. Increasing the *age* of affiliates implies significantly larger sales to the local market which may indicate that it can take time to integrate affiliates into the firm's production network. As expected, we see that the size of the local market as measured through host country *GDP* increases local sales, with the size of the estimated effect comparable to what is found for parent exports of final goods from Sweden.

While larger firms (*size*) and more *R&D* intensive firms do sell more to the local market, the estimated coefficients are smaller than the corresponding estimated coefficients in the export regression in Table 6. This may indicate that products which are based on advanced technologies are exported from Sweden.

Table 7 Regression results: Affiliate Local Sales

	Affiliate Local Sales			
	(1)	**(2)**	**(3)**	**(4)**
Age	0.023***	0.025***	0.026***	0.026***
	(11.35)	(13.01)	(13.73)	(13.83)
GDP	0.316***	0.352***	0.398***	0.396***
	(8.59)	(9.18)	(8.96)	(9.53)
GDP/cap	0.285***	0.264**	0.252**	0.243**
	(2.94)	(2.60)	(2.18)	(2.13)
Firm size	0.211***	0.178***	0.069***	0.137***
	(14.80)	(13.73)	(5.53)	(8.56)
R&D	0.000	0.026	0.002	0.048*
	(0.01)	(0.92)	(0.06)	(1.78)
Previous exp.	0.048	0.173	0.294**	0.411**
	(0.36)	(1.27)	(2.05)	(2.50)
Distance	-0.051	-0.046	-0.063	-0.065
	(1.05)	(1.02)	(1.30)	(1.38)
CEFTA	-0.589***	-0.708**	-0.568	-0.528*
	(2.70)	(2.40)	(1.64)	(1.82)
EU	0.008	-0.029	-0.163*	-0.088
	(0.08)	(0.33)	(1.70)	(0.99)
NAFTA	0.020	-0.014	-0.090	-0.022
	(0.22)	(0.14)	(0.80)	(0.23)
ASEAN	-0.416	-0.400	-0.649**	-0.546**
	(1.12)	(1.27)	(2.12)	(2.04)
MERCOSUR	0.371**	0.350**	0.186	0.262*
	(2.59)	(2.57)	(1.32)	(1.99)
Year effects	Yes	Yes	Yes	Yes
ISIC2_3dig effects		Yes	Yes	Yes
Firm effects			Yes	
Industry effects				Yes
Observations	3149	3121	3121	3105
R-squared	0.32	0.38	0.52	0.47

Notes; Robust t statistics in parentheses, clustered on host countries.
* significant at 10%; ** significant at 5%; *** significant at 1%.

This contradicts recent theories on FDI with heterogeneous firms from which we would expect the opposite result, but it may reflect that transferring technology can be costly, as suggested in Norbäck (2001).

We now turn to our measure of Platform FDI, as measured by affiliate exports to destinations other than Sweden. A number of interesting results arise, as seen in Table 8.

Table 8 Regression results: Export Platform FDI

	Export Platform FDI			
	(1)	**(2)**	**(3)**	**(4)**
Age	0.005	0.008*	0.013***	0.013***
	(1.11)	(1.97)	(3.84)	(3.71)
Market potential	0.775***	0.656***	0.500**	0.597***
	(2.93)	(2.69)	(2.38)	(2.81)
GDP/cap	0.743***	0.748***	0.791***	0.813***
	(5.41)	(5.29)	(5.40)	(5.34)
Trade openness (third)	0.098**	0.136**	0.224***	0.197***
	(2.08)	(2.14)	(3.09)	(2.91)
Firm size	0.227***	0.202***	0.049	0.159***
	(9.99)	(7.47)	(1.39)	(4.40)
Distance	0.306*	0.311**	0.318**	0.323**
	(1.93)	(2.08)	(2.17)	(2.20)
CEFTA	0.338	0.346	0.235	0.297
	(1.45)	(1.38)	(0.53)	(0.93)
EU	0.820***	0.843***	0.842***	0.774***
	(3.93)	(4.62)	(4.85)	(4.57)
NAFTA	0.646***	0.660***	0.749***	0.697***
	(3.23)	(3.04)	(3.33)	(3.24)
ASEAN	1.322***	1.267***	1.480***	1.310***
	(3.80)	(3.55)	(5.16)	(3.45)
MERCOSUR	1.032***	0.910***	0.588***	0.775***
	(6.88)	(5.62)	(3.35)	(4.62)
R&D	0.093**	0.125***	-0.045	0.033
	(2.11)	(3.19)	(0.60)	(0.57)
Previous exp.	0.212	0.297	0.577*	0.379
	(0.92)	(1.44)	(1.69)	(1.61)
Year effects	Yes	Yes	Yes	Yes
ISIC2_3dig effects		Yes	Yes	Yes
Firm effects			Yes	
Industry effects				Yes
Observations	2246	2246	2246	2236
R-squared	0.28	0.32	0.48	0.42

Notes: Robust t statistics in parentheses, clustered on host countries
* significant at 10%; ** significant at 5%; *** significant at 1%

Older affiliates (*age*) have higher affiliate export sales, which may once more reflect that integration into the firm's production network may increase over time. As expected, affiliate exports increase when demand from neighboring countries increases. The estimates show that a 1 % percent increase in the *market potential* variable increases affiliate exports by roughly 0.5 to 0.8 %. This estimated effect appears to be even stronger than the sensitivity of home-country exports to host-country market size in Table 6.

Affiliate exports to third countries also increase when the *trade openness* of neighboring countries increases. In addition, there is a significant increase in affiliate exports when the host country is a member of a regional trade agreement.

That *trade costs* are of importance for this type of platform FDI can also be seen from the sensitivity analysis of affiliate exports towards third countries to *distance* from Sweden, where we found the opposite for exports from Sweden. As suggested by theory, the firm can then save on trade costs incurred in exports from Sweden by locating production in countries which are nearer to the final destination market (and, potentially, also have other cost advantages).

Let us finally examine the results on exports of intermediate inputs from Sweden, which can be seen as a proxy for Vertical FDI. The results can be seen in Table 9. As can be seen, affiliates in larger host countries (*GDP*) import significantly more intermediate inputs from Sweden. A likely reason is that production for local sales is higher in large markets, as documented in Table 7.[17] A noteworthy finding is also that higher *R&D* intensity of the mother firm in most specifications will increase affiliate imports in intermediates. Once more, this may indicate a pattern where the parent keeps production with advanced technologies in Sweden.

[17] Another reason is that large markets are often seen as regional hubs.

Table 9 Regression results: Exports of Swedish intermediate inputs

	Affiliate Inputs from Sweden			
	(1)	**(2)**	**(3)**	**(4)**
Age	0.010**	0.016***	0.020***	0.020***
	(2.63)	(4.07)	(5.64)	(5.67)
GDP	0.104	0.169**	0.249***	0.260***
	(1.59)	(2.21)	(3.16)	(3.62)
GDP/cap	0.354***	0.285***	0.290***	0.283***
	(3.12)	(3.03)	(3.26)	(3.29)
Trade openness	-0.096	0.082	0.169	0.102
	(0.97)	(0.59)	(0.97)	(0.68)
Firm size	0.165***	0.128***	0.060	0.093***
	(4.57)	(4.22)	(1.52)	(3.00)
Distance	-0.017	0.177	0.111	0.050
	(0.10)	(0.92)	(0.50)	(0.27)
CEFTA	-0.058	0.040	-0.416	-0.160
	(0.06)	(0.06)	(0.68)	(0.26)
EU	0.504***	0.388***	0.001	0.012
	(2.73)	(2.68)	(0.01)	(0.09)
NAFTA	-0.378	-0.300	-0.649	-0.655
	(0.80)	(0.53)	(1.14)	(1.34)
ASEAN	1.154**	0.965**	0.031	0.516
	(2.13)	(2.45)	(0.08)	(1.28)
MERCOSUR	0.479	0.085	-0.027	-0.098
	(1.51)	(0.39)	(0.11)	(0.40)
R&D	0.113**	0.125***	-0.008	0.068*
	(2.23)	(2.87)	(0.16)	(1.89)
Previous exp.	-0.102	-0.118	0.481	0.340
	(0.39)	(0.45)	(1.07)	(0.91)
Year effects	Yes	Yes	Yes	Yes
ISIC2_3dig effects		Yes	Yes	Yes
Firm effects			Yes	
Industry effects				Yes
Observations	1314	1314	1314	1302
R-squared	0.18	0.30	0.52	0.48

Notes: Robust t statistics in parentheses, clustered on host countries
* significant at 10%; ** significant at 5%; *** significant at 1%

The relationship between home-country exports and FDI

Summing up the regression results, we identify two main engines that have driven Swedish parent exports and affiliate activities between 1978 and 1998 – first the *growth of the world economy* measured in terms of host country GDP and market potential, and second the *fall in trade barriers* both between Sweden and export countries but also among host countries and third markets. According to our estimates and in line with theory, the increase in of world income has a positive effect on parent exports and affiliate sales. The fall in trade cost clearly benefits parent exports, but also exports of affiliates to third countries. Hence, it must be possible to numerically assess which effects are stronger – those on parent exports or those on affiliate sales. This issue will be addressed in the next section.

5.2 The relationship between home-country exports and FDI within multinational firms

Now, we are ready for a counterfactual simulation on the Swedish export share of the average Swedish MNE in its total sales abroad, which was depicted in Figure 14.[18]

Suppose that world income had not been growing since the beginning of our data period, keeping both host-country GDP and market potential constant.

1. What would the average level of parent exports to a foreign market have been?
2. What would the local sales, sales to third countries and sales to Sweden of an average Swedish-owned foreign affiliate have been?

Likewise, we can undertake the same counterfactual simulation, keeping trade barriers constant.

Such a counterfactual simulation will help us understand the fundamental factors driving both parent exports and foreign affiliate sales. Moreover, we will be able to quantify the relative importance of these fundamental factors in driving the Swedish export share of the average Swedish MNE in its total sales abroad. Since trade cost estimates (i.e. the trade openness measure) are only available from 1978, we can only investigate the export share from 1978 and onwards, as seen in Figure 14.

To figure out to what extent the growth of the world economy explains the evolution of the Swedish export share, we calculate a hypothetical export share assuming that the size of the world economy remained constant.

The hypothetical *market share*, where *host country size GDP* and *host countries' market access market potential* [förstår inte detta uttryck – för långt eller är det ngt som saknas?? – se även nedan] remained constant at the level of 1978, is then compared to the development of the actual export share. The difference between the two can then be attributed to market growth.

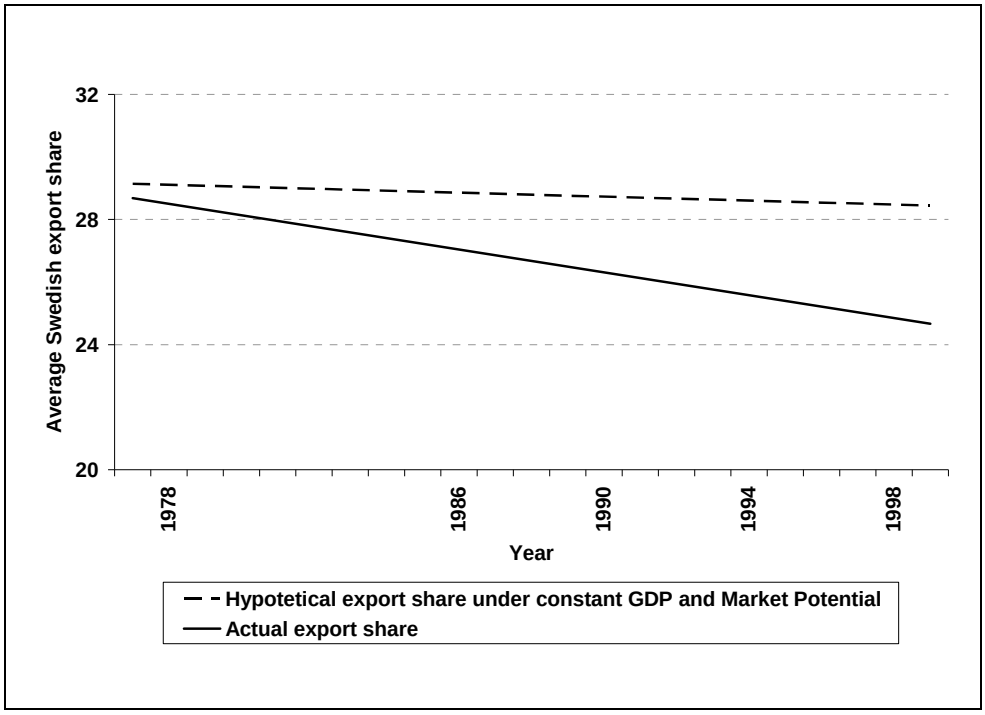
Similarly, to figure out how much the reduction in trade cost explains the evolution of the Swedish export share, we calculate a hypothetical export share assuming that transport costs remained constant at their 1978 level.

[18] Note that the rest of the sales, subtracting exports from Sweden, are foreign direct investments in terms of foreign affiliate local sales and foreign affiliate third-country exports.

In Figure 20, we display the result from the simulation, holding market size constant, which in this figure includes both *host country size GDP* and the *host countries' market access market potential*. To more clearly view the results, we plot the fitted quadratic curves for the hypothetical export share with world market size kept constant and the actual export share, reflecting the historical growth of world market size.

Note that the average export share within an MNE would have been much larger had the world economy not been growing in size. That is, a growing world economy increases foreign affiliate local sales and foreign affiliate third country exports more strongly than parent exports. This explains why a growing world economy contributes to a decline in the average export share within an MNE during the period between 1978 and 1998.

Figure 20 Actual vs. Simulated Export Share, under constant GDP and Market Potential



Source: IFN data.
Note: The export share is the average share of firms' total sales in a host country which is exported from Sweden.

To further separate the channels through which world income growth affects the parent export share in total foreign sales of Swedish MNEs, we isolate the effect through host country GDP growth on parent exports and local affiliate sales from the effect through market potential growth of export platform FDI (affiliate exports to third markets).

Therefore, Figure 21 repeats the experiment of Figure 20, holding *market potential* constant at its 1978 level, whereas

Figure 22 keeps host country size (*GDP*) constant at its 1978 level.

The experiments in Figure 21 and 22 imply that the effect of the growth of a host country's *market potential* is stronger than the effect of growing host country *GDP*, thus implying that a crucial role for the decline of the Swedish parent export share in MNE foreign sales was played by export platform FDI, strongly responding to the growth in income of other regions in the world.

In Figure 23, we show the experiment of holding trade costs constant. When keeping trade costs constant at their level in the year 1978, including the status of trade agreements, the trade cost per unit of distance, etc., we find that this hardly contributes to the explanation of the decline in the average export share within an MNE.

Figure 21 Actual vs. Simulated Export Share under constant Market Potential

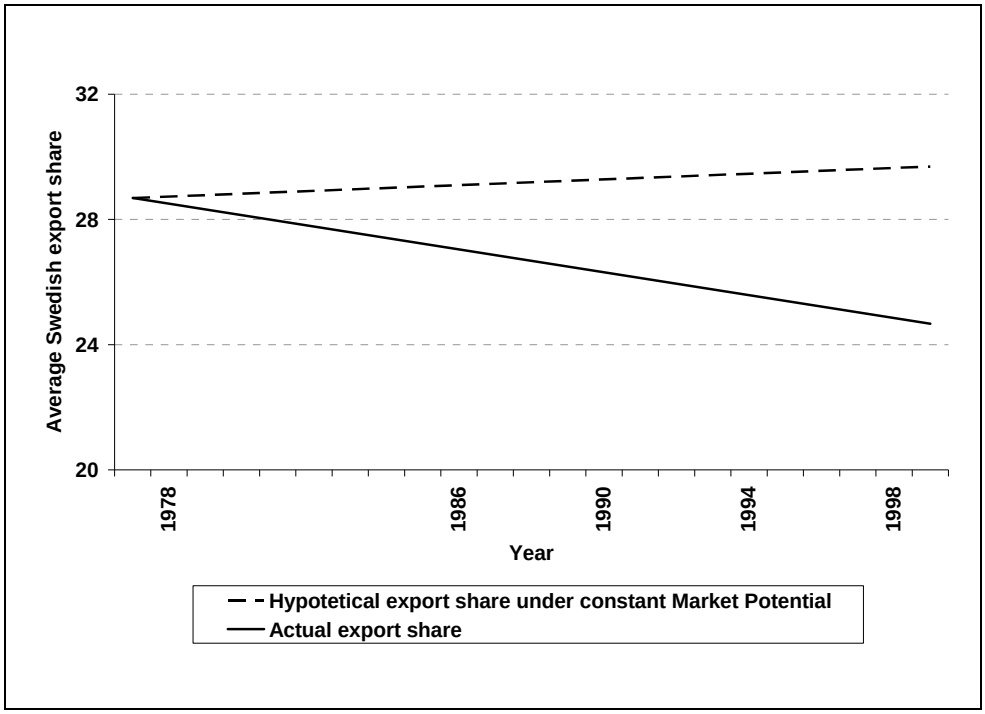


Figure 22 Actual vs. Simulated Parent Export Share under constant GDP

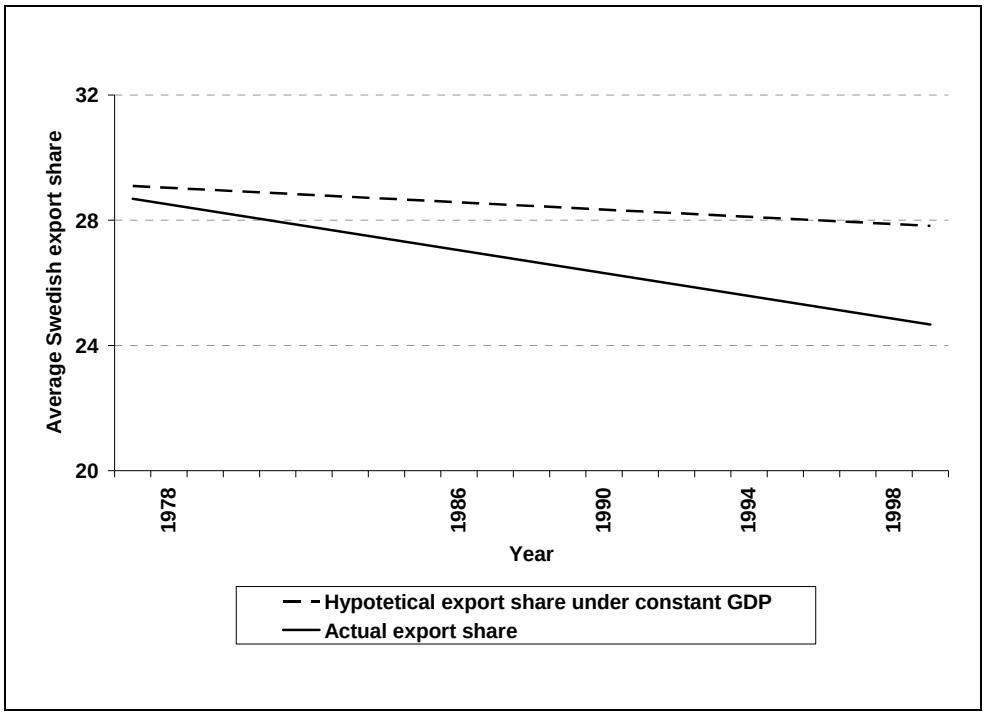
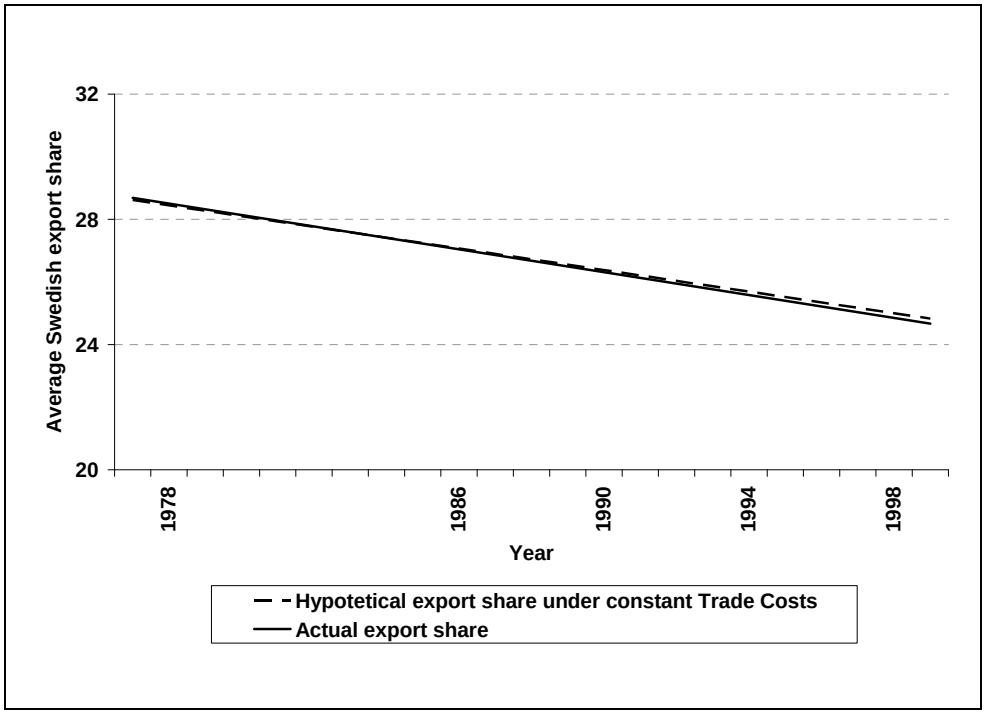


Figure 23 Actual vs. Simulated Parent Export Share under constant Trade costs



While this may be surprising, the explanation is simple: the decline in trade costs does not only boost parent exports but also affiliate exports to third countries and these two effects neutralize each other.

In sum, we find that almost the entire decline in the share of exports from Sweden within Swedish multinational firms can be attributed to the increased size of the world economy: increasing the size of destination markets increases affiliate exports to the rest of the world as well as affiliate sales to the local market more strongly than exports from Sweden.

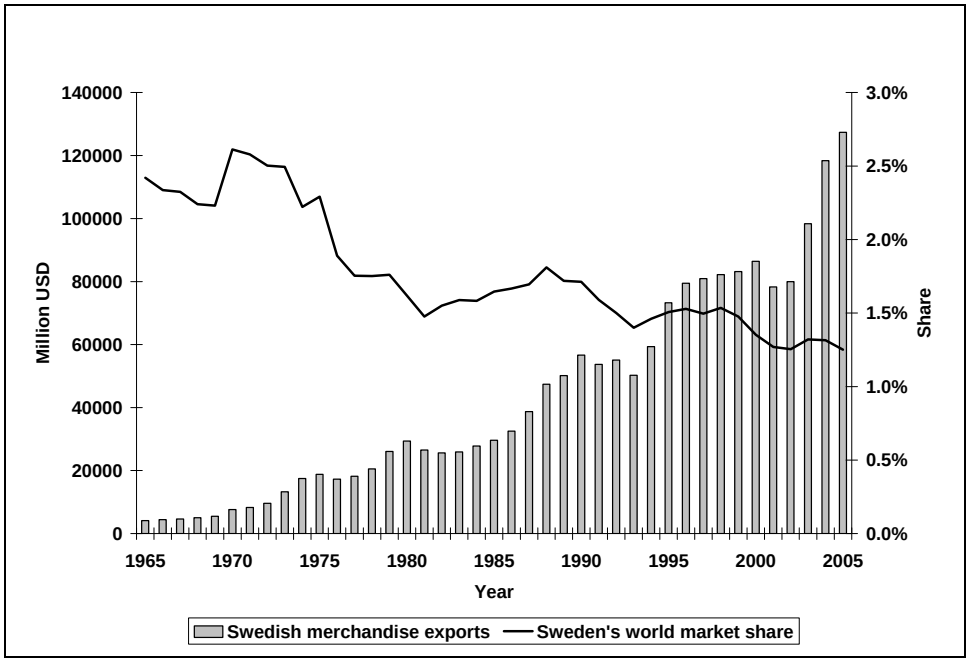
5.3 The world market share of Swedish exports

In this section, we relate the findings on Swedish MNEs to the aggregate world market share of Swedish exports. Clearly, Swedish MNE parent exports are one part of this share and Swedish affiliate exports are another. Moreover, it is likely that the mechanisms which explain Swedish affiliate exports from a host country also explain other exports from those countries. Likewise, the mechanisms explaining MNE parent exports are also likely to apply to the exports of other Swedish firms. Hence, we can take the average export share of a Swedish MNE in total foreign sales as a micro-cosmos, mirroring the Swedish aggregate export share in world merchandise trade.

When drawing this analogy, however, we need to be careful in its interpretation. We only explain those marginal effects on the Swedish world export share that are linked to the interrelation of MNE parent exports and Swedish-owned foreign affiliate sales. Naturally, there are many other partial effects that are not linked to the interrelation of trade and FDI which also affect the Swedish export share and which must be studied separately.

Nevertheless, the analogy is logic in itself. To see this, we turn to the evolution of the Swedish share in world merchandise exports in Figure 24. Swedish firms – multinational firms as well as others – held a share of 2.4 % in world exports during the year 1965. In 1998, the Swedish share of world merchandise exports had decreased to 1.5 % and in 2005, it was down to approximately 1.2 %. At least during the period between 1978 and 1998 for which we have micro data, this trend is mirrored by the average Swedish MNE parent export share in foreign sales, which we displayed in Figure 14 as well as the aggregate parent firm export seen in **Error! Reference source not found.**. This justifies the analogy.

Figure 24 The world market share of Swedish exports



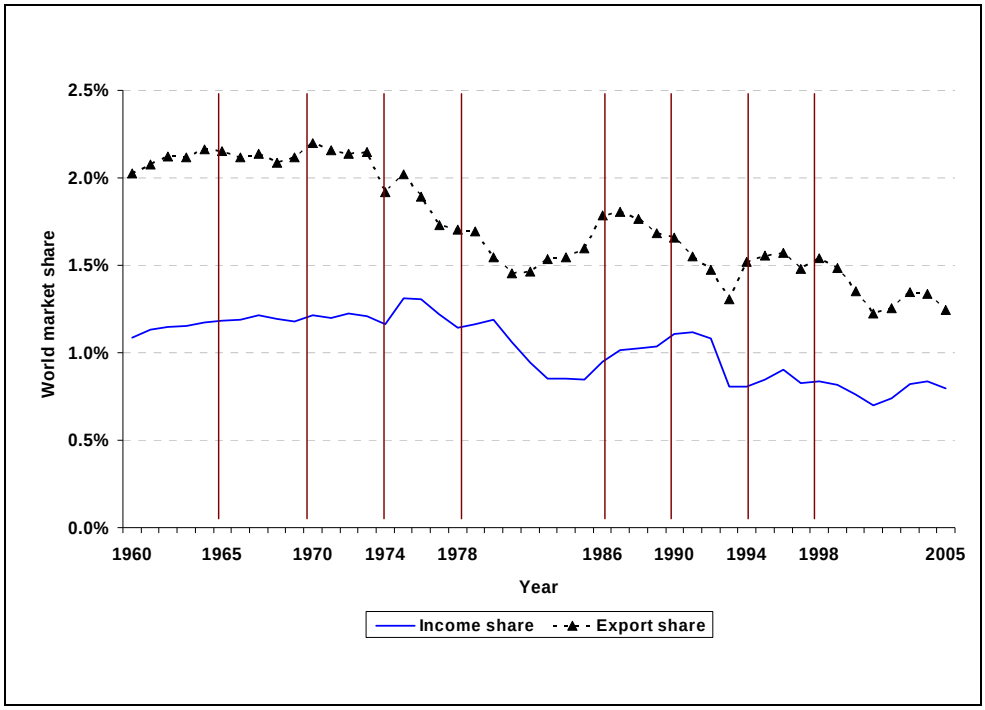
Source: UN Comtrade.

Why is the Swedish world market share of exports decreasing?

So far, we have shown that growing world markets increase affiliate exports to third markets (export platform FDI) disproportionately. We argue that this holds in a similar way also for indigenous firms originating from the same countries. That is, by the analogy of the MNE parent export share in foreign sales to the Swedish export share in world merchandise trade, the latter will be driven by the growth of world markets in a similar fashion.

To investigate this hypothesis in a crude way, Figure 25 plots Sweden's world market share of exports and Sweden's share of world income over the period 1960-2005. Clearly, there is a high correlation between the two series and both series have decreasing time trends. This suggests that a decline in the Swedish share of merchandise exports is highly correlated with the fall in the Swedish share of world GDP, analogously to our previous finding that world income growth was driving the decline in the average MNE parent export share in foreign sales.

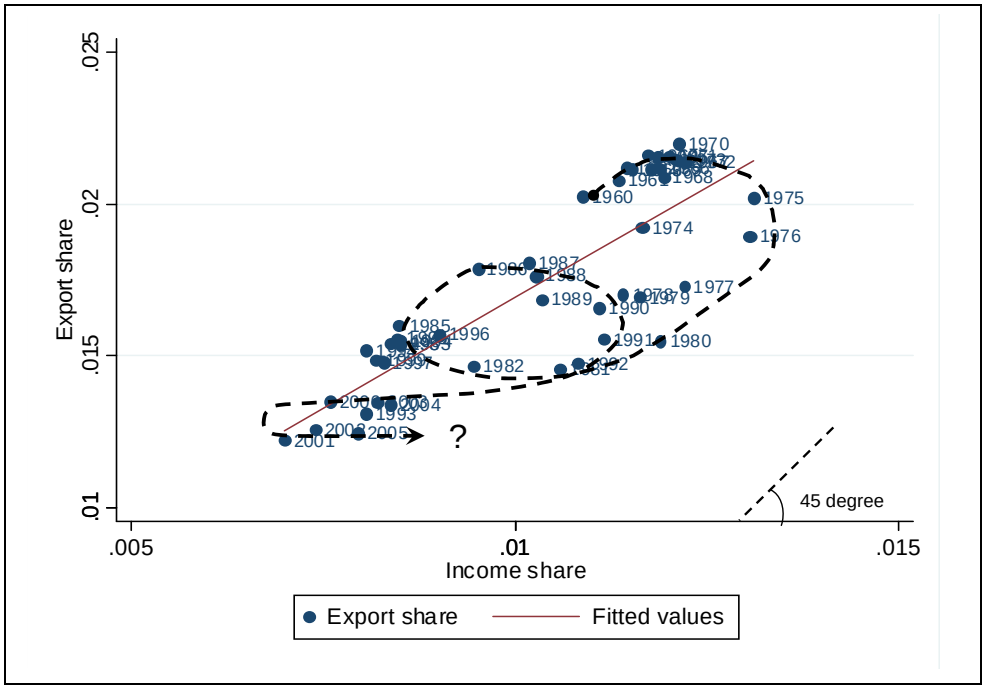
Figure 25 Export performance: Export and income share of Sweden



Source: UN Comtrade and World Development Indicators.
Note: Vertical lines give the IFN survey years.

In Figure 26, we plot Sweden's world market export share directly against its income share. Tracing out the time path over the period 1965-2006 of this diagram, we can identify the influence of the effects of various macroeconomic shocks and other historical events. Still, there is a close association between the world market export share and income share.

Figure 26 Export performance: Export and income share of Sweden



Source: UN Comtrade and World Development Indicators.

Our micro-econometric analysis enables us to give a causal interpretation of this trend: since other regions in the world grow faster than Sweden, trade among those regions also grows faster. In particular, foreign affiliates trade more with quickly growing economies, steadily increasing the importance of export platform FDI. In addition, domestic firms of these fast growing countries are likely to join the export expansion of foreign affiliates.

Seen in this way, the decline in the Swedish world market export share is then a natural consequence of the growing world economy, and the catch up of many countries that were previously lagging behind.

6 Conclusions

This study encompasses the recent theoretical and empirical literature and examines how FDI and international trade are related, by evaluating the impact of increased world economy and trade liberalization on Swedish exports and foreign affiliate production.

Thus, these findings are used to discuss in what way, if any, outward FDI by Swedish multinational enterprises may have contributed to the decline in the market share of Sweden's export in world merchandise trade

The analysis is based on firm-level data on Swedish multinational firms within a three-country model of FDI with heterogeneous firms.

Our results show that a growing world economy increases Swedish exports as well as foreign direct investments.

However, based on the relative numerical importance of the various sales types, we find that world income growth promotes platform FDI, in terms of affiliate exports to third countries, more than Swedish firm exports, in relative terms. This is consistent with what would be expected from the theory.

Further, we show that the steady decline in trade barriers does not only increase Swedish firm exports but also platform FDI. The statistical analysis further shows that the two effects neutralize each other.

Since world income growth causes a decline in the Swedish firm export share of foreign sales, we analogously conclude a similar declining trend of both the Swedish share of world merchandise export and the Swedish share of world income.

Not only MNEs will expand production in growing markets, entry by indigenous firms should also take place, thereby increasing the competition on international markets.

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8 Appendix

8.1 Definition of Foreign Direct Investment

The definition of foreign direct investment and related components according to the guidelines of OECD (1996) and IMF (2001).

Foreign direct investments from the viewpoint of the Balance of Payments reflect the aim of obtaining a *lasting interest* by a resident entity of one economy – *Direct Investor* – in an enterprise that is resident in another economy. *Lasting interest* implies the existence of a long-term relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the latter. Foreign direct investment involves both the initial transaction establishing the relationship between the investor and the enterprise and all subsequent capital transactions between them and among affiliated enterprises, incorporated as well as unincorporated ones.

A foreign direct investor, as mentioned above, can be an *incorporated* or *unincorporated* public or private enterprise, a government, an individual and a group of related individuals, or a group of related enterprises, both incorporated or unincorporated, which has a direct investment enterprise operating in one country other than the country or countries of residence of the foreign direct investor or investors.

A foreign direct investment enterprise is defined as an incorporated or unincorporated enterprise where a foreign investor owns 10 % or more of the ordinary shares or voting power of an incorporated enterprise or the equivalent of an unincorporated enterprise. The definition of a foreign direct investment relationship is set by a numerical threshold ownership of 10 % of a company's capital, comprising ordinary shares or voting stocks. This percentage is set as a dividing line between foreign direct investment and portfolio investment in the form of shareholdings. The management representation, as stipulated by the ownership of at least 10 %, implies that the direct investor can influence or participate in the management of an enterprise. However, when collecting the investment statistics, some countries are flexible to the 10 % cut-off point concerning a foreign direct investment relationship and take into account a combination of factors such as representation on the board of directors, participation in policy-making processes and material inter-company transactions, among other things.

A direct investment enterprise could be an incorporated enterprise (subsidiary or associate company) or an unincorporated enterprise (branch).

A subsidiary is an incorporated enterprise where

- a foreign investor directly or indirectly controls more than 50 % of the share-holders' voting power, or;

- the foreign investor has the right to appoint or remove a majority of the members of the administrative, management or supervisory bodies of the enterprise.

An associate is an enterprise where the direct investor and its subsidiaries control between 10 % and 50 % of the voting shares.

A branch is an unincorporated enterprise in the host country that fulfils one or several of the following statements:

- is a permanent establishment or office of a foreign direct investor, or;
- is an unincorporated partnership or joint venture between a foreign direct investor and third parties, or;
- is land, structures and immovable equipment and objects, in the host country, that are directly owned by a foreign resident, or;
- is mobile equipment that operates within an economy for at least one year if separately accounted for by the operator.

Foreign direct investment flows are generally depicted on a net basis where capital transaction credits are deducted from capital transaction debits between direct investors and their foreign affiliates. Net decreases in outward FDI (assets) or net increases in inward FDI (liabilities) are recorded as credits, with a positive sign in the balance of payments, while net increases in outward FDI or net decreases in inward FDI are recorded as debits, with a negative sign in the balance of payments. That is, a negative sign implies that net outward FDI outranks net inward FDI, and that at least one of the three components of FDI (equity capital, reinvested earnings or intra-company loans) is negative and not offset by positive amounts of the remaining components.

FDI flows are formally defined as follows:

- *For subsidiary and associated companies*:
  1. the direct investor's share of the company's reinvested earnings;
  2. plus the direct investor's purchases less sales of the company's shares, debt securities (bonds, notes, money market and financial derivative instruments) and loans (including non-cash acquisitions made against equipment, manufacturing rights, etc.);
  3. less the company's net purchases of the direct investors' shares, debt securities (bonds, notes, money market and financial derivative instruments) and loans;
  4. plus the net increase in trade and other credit (including debt securities) given by the direct investor to the company;
  5. less the outstanding balance at the beginning of the period, and less the net increase between the opening and closing balances which is due to revaluations and exchange rate movements

- *For branches*
    1. the increase in reinvested profits;
    2. plus the net increase in funds received from the direct investor, measured as the increase in the net worth of the enterprise to the investor;
    3. less increases (net of decreases) due to revaluations and exchange rate movements

Foreign Direct Investment Stocks are estimated, at book value or historical cost, by either cumulating FDI flows over a period of time or adding flows to an FDI stock that has been obtained for a particular year on assets and liabilities of direct investment. The FDI stocks could be seen as an indirect activity measurement of MNEs outside their home countries and the parent firms' financial stakes in their foreign affiliates, since the stocks are the amount of direct investment, or the "direct investment position," of a country as calculated from direct investment stock data or cumulated flows of direct investment.

FDI Stocks are formally defined as follows:

- *For subsidiary and associate companies*:
    1. the market or book value, derived from the balance sheets, and reserves (retained profits) attributable to the direct investor;
    2. plus loans, trade credit and debt securities (bonds, notes, money markets instruments, financial derivatives etc.) due from the subsidiaries and associates to the direct investor, including dividends declared but not yet paid to the direct investor;
    3. less loans, trade credit and other liabilities due to subsidiaries and associates from the direct investor
- *For branches*
    1. the market or value of fixed assets, investments and current assets, excluding amounts due from the direct investor;
    2. less the liabilities of the concern to third parties.

8.2 A Heterogeneous Firm Model of MNEs

We consider three countries, a Home country (H), a Southern country (S) (that is a potential host to MNEs from H), and the Rest of the World (R). There are three sectors: a homogeneous goods sector producing good Y, and two differentiated goods sectors. MNEs will only exist in the differentiated goods sector. Moreover, there is one production factor labor L with endowments L_i for $i = H, S, R$. Consumers in all countries have identical utility functions which consist of a Cobb-Douglas upper-tier function with income shares a and a^* for differentiated goods sectors 1 and 2, respectively. The lower-tier utility functions for differentiated goods each consist of a CES function on a continuum of goods with substitution elasticity σ.

8.2.1 The homogeneous goods sector

The homogeneous goods price is numeraire. There is a labor coefficient $1/a_i$ for the technology of the homogeneous good in each country i, $i = H, S, R$. We assume labor endowments to be such that there is diversification in all countries. There is perfect competition. Hence, the wage in each country is quasi exogenous such that $w_i = a_i$.

8.2.2 The differentiated goods sector

All firms in the first differentiated goods sector are owned by country H. Conversely, all differentiated goods firms in sector 2 are owned by country R. Country S has no own firms in this industry since it lacks technological knowledge, but it may have foreign affiliates. We focus on sector 1 among the differentiated goods sectors. The other sector is analogue. There is a continuum of firms in each differentiated goods sector which only differ in their productivity, i.e. there is an exogenous labor coefficient $1/\theta$ specific to the firm (and independent of the country where a production plant is located) with $0 < \theta < \infty$. There is a frequency distribution over all firms in this sector, $g_H(\theta)$. For notational convenience, we normalize the total mass of firms to one. There is no fixed cost of exporting, but there is an iceberg transport cost, t_{ij}, for shipping goods from destination i to destination j.

Hence, all firms serve all markets. Furthermore, we assume $a_i < a_j(1+t_{ij})$ for all countries $i \neq j$. This ensures that there will be some differentiated goods production in each country. Moreover, $a_S < a_i$ for $i = R, H$ which renders country S a low-cost location.

We restrict the firm choice to three firm types – *exporting firms, export platform FDI and horizontal FDI.*

- Exporting firms have a plant in the home country (H) and export to the two other countries.
- Export platform FDI has a plant in the home country (H) and in country S, but exports from S to R.
- Horizontal FDI has a plant in each country.

Foreign plants require a fixed cost f per plant in terms of the numeraire good while the fixed cost for the home plant is assumed to already be sunk.

Under the stated parameter constraints, there will thus always be production in the home country and firms will always make strictly positive profits.

The operating profits of a differentiated goods firm when producing in country i and serving a market in country j, π_{ij}, are given by

$$\pi_{ij} = \left[\frac{p_{ij}(\theta)}{(1+t_{ij})} - \frac{w_{ij}}{\theta} \right] x_{ij},$$

where x_{ij} is goods demand and t_{ii}=0. The optimal pricing decision is given by $p_{ij} = (\sigma/(\sigma-1))(1+t_{ij})(w_i/\theta)$ and output by

$$x_{ij} = \left(\frac{\sigma}{\sigma-1} \right)^{-\sigma} \theta^{\sigma} (1+t_{ij})^{-\sigma} w_i^{-\sigma} \frac{\alpha I_j}{P_j},$$

where I_j is the income of country j and $P_j^{1/(1-\sigma)}$ is the ideal price index corresponding to the CES sub utility function.

The profit functions of the three firm types are:

Export firm:

$$\Pi^{EFIRM} = \rho \Theta w_H^{1-\sigma} \left(\frac{\alpha I_H}{P_H} + (1+t_{HS})^{-\sigma} \frac{\alpha I_S}{P_S} + (1+t_{HR})^{-\sigma} \frac{\alpha I_R}{P_R} \right),$$

with $\rho = \sigma^{-\sigma}(\sigma-1)^{\sigma-1}$ and $\Theta = \theta^{\sigma-1}$ is the productivity index.

Export platform firm:

$$\Pi^{PFDI} = \rho\Theta\left(w_H^{1-\sigma} \frac{\alpha I_H}{P_H} + w_S^{1-\sigma} \frac{\alpha I_S}{P_S} + (1+t_{SR})^{-\sigma} w_S^{1-\sigma} \frac{\alpha I_R}{P_R} \right) - f,$$

Horizontal FDI Firm

$$\Pi^{HFDI} = \rho\Theta\left(w_H^{1-\sigma} \frac{\alpha I_H}{P_H} + w_S^{1-\sigma} \frac{\alpha I_S}{P_S} + w_R^{1-\sigma} \frac{\alpha I_R}{P_R} \right) - 2f.$$

Note that all three profit schedules are linear in the productivity index Θ. Under the stated assumptions, it holds that

$$\frac{\partial \Pi^{HFDI}}{\partial \Theta} < \frac{\partial \Pi^{PFDI}}{\partial \Theta} < \frac{\partial \Pi^{EFIRM}}{\partial \Theta}.$$

Hence, horizontal FDI can only exist for large levels of productivity while exporting firms can only exist for low levels of productivity. These two firm types will always exist if the range of productivity θ is sufficiently close to zero and infinity which we will henceforth assume.

Next, we can define the level of productivity of a firm for which a firm is indifferent between exporting and export platform FDI, Θ_H^{PFDI} (1)

$$\Theta_H^{PFDI} = \frac{f}{\rho\left[\left(w_S^{1-\sigma} \frac{\alpha I_S}{P_S} + (1+t_{SR})^{-\sigma} w_S^{1-\sigma} \frac{\alpha I_R}{P_R} \right) - w_H^{1-\sigma} \left((1+t_{HS})^{-\sigma} \frac{\alpha I_S}{P_S} \right) + (1+t_{HR})^{-\sigma} \frac{\alpha I_R}{P_R} \right]},$$

while the productivity level of the firm that is indifferent between export platform FDI and horizontal FDI is given by, Θ_H^{HFDI} (2)

$$\Theta_H^{HFDI} = \frac{f}{\rho\left[\left(w_R^{1-\sigma} - (1+t_{SR})^{-\sigma} w_S^{1-\sigma} \frac{\alpha I_R}{P_R} \right) \right]},$$

Under suitable parameter constellations, we also have that $\Theta_H^{PFDI} < \Theta_H^{HFDI}$ which we will henceforth assume. Then, it immediately follows that there will be exporting firms for a productivity index smaller than Θ_H^{PFDI}, horizontal FDI for productivity levels larger than Θ_H^{HFDI} and export platform FDI in-between. Note that the cut off levels depend on the endogenous price indices and the endogenous income terms. All other variables are (quasi) exogenous.

8.2.3 Estimating the Model

The export value of Firm z in terms of consumer prices from H to S is given by

$$Swedish\_Exports_{ZS} = \sigma\rho\Theta_Z w_H^{1-\sigma}(1+t_{HS})^{1-\sigma}\frac{\alpha I_S}{P_S}.$$

Note that no market access measure is entering this equation. Firm level exports of H-firm affiliates from S to R are given by

$$Affiliate\_Exports_{ZR} = \sigma\rho\Theta w_S^{1-\sigma}(1+t_{SR})^{1-\sigma}\frac{\alpha I_R}{P_R}.$$

Local sales of H-country affiliates are given by

$$Local\_Sales_{ZS} = \sigma\rho\Theta w_S^{1-\sigma}\frac{\alpha I_S}{P_S}.$$

In terms of data, Θ_Z can be approximated by a firm size variable, $\sum_Z$, i.e. $\Theta_Z = \sum_Z + \varepsilon_Z$ with ε_Z a log-normally distributed random variable, w_i by GDP per capita or some toolmaker wage or the US Bureau of Labor statistics average hourly wage cost, $\frac{\alpha I_S}{P_S}$ is the real consumption value (=production value-exports + imports) in an industry to which firm z belongs in country S, and $\frac{\alpha I_R}{P_R}$ can be calculated as the market access measure on the same industry consumption variables (World Bank data).[19]

[19] See, http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:21085384~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

The final estimation equation is the estimation of the probability that FDI occurs, i.e.

$$P(FDI) = E\left[I\left[\Theta_H^{PFDI} - \sum_Z \quad > 0\right]\right],$$

where $I(.)$ is the indicator function, and Θ_H^{HFDI} can be log-linearized in its arguments by a Taylor expansion around the mean of the endogenous variables. This equation is used to analyze the extensive margin of FDI. To estimate this equation, one need not only know where a parent has located its foreign affiliates, but also to where a firm instead exports from the home plant. There are two problems in our data in this respect. First, most firms are multi-product firms. Hence, the activities of affiliates and parent need to be split up according to their divisions. Unfortunately, we do not have any such information for parent exports. Second, export destinations are sometimes aggregated from country-level information to continents or regions. In this case, it is once more not possible to exactly identify to where a parent exports instead of undertaking FDI. For these two reasons of data availability, we must refrain from estimating the extensive margin.

8.2.4 Analyzing aggregate Exports

Aggregate exports are given by

Aggregate Swedish Exports =

$$= \int_0^{\Theta_H^{PFDI}} g_H(\theta) \cdot Swedish\_Exports_{ZS} d\theta + \int_0^{\Theta_H^{PFDI}} g_H(\theta) \cdot Swedish\_Exports_{ZR} d\theta$$

$$= \left[\sigma\rho w_H^{1-\sigma} (1+t_{HS})^{1-\sigma} \frac{\alpha I_S}{P_S} + \sigma\rho w_R^{1-\sigma} (1+t_{HR})^{1-\sigma} \frac{\alpha I_R}{P_R} \right] B(0, \Theta_H^{PFDI}$$

Aggregate Swedish exports just sum up the exports of all exporting firms over all countries. Hence, changes in aggregate Swedish exports depend on three factors: changes in the level of exports of existing exporting firms, changes in the number of exporting firms and changes in the exogenous productivity distribution of all firms.

The Swedish share of exports is then just to be divided by the value of world exports, which is given by

Aggregate World Exports

$$
\begin{aligned}
&= \int_0^{\Theta_H^{PFDI}} g_H(\theta)\cdot Swedish\_Exports_{ZS}\,d\theta + \int_0^{\Theta_H^{PFDI}} g_H(\theta)\cdot Swedish\_Exports_{ZR}\,d\theta \\
&+ \int_{PFDI}^{\Theta_H^{HFDI}} g_H(\theta)\cdot Affiliate\_Exports_{ZH}\,d\theta + \int_{PFDI}^{\Theta_R^{HFDI}} g_R(\theta)\cdot Affiliate\_Exports_{ZR}\,d\theta . \\
&+ \int_0^{\Theta_R^{PFDI}} g_R(\theta)\cdot R\_Exports_{ZS}\,d\theta + \int_0^{\Theta_R^{PFDI}} g_R(\theta)\cdot R\_Exports_{ZH}\,d\theta
\end{aligned}
$$

To say something about the Swedish world merchandise share, we need to know something about the export performance of all other countries in the world. This is information that we do not have. Might it be sufficient to instead look at the ratio of Swedish aggregate exports to Swedish aggregate affiliate sales? Note that if the income of S rises, but not that of H and R, i.e. catch up of [förstår inte riktigt detta?] China and India, then Θ_H^{PFDI} falls and Θ_H^{HFDI} remains unchanged. But then there is an increase in the share of export platform FDI and in aggregate local sales. Swedish exports fall, but Swedish affiliate local sales rise. Since, by definition, Swedish affiliate exports are not Swedish aggregate exports, in a sense they capture exports by the world. Thus, we could also look at the ratio of Swedish aggregate exports to Swedish affiliate aggregate exports. [inte säker på att jag förstår de två sista meningarna – blev det rätt så?]

8.3 Appendix 2: Obtaining predictions on trade costs

Extending Anderson and van Wincoop (2003) to many industries, a simple multi-country pure exchange economy with a Cobb-Douglas utility function on m industries and CES subutility functions each on n goods within an industry yields the following reduced form equation:

$$X_{ijkt} = \mu_{kt}\left(\frac{Y_{it}Y_{jt}}{Y_t^T}\right)\left(\frac{\tau_{ijkt}}{P_{ikt}P_{jkt}}\right)^{1-\sigma}, \qquad (1)$$

where X_{ijkt} is the bilateral export value of industry k from country i to country j in year t, $\tau_{ijkt}, \tau_{ijkt} \geq 1$ is trade cost, Y_{it}, Y_{jt}, Y_t^T are income in country i, j, and the entire world, $\sigma, \sigma > 1,$ is the substitution elasticity from the CES utility function, μ_k is the income share spent by the representative agents of all countries on goods of industry k, and P_{ikt} and P_{jkt} are the ideal CES price indices in countries i and j.

Next, we define the hypothetical level of trade cost $\hat{X}_{ijkt}$ that would emerge without trade barriers

$$\hat{X}_{ijkt} = \mu_{kt}\left(\frac{Y_{it}Y_{jt}}{Y_t^T}\right)\left(\frac{1}{P_{ikt}P_{jkt}}\right)^{1-\sigma}.$$

Then, we obtain the percentage of trade volume lost through trade barriers

$$\frac{X_{ijkt} - \hat{X}_{ijkt}}{\hat{X}_{ijkt}} \approx \ln X_{ijkt} - \ln \hat{X}_{ijkt} = (1-\sigma)\ln \tau\,. \qquad (2)$$

Note that this variable is negative and it is rising as trade barriers are reduced.

We define the trade cost index in logarithm, $\ln \tau_{ijt}$, as:

$$\ln \tau_{ijt} = a_{ot} + a_{1t} \cdot \ln Distance_{ij} + a_{2t} \cdot (1 - common\,border_{ijt}) + a_{3t} \cdot (1 - common\,language_{ijt}) + a_{4t} \cdot is$$
$$+ a_{5t} \cdot island_{jt} + a_{6t} \cdot landlocked_{it} + a_{7t} \cdot landlocked_{jt} - a_{8t}\,'common\,RTA_{ijt},$$

(3)

where $Distance_{ij}$ is measured in kilometers between capitals of countries, $common\ border_{ij}$ and $commonlanguage_{ij}$ are dummy variables with the value of 1 if countries i and j share a common border or a common language, respectively, *island* is a dummy variable for island, *landlocked* is a dummy variable with the value of 1 if a country has no access to a national harbor, $commonRTA_{ijt}$ is a vector of dummy variables with the value of 1 if two countries i and j are common members of the EU, NAFTA, MERCOSUR, CEFTA, CARICOM, ASEAN, PATCRA, ANZD, CACM, or USIS. The a_{lt}, l=0..8, are weighting factors of the index function.

Taking the logarithm of equation (1), inserting equation (3), adding a stochastic error term ε_{ijkt}, a variable for GDP per capita difference between the two partner countries, $RealGDPp.c.difference_{ijt}$, to capture inter-industry trade effects ignored by the model, and bilateral real exchange rates, $Realexchangerate_{ijt}$, to account for exchange rate fluctuations, we obtain the gravity estimation equation:

$$\begin{aligned}\ln X_{ijkt} - \ln\left(\frac{Y_{it}Y_{jt}}{P_{it}^{1-\sigma}P_{jt}^{1-\sigma}Y_t^T}\right) &= (1-\sigma)a_{1t}\cdot \ln Distance_{ij} + (1-\sigma)a_{2t}\cdot(1-commonborder_{ijt}) \\ &+ (1-\sigma)a_{3t}\cdot(1-commonlanguage_{ijt}) + (1-\sigma)a_{4t}\cdot island_{it} \\ &+ (1-\sigma)a_{5t}\cdot island_{jt} + (1-\sigma)a_{6t}\cdot landlocked_{it} + (1-\sigma)a_{7t}\cdot landlocked_{jt} \\ &- (1-\sigma)a_{8t}'commonRTA_{ijt} + (1-\sigma)a_{0t} + \ln\mu_{kt} \\ &+ b_{1t}\cdot Realexchangerate_{ijt} + b_{2t}\cdot RealGDPp.c.difference_{ijt} + \varepsilon_{ijkt},\end{aligned}$$

(4)

The left-hand side is , on the one hand, proxied by bilateral industry imports in US dollar and deflated by the US consumer price index, and on the other hand by the real GDP of countries i and j and its sum over all countries in the sample. Hereby, we assume that consumer price indices are sufficiently good proxies for the ideal CES price indices from theory. Furthermore, we measure $\ln\mu_{kt}$ as the logarithm of an industry k's average consumption value (production+import value-export value) in a country's GDP over all countries in the sample. The gravity equation is separately estimated by OLS for each year and industry, yielding industry-specific and time varying estimation coefficients.

From the estimated score on the right-hand side, we obtain a predicted scaled measure of the percentage of trade lost through trade barriers, *ln Trade lost*$_{ijkt}$, as defined in equation (2), by replacing the theoretical weights of the trade cost index function in (3) by the estimated ones from the gravity regression (4):

$$\begin{aligned}\ln Trade\,lost_{ijkt} &= (1-\sigma)\ln \tau_{ijkt} \\ &= (1-\sigma)a_{1t}\cdot \ln Distance_{ij} + (1-\sigma)a_{2t}\cdot(1-common\,border_{ijt}) \\ &\quad + (1-\sigma)a_{3t}\cdot(1-common\,language_{ijt}) + (1-\sigma)a_{4t}\cdot island_{it} \\ &\quad + (1-\sigma)a_{5t}\cdot island_{jt} + (1-\sigma)a_{6t}\cdot landlocked_{it} + (1-\sigma)a_{7t}\cdot landlocked_{jt} \\ &\quad - (1-\sigma)a_{8t}'common\,RTA_{ijt} + (1-\sigma)a_{0t}.\end{aligned}$$

(5)

Note that a reduction in the absolute size of the distance coefficient over time results in a smaller percentage of trade lost over time, i.e. *ln Trade lost*$_{ijkt}$ becomes less negative. Likewise, the emergence of a regional trade agreement (RTA) also reduces the percentage of trade lost, since gravity estimation estimates typically yield a positive sign on the coefficient ($-(1-\sigma)a_{8t}$). Overall, the number should be negative, but rising over time when reflecting a reduction in trade cost over time.

GDP data are from PennWorld Tables, the import, export and production values are from Nicita and Olareaga (2006) drawing from the COMTRADE database, the geography variables are from ???, and nominal exchange rates and consumer price indices are from World Development Indicators. The dataset on bilateral industry imports covers the years 1978-2000, 28 manufacturing industries of the isic2/3 classification, and up to 158 countries.

To avoid sample selection problems in the time dimension, we require a bilateral country pair of an industry to be included in the sample only if there are data for at least 21 out of 23 possible years. To smoothen potential business cycle and exchange rate valuation effects, we take a five-year moving average over the predicted trade openness measure. The moving average of the year 1980 is referred back to the IFN data of the year 1978.[20]

The dataset of Nicity and Olarreaga (2006) also contains the years 1976 and 1977. However, the coverage turned out to be too incomplete and caused a serious selection bias over time. Therefore, these two years were not used.

To capture the trade barrier faced by exports from Swedish affiliates abroad to third countries, we calculate a distance weighted average of bilateral import barriers of all countries i with respect to imports from a host country j in a year t and an industry k:

$$trade\_open\_neighbor_{jkt} = \sum_i \frac{trade\_openess_{ijkt}}{distance_{ij}}. \qquad (6)$$

We need to take an average value, since we do not know exactly the destination to which affiliates' exports are directed. However, destinations closer to a host country are more likely to be a recipient and their trade measure obtains a larger weight in our *trade_open_neighbor* measure. Once more, we are careful in only including countries i for which this measure is available for all years in the sample to avoid a sample selection bias in the time dimension.

To demonstrate this new measure of predicted trade openness, we depict its average over all manufacturing industries facing Swedish exports abroad during each year in the sample in Figure 21. This shows that there was an increase in trade openness, i.e. there was a continuous decrease in trade cost over time. [21] In particular, the trade cost per unit of distance decreased over time. But the increasing number of trade agreements also contributed to this time trend.

Naturally, the estimation contains severe econometric constraints which can be cured, however. For example, we do ignore the repercussion effects embodied in the price indices. Anderson and van Wincoop's (2003) method cures for this problem using a non-linear constrained least squares estimator. Alternatives are provided by Baier and Bergstrand (2007) by log-linearizing the price index terms using their theoretical expressions. Another method is Egger and Larch (2007), employing Krugman's (1980) intra-industry model instead of Anderson and van Wincoop's (2003) pure exchange economy as a theoretical reference point from which to derive the gravity equation. This allows us to include asymmetric trade barriers. Finally, the estimation of the gravity equation rests on all non-zero trade relations. This, however, causes sample selection problems, which can be cured using the Helpman-Melitz-Rubinstein (2007) method. At the same time, this method accounts for unobserved heterogeneity among firms as concerns their productivity, which is a determinant of the exporting decision and thus also of whether one observes zero trade links.

[21] Since data are deflated, this rise is in real terms.

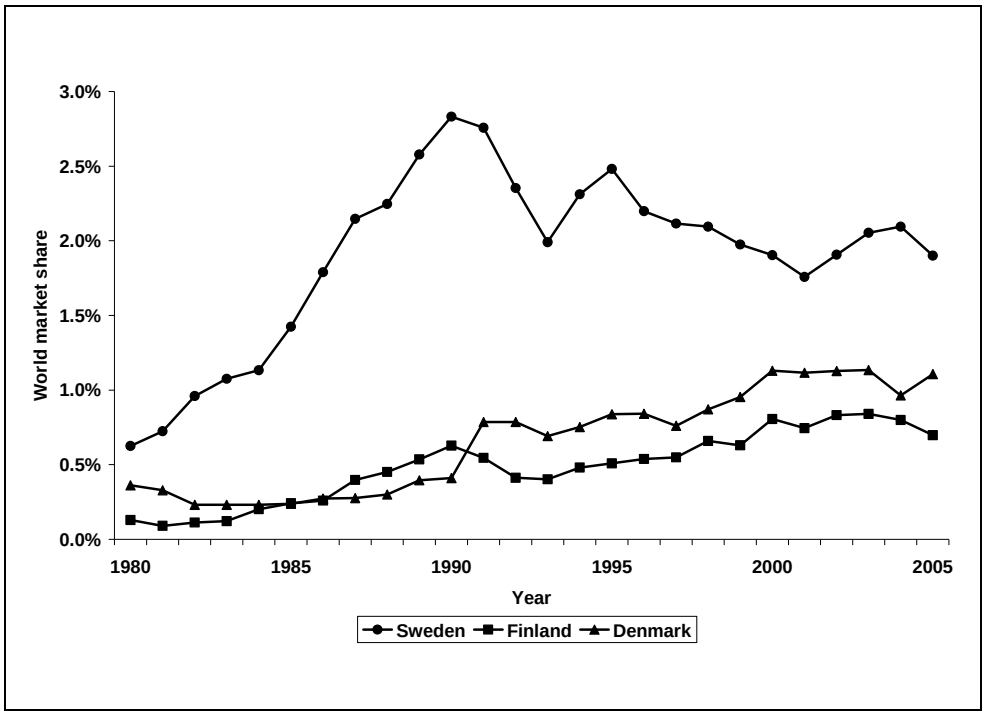
9 Additional figures and tables

Outward FDI stocks as a percentage of GDP and exports for EU25 +

	Share of GDP						Share of Exports					
	1980	**1985**	**1990**	**1995**	**2000**	**2005**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**
Sweden	***2.7***	***10.2***	***20.9***	***29.2***	***50.9***	***56.7***	***11.6***	***35.3***	***88.2***	***91.0***	***141.4***	***155.4***
Denmark	3.0	3.0	5.4	13.6	45.7	45.6	12.3	10.5	19.8	48.5	142.5	138.6
Finland	1.4	3.3	8.1	11.5	43.2	38.5	5.2	13.4	42.3	37.0	113.0	112.5
Germany	4.7	8.5	8.9	10.6	28.5	34.6	22.4	32.6	37.0	51.3	98.2	99.5
Austria	0.7	1.6	2.9	4.9	12.8	22.0	3.0	6.3	11.5	20.5	36.6	53.6
Bel+Lux	4.6	10.6	18.9	26.5	71.3	104.2	9.3	17.8	34.4	43.4	91.3	115.4
France	3.5	6.9	8.9	13.0	33.5	40.1	20.5	37.0	50.7	67.7	135.8	183.8
Greece			3.4	2.4	5.3	5.9			35.6	26.6	51.8	77.4
Ireland		70.1	36.0	28.4	29.0	58.4		139.7	72.5	42.7	36.1	107.3
Italy	1.6	3.8	5.3	9.4	16.4	16.7	9.4	21.6	35.3	45.5	74.9	78.5
Netherlands	22.7	34.7	34.8	39.9	79.0	102.7	49.6	61.4	81.1	85.0	131.0	157.6
Portugal	1.6	2.2	1.2	3.2	17.4	24.3	11.0	10.3	5.5	15.7	80.2	116.4
Spain	0.8	2.5	3.0	5.8	28.9	33.9	9.3	18.4	28.2	35.4	145.5	197.7
UK	15.0	22.0	23.2	26.9	62.2	56.3	73.0	99.0	123.8	128.1	314.4	321.6
Canada	9.0	12.3	14.8	20.3	33.3	35.3	35.1	47.4	66.4	61.4	85.9	111.1
United States	7.7	5.7	7.4	9.5	13.4	16.4	95.5	108.9	109.4	119.5	168.3	226.1
Mexico	0.8	1.0	1.0	1.5	1.4	3.6	9.1	7.5	6.6	5.3	5.0	13.1
Japan	1.9	3.3	6.7	4.6	6.0	8.5	15.0	24.8	70.0	53.8	58.1	65.0
China		0.3	1.2	2.5	2.6	2.3		3.3	7.2	11.9	11.1	6.1
Korea	0.2	0.5	0.9	2.0	5.2	4.6	0.7	1.5	3.5	8.2	15.6	12.8
India	0.0	0.0	0.0	0.1	0.4	1.2	0.9	1.0	0.7	1.6	4.4	9.6
Norway	0.9	1.7	9.4	15.2	217.2	123.6	3.0	5.5	32.0	53.6	603.7	358.2
Switzerland	19.6	25.3	27.9	44.9	92.4	106.9	72.5	91.4	103.6	174.5	281.8	313.5
Russia				0.6	7.8	15.7				2.9	19.1	49.4
Argentina	7.9	6.7	4.3	4.1	7.4	12.3	74.4	70.5	49.0	51.0	80.3	56.4
Brazil	16.9	17.7	9.4	6.3	8.6	9.0	191.5	153.8	130.7	95.6	94.3	60.5
EU 25	5.7	10.0	11.3	14.6	36.4	40.7	25.9	39.5	52.7	60.9	125.0	135.9

Source: UNCTAD.

World market shares in outward FDI stocks



Source: UNCTAD.