Does Foreign Direct Investment Replace Home Country Investment?

The Effect of European Integration on the Location of Swedish Investment[1]

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Abstract

The purpose of this paper is to examine the effects of European integration on the location of investments by Swedish multinational corporations (MNCs). Evidence is presented about the extent to which European integration has attracted investment by Swedish MNCs, and whether foreign direct investment is being undertaken at the expense of home country investment. In the empirical analysis, involving both OLS and iterative SUR techniques, a significant difference across industries has been confirmed. A substitutionary relationship between foreign and home country investment is found for more R&D-intensive production, whereas the opposite pattern seems to prevail for production based on traditional comparative advantage. The results of this study emphasize the importance of using disaggregated industry-level data when analysing the effects of foreign direct investment on home country investment.

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1. Introduction

Issues related to the location of production and the allocation of investment across countries have recently emerged as one of the most central research areas in international economics. The explanation of this revived interest in locational economics stems from the theoretical advances made possible by the incorporation of imperfect competition into general equilibrium models, and from the fact that foreign direct investment (FDI) has recently grown to become a major force in the global economy (UN 1999). Much of the insights proposed in the traditional eclectic approach to FDI (Dunning 1977), have thereby been furnished with a more solid theoretical foundation (Helpman & Krugman 1985; Brainard 1993; Markusen, 1995).

The massive flows of FDI into the European Union (EU) in the late 1980s and early 1990s indicate that firms expected the beneficial effects of the internal market to accrue predominantly to insiders.[4] Evidence has been presented that the fear of being excluded from a potential growth market was a major determinant of the inflows of investment from outsider firms - European as well as American and Japanese - into the Common Market (Braunerhjelm 1990; Yamawaki 1990; Rugman and Verbeke 1991; Ozawa 1992a; Dunning 1997 a,b).

This paper explores the effect of regional integration on the relationship between foreign and home country investment and the extent to which these effects differ across industries. More precisely, we hypothesize that a substitutionary relationship prevails between foreign and home country investment in R&D-intensive industries, while a complementary investment pattern is expected for industries originating in traditional comparative advantage factors. In the first type of industries, henceforth denoted the Schumpeter industries, the knowledge originating in R&D can be utilized irrespective of the location of production. In less R&D-intensive industries, here denoted Heckscher-Ohlin industries, different parts of the value-added chain are processed in different units at different locations, depending on technology and the endowments of factors of production. Similar industry-specific effects have been emphasized in other areas of economics, e.g. industrial organization and the effects of FDI (Caves, 1971), and the relation between FDI, R&D and licensing (Clegg, 1987). However, to our knowledge, there has been no analysis of the home country effects of FDI in which industry-specific characteristics such as knowledge intensity have been taken into account.

[4]Throughout the investigated period (1982-95) we will refer to the integrated countries within Europe as EU countries, irrespective of whether or not the Union was established de facto in the particular year discussed.

The empirical analysis focuses on Sweden, which is known for being one of the home countries with most MNCs per capita. Sweden is also one of the very few industrial countries for which data on FDI, cross-tabulated by sector and country, is accessible. The data set used in the analysis covers the period 1982 to 1995, i.e. the period during which European integration entered upon a more active phase and was gaining credibility.

Previous studies of the home country effects of FDI have focused predominantly on the relation between exports and FDI, while less attention has been paid to the impact of FDI on domestic investment.[5] In the case of foreign production and home country exports, most studies assert a positive relation between the two (Swedenborg, 1979; Blomström, Lipsey and Kulchycky, 1988; Kravis and Lipsey, 1988). In a recent study based on Austrian data, Pfaffermayr (1996) provides evidence for a significant and stable complementary relationship between foreign direct investment and exports with causation in both directions. The empirical evidence for a complementary relationship is also supported by theoretical arguments, particularly in the "new" trade theory (Helpman 1984; Helpman & Krugman, 1985 and 1989; Grossman & Helpman 1991; Brainard, 1993), suggesting that FDI and exports increase simultaneously.[6]

The positive relationship between foreign production and exports suggests the presence of a similar relationship between FDI and home country investment. An increase in exports suggests that an expansion of the domestic production capacity will ensue. However, the relatively limited number of empirical studies on the relationship between foreign and domestic investment provide inconclusive results, often due to data problems. Herring and Willett (1973) and Noorzoy (1980), using time series data on the industry level during the early 1970s, report a positive relationship between investment at home and abroad. However, they do not explain the causes behind this interdependence. Two studies published in the 1990s, Stevens and Lipsey (1992) investigating a sample of seven US multinational corporations for a period of 20 years, and Belderbos (1992) analysing Dutch food and metal/electronic companies for the period 1978-1984, report a negative relationship between domestic and foreign direct investment. Both studies claim that the

[5]The relation between FDI, exports and technology was first considered in the 1960s (Vernon, 1966; Aharoni 1966; Johnson, 1968). See Caves (1996) for a survey of this literature.

[6] More recent findings offer, both theoretically and empirically, a more ambiguous picture of the relationship between FDI and exports (Markusen et al. 1996; Svensson 1996; Braunerhjelm, 1996). Bergsten, et al. (1978) provide both theoretical arguments and empirical evidence suggesting that FDI and exports may change from complements to substitutes for one another as the internationalization process goes on. The argument builds on an assumed high degree of vertical integration in the early stage of the internationalization process, which is replaced at a later stage by a high degree of horizontal integration.

interdependence revealed is related to the financial side of the firm and to the capital constraints that it faces. In a paper on US investment, Feldstein (1994) concludes that a one-to-one dollar relation exists between foreign and domestic investment, i.e. a full substitutionary effect is found. In contrast to most of the other studies referred to above Feldstein's analysis is based on total flows, which means that his analysis does not suffer from the partial flavor that characterizes most other studies, in which the information commonly emanates from a limited number of industries or firms.

In this paper we argue that the inconclusive results of earlier studies are partly an aggregation phenomenon. The pattern of FDI is influenced by the specialization of the firms and the way in which they are organized; for instance, whether they are horizontally or vertically integrated, how dependent they are on market proximity, differences in their factor intensities, and the kind of competition they face in different markets. To understand the relationship between FDI and home country investment thus calls for an analysis disaggregated at the industry level. Hence, what distinguishes the present study from previous analyses of the relationship between FDI and home country investment is that we explicitly focus on differences across industries and regions.

The rest of the paper is organized as follows. Section 2 describes the pattern of Swedish FDI over time and distributed across regions and industries. The theoretical rationale for engaging in foreign operations is briefly presented in Section 3. Thereafter Section 4 provides definitions of the industries, the data set, the econometric specification and the empirical results. The main conclusions are summarized in Section 5.

2. Stylized facts about Swedish outward FDI 1982 to 1995

We commence by briefly surveying the investment pattern of Swedish multinational MNCs during the period 1982–1995. Two key factors are likely to have influenced the investment pattern over this period: First, even though the integration process within Europe became credible in 1985/86, the situation for Swedish firms remained uncertain up to 1994 when a referendum confirmed that the full membership applied for in mid-1991 would be realized.[7] Second, the Swedish manufacturing industry is dominated by a relatively small number of large multinational

[7] The EU's attitude towards Swedish membership was highly positive throughout the period, and in early 1994 the Swedish application was formally accepted. As from January 1995 Sweden became a full member.

corporations, with a long tradition of production abroad (Braunerhjelm & Ekholm, 1998). In 1994 the 30 largest MNCs accounted for 30 percent of total Swedish manufacturing employment and 52 percent of manufacturing exports. Moreover, about 75 percent of R&D in the manufacturing sector is undertaken by these MNCs.[8] These activities extend over a large number of local firms through a variety of networks and supplier links. The heavy dependence of Swedish firms on the European market in terms of exports and foreign production suggests that Swedish firms would be particularly sensitive to changes such as the integration process occurring in the EU region. An increase in outward FDI is likely to influence home market activities, and hence also to have macroeconomic implications for employment, growth and specialization.[9]

Figure 1 shows the pattern of accumulated Swedish FDI to the two most important recipient markets (together they account for roughly 75 percent of Swedish FDI) in the period 1982-1995.[10] Between 1982 and 1986 FDI by Swedish MNCs in the US and the EU followed almost identical paths, with respect to both growth rates and the level of investment. After 1986 the growth of Swedish FDI into the EU was spectacular, whereas FDI in the United States remained more or less constant. Obviously, the high degree of internationalization of Swedish firms did not prevent them from building up further capacity abroad in the 1980s. This suggests that the hump-shaped pattern of FDI in 1982-1995 can be largely explained by the reaction of firms to the broadening and the deepening of the European integration.[11]

To highlight the structural composition of FDI, the pattern of FDI has been distributed over Schumpeter and Heckscher-Ohlin industries in Figure 2.[12] A conspicuous feature of production in the Schumpeter industries is the role assigned to R&D and other headquarter services. These services are provided in order to differentiate a firm's products from those of its

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[8]IUI databases.

[9]Long-run structural shifts in home market conditions may also affect FDI (Ozawa1992b; Narula 1995; Ozawa 1995). In particular, changes in unit labor costs (Barrell & Pain 1996), in the quality of human capital (Borenzstein et al (1998), and in technology (Narula & Wakelin 1998), may influence the location of investment. In the relatively short period we are considering, the last two variables are likely to have been fairly constant, whereas relative unit labor costs have fluctuated dramatically. In 1992, for example, when Sweden was forced to abandon its one-way peg to the ECU, relative unit labor costs fell by approximately 30 percent. We will control for this effect in the empirical analysis (see Section 4).

[10] For a description of the definition of FDI adopted in this article and the problems encountered in the measurement process see Braunerhjelm and Oxelheim (1999).

[11]A more detailed inspection of the data reveals that FDI peaked in 1990, and then fell quite dramatically for a couple of years. The fall in FDI in 1992 and 1993 is partly a reflection of the fact that Sweden went into a severe industrial crisis at that time, and partly that the prospects of Sweden becoming a full-fledged member of the EU increased dramatically following its formal application in late 1991.

competitors. This allows economies of scale to accrue at the level of the firm, i.e. even though production is spread over many units, the units all benefit from some common non-competitive, firm-specific input. Competitiveness in the Heckscher-Ohlin industries rests largely on country-specific resources, where factors of production exhibit relatively low mobility across industries and products tend to be fairly homogeneous. Economies of scale appear primarily at the level of the plant, and production tends to be concentrated to a limited number of units.

As can be seen in Figure 2, outward FDI followed different paths in the two types of industry during the 1980s.[13] FDI by the Schumpeter industries increased in 1986 to a new, higher level. FDI by the Heckscher-Ohlin industries shifted upward dramatically in 1990, the only year FDI in the Heckscher-Ohlin industries exceeded FDI by the Schumpeter industries. However, this shift can be pinned on to two major takeovers by MNCs in the Swedish paper and pulp industry.[14] In 1992, the stock of Schumpeter investment in the EU was almost twice the size of the stock of Heckscher-Ohlin investment.

Essentially the pattern of outward FDI since the early 1980s is characterized by two particularly conspicuous changes: first, the shift towards the European Union from 1986/87 onwards, headed by the Schumpeter industries, and, second, the temporary halt triggered by the recession, and to some extent the reduced uncertainty in 1991 connected with Sweden's application for full membership of the European Union.

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[12]The exact definition of these industries is presented in Section 4.

[13]The exact distribution of Swedish outward FDI by industry and region is shown in Braunerhjelm and Oxelheim (1999).

[14]In 1990, Stora acquired Feldmühle and SCA acquired Reedpack. Throughout the period the share of acquisitions in FDI increased, and accounted for more then 80 percent in the 1980s. However, the increased share of FDI that can be attributed to acquisition is not exclusive for the EU. Rather, it holds for all developed countries. Moreover, the percentage change between entry through greenfield or acquisitions has been much more dramatic in the 1960s and the 1970s (Braunerhjelm and Ekholm, 1998).

3. Conceptual Framework

In the early 1990s the "new" locational theory made considerable progress as regards the theoretical modeling of the regional distribution of production (Krugman 1991; Brainard 1993; Markusen 1995; Venables 1996; Markusen et al., 1996). In general these models show that in markets characterized by imperfect competition and positive costs of market access, the interaction of trade costs and production costs determines whether foreign markets are supplied by exports or by local production. In principle falling trade costs promote concentration in production if economies of scale appear at the plant level, while sizeable trade costs and multi-plant economies of scale tend to generate dispersed production patterns. Changes in the relation between trade and production costs may then induce firms to favor market proximity at the expense of exports, and vice versa. In the presence of fixed production costs, the size of the market also influences the location of production.

Very simplistically, the basic structure of the model can be described as follows. Let $N^i=N_f/N_d$ denote production in industry i located in the foreign (f) and the domestic (d) markets respectively.[15] Similarly, assume that C denotes relative production costs ($C=C_f/C_d$), while E captures relative aggregate expenditure, or size of the markets ($E=E_f/E_d$). Location of production (N) can then be expressed as a function of relative production costs (C), the relative size of the market (E), and trade costs (T), where the last is defined as a composite of costs related to transportation as well as tariff and non-tariff barriers,

$$N = F(C,E,T).$$

Assume that the world initially consists of three countries and that two of them then integrate into a single market. The implied relative change in market size due to integration may influence the distribution of production across the two countries in several ways. If (marginal) costs are lower in the integrated area due to abolished trade costs, local production becomes preferable to exports for outsider firms. Hence, integration may deter exports and increase local production. Similarly, if economies of scale are better exploited in the larger market, then location will be

[15] To simplify the notation, we will drop the industry index henceforth.

concentrated to that region.[16] To summarize, the locational response to changes in the three key variables can be expressed as follows:

$$dN/dC<0,\ dN/dE>0,\ dN/dT \lessgtr 0,$$

implying that foreign production is decreasing in relatively higher foreign production costs and increasing in a relative expansion of foreign expenditures, whereas the effect of trade costs is more ambiguous and depends on firm characteristics, interaction effects, etc., to be discussed in greater detail in the following section.

3.1 Hypotheses on Outsiders' Location Strategies

On a basis of the theoretical framework briefly presented above, we will now formulate and empirically test three hypotheses. The questions we address concern the way a change in the size of the market (integration), paired with lower trade costs associated with border crossings, influences FDI and home country investment, and to what extent the effect differs across industries. We assume throughout that both industries encounter positive trade costs and that an increase in relative production costs will always, *ceteris paribus*, have a negative effect on the location of production. The hypotheses are derived stepwise as follows. First we consider the effect of integration on the distribution of FDI, after which we turn to the implications of FDI on home country investment, taking account of such industry-specific features as the degree of vertical and horizontal organization.

In discussing the first step we start with the Schumpeter industries characterized by relatively large outlays on R&D, product differentiation, intra-industry competition, and a relatively high degree of horizontal integration. Since multi-plant economies of scale appear primarily in the Schumpeter industries, a dispersed production structure is an option to a greater extent than in the Heckscher-Ohlin industries. How will Schumpeter firms respond to a regional integration process embracing their main export markets? [17] First we have to shed light on how the competitors of home country firms are affected by such integration. The main effect stems

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[16] Larger markets also increase the possibility of increased knowledge spillovers in the integrated area, due to increased interaction between firms as trade barriers are dismantled.

[17] We disregard potential spillover effects that tend to have a positive effect on location in the foreign (integrated) market.

from the abolition of trade costs within the integrated area, implying zero (non-transportation) trade cost for intra-regional transactions, while trade costs between outsiders and insiders remain positive and symmetric. Hence, even though trade costs may remain identical ─ or are even reduced ─ with respect to transactions between the integrated area and the home country after the integration is completed, insider firms have the advantage of zero trade costs within the integrated area. Consequently, in *relative* terms, outsider firms suffer a competitive disadvantage.[18]

Note that this effect can be expected to be particularly prominent in the case of neighboring markets. For more distant markets, where the transportation cost is already quite substantial, a further increase in relative trade costs may have little additional effect. *Moreover*, so long as economies of scale at the plant level exceed zero, a more sizeable market - in the presence of trade costs - will have a positive effect on production in the integrated area.

We therefore contend that integration is likely to result in an increase in FDI in the integrated region by outsider Schumpeterian firms. To summarize, the partial locational effects can be formulated in the following way (superindex denoting the Schumpeterian industries):

$$(dN/dE)^s \geq 0 \text{ and } (dN/dT)^s > 0.$$

For the Heckscher-Ohlin industries, the situation is somewhat more complex. One aspect is that firms in this industry base their competitiveness to a larger extent on country-specific factors, implying that in terms of costs of market access an integration may not have a negative effect on their relative competitiveness. If there are no competitors within the integrated area, a decline in trade costs will also translate into a drop in trade costs for outsider firms. On the other hand, if there are competitors within the integrated area, then plant-level economies of scale and higher relative trade costs tend to promote FDI in the integrated area in the same way as in the Schumpeter industry case. Yet, since this type of production is often connected with the exploitation of raw materials and involves large investment in process-orientated production systems and distinct economies of scale at the plant level, relocation at a short notice is frequently a less viable option. Furthermore, there may be other ways of compensating for the rising costs of being an outsider, such as merging with other outsider firms to increase the exploitation of scale economies at the plant level. Alternatively, foreign affiliates may specialize in downstream

[18] The fact is often disregarded that it is the relative changes vis-à-vis insiders that matter, not the absolute levels.

production, such as sales or service, i.e. firms pursue strategies that increase the degree of vertical integration.

In the first case, i.e. when there is little or no competition from insiders and trade costs are either unchanged or falling, FDI may go either way:

$$(dN/dE)^{ho}_{nc} \lesseqqgtr 0 \quad \text{and} \quad (dN/dT)^{ho}_{nc} \lesseqqgtr 0$$

The superscript "ho" refers to the Heckscher-Ohlin industries while the subscript "nc" denotes no competitors. However, in the second case, when competitors do exist in the integrated area, we expect FDI to increase in the integrated area,

$$(dN/dE)^{ho}_{c} > 0 \text{ and } (dN/dT)^{ho}_{c} > 0,$$

where "c" stands for the existence of inside competitors.

As regards the second step, i.e. the relation between foreign and domestic investment for the respective industries, the effect on home country investment of increased production capacity in foreign affiliates depends on the linkages with home country firms. The home country effects originate primarily in the effect of FDI on production in the parent company, but also in the indirect effects that encompass domestic suppliers of goods and services. We then have to pay particular attention to the organization of industrial production and the extent to which FDI may stimulate home country production and exports in other parts of the value-added chain. In the R&D-intensive Schumpeter industries, production of the final product is to a larger extent integrated within each firm or unit, drawing on some intangible, firm-specific asset, which can be utilized simultaneously by several units. In the Heckscher-Ohlin industries, which are based to a greater extent on country-specific factors of production, FDI is more likely to occur in downstream activities. The probability of foreign and domestic investment being complementary is considerably higher in this case. On a basis of the reasoning above, and taking these organizational differences between the types of industry into account, our main hypotheses subject to empirical test can be summarized as follows:

H1: The different organizational structure of the Schumpeter industries and the Heckscher-Ohlin industries is expected to be reflected in significant differences as regards the effect of FDI on domestic investment.

H2: The qualitative impact of FDI on home country production and investment in the horizontally organized Schumpeter industries is hypothesized as being *negative*, whereas a *positive* impact on home country investment is expected for the vertically integrated Heckscher-Ohlin industries.

H3: We also expect the distance to different markets to influence the results. In particular, a stronger substitutionary effect between FDI and home country investment is expected for the neighboring EU-market, relative to more distant markets.

4. Model, Data and Empirical Results

The Swedish manufacturing sector has been classified into three types of industry denoted Schumpeter, Heckscher-Ohlin, and Other. The R&D intensity of an industry determines whether it is classified as a Schumpeterian or a Heckscher-Ohlinian industry (Table 1).[19] More precisely, the Schumpeter industries comprise ISIC 35 (chemicals) and 38 (fabricated metal products, machinery and equipment), while the Heckscher-Ohlin industries comprise ISIC 32 (textile, wearing apparel and leather), 33 (wood and wood products), 34 (paper and pulp), and 37 (basic metal industries). The two sub-industries ISIC 31 (food, beverage and tobacco) and ISIC 36 (non-metallic mineral products) constitute "Other industries", since these industries have a history of heavy protection that motivates a separate classification. Further specification in the composition of these aggregates is hindered by the lack of data.

It can always be argued that the division adopted here is artificial, since the operations of most firms involve both Schumpeterian and Heckscher-Ohlinian features. However, we have here found the results to be robust when considering different industry classifications, such as the borderline cases paper and pulp industry with fairly high-tech production processes, and the chemical industry which embraces the production of basic chemicals as well as advanced

[19] A preferable way of categorizing these industries would have been to make regression tree estimates (Durlauf & Johnson 1995). However, the limited number of observations precluded such an approach, and we have had to resort to a priori information on R&D.

pharmaceuticals.

4.1 Econometric model

Since we are addressing an issue over a short period of time, for which only annual data are available, the limited number of observations poses a problem. Consequently, in the empirical analysis of the relationship between FDI and home country investment, the data has been pooled over years and industries.[20] In the regressions, OLS estimation techniques and iterative seemingly unrelated regressions (ITSUR) have both been used. The latter method has been adopted because the residuals in the regressions for the respective industries may be correlated. All value variables have been deflated by the implicit GDP-deflator and are expressed as percentage changes over the period 1982-95. The estimated equation is as follows:

$$INVSVE_t = \alpha_0 + \alpha_1 FDIEU_t + \alpha_2 FDIELSE_t + \alpha_3 REXCH_t + \alpha_4 D + u, \quad (1)$$

where

$$\alpha_1 = \beta_0 + \beta_1 DHO_t + \beta_2 DOTHER_t$$
$$\alpha_2 = \gamma_0 + \gamma_1 DHO_t + \gamma_2 DOTHER_t.$$

The dummy DHO assumes a value of 1 if the foreign investment is undertaken by a Heckscher-Ohlin industry, and zero otherwise. Similarly, the dummy DOTHER assumes a value of 1 if the category "Other industry" is engaged in FDI, and zero otherwise. If we insert the expression for the α-coefficients into equation 1, the following equation is generated:

$$INVSVE_{j,t} = \alpha_0 + \beta_0 FDIEU_t + \beta_1 DHO^* \, FDIEU_t + \beta_2 DOTHER^* \, FDIEU_t + \gamma_0 FDIELSE_t + \gamma_1 DHO^* \, FDIELSE_t + \gamma_2 DOTHER^* \, FDIELSE_t + \alpha_3 REXCH_t + \alpha_4 D + u. \quad (2)$$

The dependent variable ($INVSVE_{j,t}$) is defined as the percentage change in gross domestic investment in manufacturing industries in Sweden. The key independent variables represent percentage changes in foreign direct investment by Swedish firms, distributed by industry and

[20]Running the regressions sector by sector provided results in support of our hypotheses, however, the degrees of freedom were unsatisfactorily low.

region. The subscript t denotes annual percentage changes between period t and (t-1), while subscript j refers to industry.

In equation 1 foreign direct investment in the EU by manufacturing industry is denoted FDIEU, and in the rest of the world FDIELSE. Inserting the expression for the α-coefficients implies that foreign investment is broken down by type of industry in equation 2, as well as by region. More precisely, in the latter equation β_0 and γ_0 capture the effect on gross domestic investment of foreign direct investment by Schumpeter-industries in the EU and the rest of the world respectively. The effect of outward investment in the EU-region by the Heckscher-Ohlin industries on gross domestic investment is on the other hand obtained by adding the coefficients of the variable FDIEU and the interaction variable DHO* FDIEU (i.e. $\beta_0 + \beta_1$). Similarly, the effect of investments outside EU by the Heckscher-Ohlin industries is obtained by adding the coefficients of FDIELSE and DHO* FDIELSE (i.e. $\gamma_0 + \gamma_1$). Correspondingly, the effect of FDI by "Other industry" on gross domestic investments, can be calculated as ($\beta_0 + \beta_2$) for the EU region, and ($\gamma_0 + \gamma_2$) for the rest of the world.

We control for differences in relative production costs in Sweden and foreign countries by including fluctuations in the real exchange rate (REXCH). In this way it is intended to capture cycles in FDI due to changes in labor costs abroad (Barrell & Pain 1996). In addition, this variable can be assumed to affect the timing of FDI through its effect on the price of a potential acquisition target (Dixit 1989; Kogut & Chang 1996; Goldberg & Klein, 1997). A higher real exchange rate can therefore be expected to have a negative impact on home country investment.

Finally, a vector of time dummies has also been used (D). These dummies are included in order to allow for the effects of the transition period 1992-94 arising from the severe industrial crises in Sweden at the time, and from the fact that Sweden submitted its application for membership of the European Union in mid-1991. We have used dummies for the intercept, and we also interacted time dummies with industries and regions.

4.2 Data

The data on FDI - part of which is unpublished - has been provided by the Swedish Central Bank, while data on gross investment in the manufacturing sector by industry, and the output deflators, were obtained from Statistics Sweden (SCB). Data on gross domestic investment includes inward foreign direct investment. However, the size of these flows was negligible for most of the investigated period. This meant that in terms of net flows of FDI as a percentage of GDP, Sweden experienced the highest gap between outward and inward FDI among the OECD-countries (between 1986 and 1990 outward FDI amounted to 3.44 percent and inward to .56 percent). For the period 1982-1990, the average inflow of investments in the Schumpeter industries was less than 5 percent of gross domestic investment and the corresponding figure for the Heckscher-Ohlin industries was below 1 percent. These trends continued up to 1995, with the exception of 1991 and 1995, when a few sizeable foreign acquisitions led to a jump in the inward FDI figures.[21] Finally, exchange rate data has been obtained from the IMF database on international financial statistics and is based on relative, normalized, unit labor costs. The overall period analysed stretches from 1982 to 1995.

4.3 Results

The results of the OLS-estimation are presented in Table 2.[22] In accordance with our hypothesis, a substitutionary and (weakly) significant effect of FDI in the EU on domestic investment is found for the Schumpeter industries. Furthermore, the negative effect appears only for the nearby EU region, whereas the sign is positive - albeit insignificant - for the rest of the world, where the US is the dominating recipient of Swedish FDI.

Remaining FDI-variables fail to attain significance. However, in both the Heckscher-Ohlin and the "Other" industries the coefficients associated with the effect of FDI in the EU on home country investment is positive, as expected. This indicates a complementary relationship between FDI and domestic investment in the Heckscher-Ohlin industries, suggesting that different parts of the value-added chain are located in different countries. More resource-intensive or process-intensive stages are likely to be located in the home country while downstream activities are more likely to occur abroad. As regards FDI outside the EU, the coefficients are negative, but the significance is even lower.

The control variable that captures production costs and the costs of acquisition targets (REXCH), also fail to attain significance. To capture the effect of the turbulent period 1992-94, the time dummies in the pooled estimation were designed as interaction variables between FDI and the years 1992-94 for the respective industries.[23] Most of these interaction variables are

[21] These acquisitions involved Alfa Laval, the temporary effects of the Volvo-Renault agreement, and Pharmacia's merger with Upjohn.

[22] A Hausman test (Hausman 1986) reveals no sign of simultaneity, implying that FDI can be regarded as exogenous.

[23] These are not shown in Table 2, but are available on request.

significant, and in some cases the effect switches from negative to positive, and vice versa. This mirrors the recession and the huge swings in investment that occurred during this particular period. Hence, overall the regression results applying OLS are rather poor.

Even though the results of Table 2 yield only weak support for the hypotheses presented in Section 3, a significant difference across industries does exist. As shown in Table 3, this difference is significant at the 5 percent level between the Heckscher-Ohlin and the Schumpeter industries as regards FDI in the EU. At the 10 percent level, the difference across the other industries is also found to be significant for two of the three remaining comparisons.

Since there is reason to believe that the residuals in the above industries may be correlated, we proceed by applying an iterative seemingly unrelated regression (ITSUR) estimation technique. This is a more appropriate method compared to the commonly used OLS technique. In this procedure, the coefficients in the equations are estimated simultaneously as a system. This methodology yields efficient estimators,even for small samples (Zellner 1962; Kmenta & Gilbert, 1968). In order to increase the degree of freedom, we have analysed different structures for the time dummies for the three sub-periods: the pre-transition period 1982-91, the transition period 1992-94, and the period following the transition, i.e. 1995. Only the time dummy for 1995 was found significant, and hence was retained in the estimations. Finally, since the effect on home country investment of FDI outside the EU proved to be significant and to exhibit almost identical coefficients for all three types of industry, we imposed the restriction that the effect of FDI in the rest of the world should assume the same value for all three. The results of the estimation are shown in Table 4. For reasons of comparability we have included the results from an OLS estimation in which identical restrictions were imposed.

The ITSUR estimation yields a considerably more significant negative effect for the Schumpeter industries. The effect of FDI in the EU is significant at the 1 percent level. This corroborates the result in Table 2, although no significance was attained in the OLS estimation reported in Table 4. On the other hand, FDI in the EU by the Heckscher-Ohlin industries, which in the OLS estimations was shown to have a positive impact on home country investment (both in Table 2 and 4), is now insignificant, albeit still positive. Finally, the estimates for the third type of industry, denoted "Other", indicate a strong positive effect on home country investment of FDI in the EU. For all industries, due to the restriction imposed on FDI in the rest of the world, an identical and positively significant impact on home country investment is found.

Hence, the empirical analysis suggests that a negative relationship prevails between FDI and home country investment in the Schumpeter industries, while a positive relation is found for the industries denoted "Other". The result for the Heckscher-Ohlin industries is inconclusive.[24]

Of course, this cannot be interpreted as meaning that the counterfactual - i.e. no FDI - would have had a positive impact on home country investment. Rather, it is quite conceivable that the growth of domestic investment would have been even lower, had firms abstained from FDI. The impact should be interpreted as meaning that there is a potential for more extensive investment in the home country Schumpeter industries, provided that the right prerequisites prevail. Hence, the result should be viewed as if the potential for investing and expanding in the home country's Schumpeter production is not being fully exploited. This could be due either to fairly concrete reasons such as scarcity of skills, or to more general reasons originating for instance in a country's decision not to participate in an integration process or in a perceived inferior "investment climate".

To summarize: we have found that a statistical difference prevails across industries as regards the effect on domestic investment of outward FDI. An important corollary is that the analysis of the relation between outward FDI and home country effects should be disaggregated to the industry level, something which has been neglected in previous studies (Belderbos 1992; Stevens and Lipsey 1992; Feldstein, 1994).

5. Concluding remarks

We have found that a substantial shift in the investment pattern occurred in the mid-1980s at the time of the announcement of the creation of the internal market. The shift implied a dramatic increase in Swedish FDI in the European Union, especially by the Schumpeter industries. An extensive interview study indicated that a major cause of this shift was uncertainty about a future

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[24]The question is then how important these effects are in terms of economic significance? Even if there is a negative effect, does it really matter in terms of volume of investments? Looking at the Schumpeter industries, we find that home country investment increased on average in real terms throughout 1982-1995 by 5.5 percent. According to our estimate in the OLS regression, the coefficient of FDI by the Schumpeter industries is negative and of the magnitude -.15. Multiplying this by the average annual increase in real FDI (25 percent) by the Schumpeter industries in the same period, gives a hint about the economic significance of FDI on home country investment. These numbers imply that FDI in the EU by Schumpeter firms reduced the growth of home country investment by approximately 40 percent.[This figure is calculated in the following way: -15*25%=3.8%, which amounts to approximately 40 percent of the annual increase in home country investments, corrected for the effect of FDI in the Schumpeter industries, i.e. 9.3 percent (5.5 plus 3.8 percent)]. However, if we make the same calculation but insert the coefficient obtained in the ITSUR estimation, the effect is substantially reduced, leaving us with, approximately, a mere 1 percent effect. Hence, we stress that calculations of the economic significance should be interpreted cautiously.

Swedish membership of the EU and a fear of Fortress Europe, although other factors such as uncertainty about environmental and energy policies, high domestic production costs, etc., also had an impact (Braunerhjelm 1990).

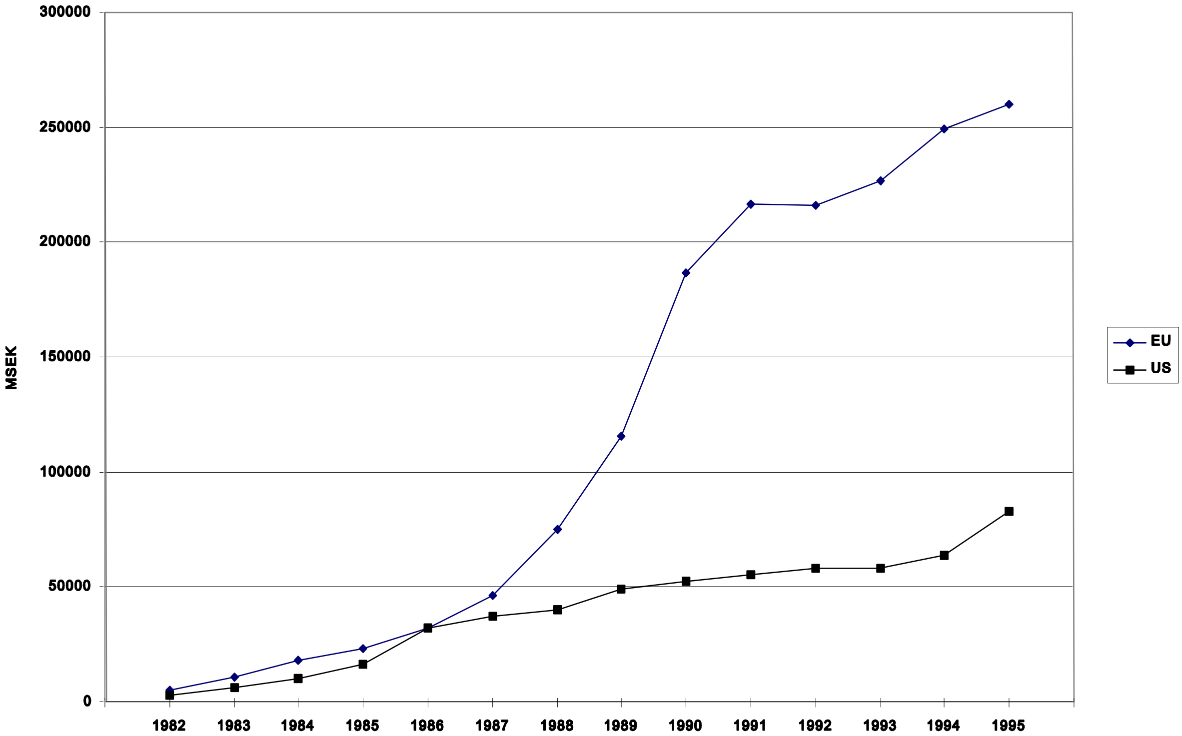
As far as production in Swedish multinationals is concerned, previous studies have reported a positive effect from foreign production on home country exports. In this article we have extended this relationship a little further and emphasized the relationship between domestic investment and FDI. We found strong substitutability between investment abroad and at home in the Schumpeter industries when the analysis was confined to the EU region, i.e. the core economic area for the Swedish multinational corporations. The opposite pattern seems to occur when the countries outside the EU are taken into account. The results suggest that the institutional change, represented by the internal market program in Europe, encouraged Swedish foreign direct investment in the European Union. Further, the implications for home country investment differ - and are robust - as regards the Schumpeter and Heckscher-Ohlin industries.

From a financial point of view the existence of a substitutionary relationship has often been claimed, since home country investment tends to compete with FDI for scarce funds in terms of retained corporate earnings. However, although there are budget restrictions, we may argue that in a world characterized by close-to-perfect financial integration the financial argument should be of minor importance. In the case of Sweden, evidence exists that the Swedish financial markets were already de facto integrated when the internal market program was first presented (Oxelheim 1996). Furthermore, if such budget restrictions do exist, it still has to be explained why they differ systematically between industries, as our result seem to suggest.

Even though the results support our hypotheses, more research needs to be carried out regarding the extent to which the results are driven by factors related to proximity, such as closeness to customers, long-run commitment etc., or a fear of a future Fortress Europe. What this study emphasizes is the need to disaggregate the analysis to the industry level, if we are to understand the home country effects of FDI. Neglecting such differences in the pattern of FDI between industries may lead to wrong policy conclusions. A positive relationship on the aggregate level between FDI and home country investment, might suggest a policy differing from the one called for by the underlying negative relationship in the Schumpeter industries.

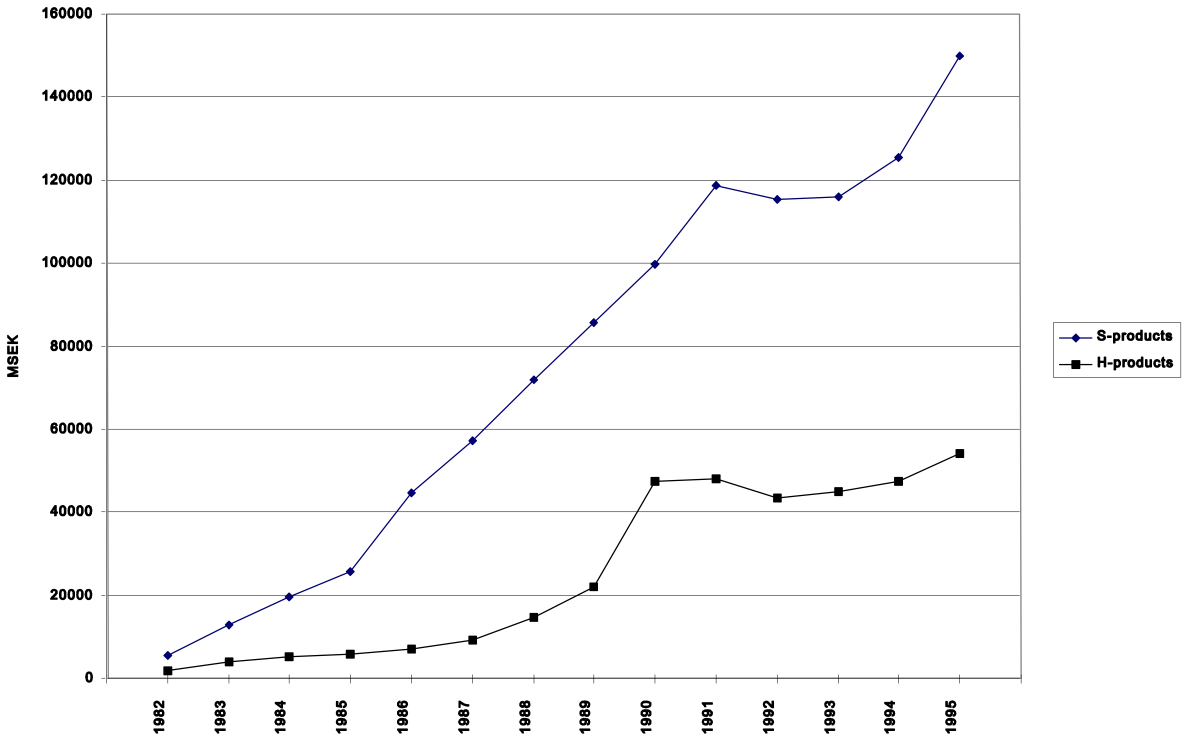
Although we believe FDI to be a necessary condition for firms to expand and increase their market shares, a substitutionary relationship may be a signal that the home country is losing in attractiveness relative to other countries. This may originate in micro-oriented or macrooriented factors. Further, in a dynamic perspective a relative change in the industrial structure whereby the share of the Schumpeter industries declines, implies that over time there will be an increase in the likelihood of a positive relationship between FDI and home country investment on the aggregate level. Any erosion in knowledge or skill today may be extremely hard to reverse later, especially if the future location of firms is governed by already existing clusters, for example, to take advantage of R&D spillovers. Hence, a shift may have irreversible long-term effects on production structure, growth and welfare.

Figure 1. Accumulated Swedish foreign direct investment (FDI) in the European Union and the United States, 1982-1995
Deflated by the GDP implicit price index (1991=100), annual data.



Sources: Based on data from the Swedish Central Bank (FDI) and Statistics Sweden (implicit price index).

Figure 2. Accumulated total foreign direct investment (FDI) in the Schumpeter-industry and the Heckscher-Ohlin-industry, 1982-1995
Deflated by the GDP implicit price index (1991=100), annual data.



Note: Schumpeter (S) denotes knowledge-intensive industries, and Heckscher-Ohlin (H) refers to basic industries.

Sources: Based on data from the Swedish Central Bank, *Database*, (FDI) and Statistical Bureau, *Statistics* Sweden (implicit price index).

Table 1. Research and Development Expenses in Swedish Multinationals, 1986, 1990 and 1994
R&D expenses as percentage of turnover

Industries	ISIC code	1986	1990	1994
Food, beverages and tobacco	31	0.7	0.3	0.6
Textiles, wearing apparel and leather	32	0.1	0.9	0.9
Wood and wood products	33	1.9	0.3	2.2
Paper and pulp	34	0.7	0.9	0.9
Chemicals	35	6.7	6.8	9.2
Non-metallic mineral products	36	1.0	0.5	0.5
Basic metal industries	37	0.2	0.8	0.7
Fabricated metal products, machinery and equipment	38	4.5	5.1	5.4

Source: IUI databases on MNCs.

Table 2. Results of OLS-regression of FDI by Swedish manufacturing firms on domestic investment distributed on regions and industries, 1982-1995

(Real prices 1995=100)

	Dependent variable=percentage change in domestic investment by Swedish manufacturing industries
Explanatory variables	
Intercept	3.68 (1.19)
FDI by the Schumpeter industry in the EU	-.16* (-1.70)
FDI by the Schumpeter industry outside the EU	.05 (1.38)
FDI by the Heckscher-Ohlin industry in the EU	.05 (1.30)
FDI by the Heckscher-Ohlin industry outside EU	-.06 (-1.22)
FDI by the Other industry in the EU	.01 (.63)
FDI by the Other industry outside the EU	-.001 (-.04)
Real exchange rate	.12 (.19)
Adj R^2	0.29
F-value	2.02*
No of observations	36
DF	21

Note: t-values in parenthesis,*** P<0.01; **P<0.05; *P<0.10. Time and interaction dummies for the period 1992-94 for the respective industry and region are not shown.

Table 3. Differences in the effect of FDI on home country investments across industries and regions (Schumpeter industries used as benchmark).

	Industry interaction dummies, EU	Industry interaction dummies, rest of the world
Heckscher-Ohlin industries	.21** (2.11)	-.11* (-1.82)
Other industries	.17* (1.79)	-.06 (-1.26)

Note: t-values in parenthesis,*** P<0.01; **P<0.05; *P<0.10.

Table 4. Results of ITSUR- and OLS-regressions of FDI by Swedish manufacturing firms on domestic investment, distributed on regions and industries, 1982-1995 (Real prices 1995=100)

Explanatory variables	**Schumpeter-industry**		**Heckscher-Ohlin industry**		**Other industry**	
	ITSUR	OLS	ITSUR	OLS	ITSUR	OLS
Intercept	2.93 (.67)	1.28 (.28)	-.08 (-.01)	1.22 (.27)	-.89 (-.27)	.514 (.12)
FDI in EU	-.003*** (-3.20)	.002 (.39)	.01 (1.36)	.029** (2.08)	.014*** (6.44)	.003 (.31)
FDI in rest of the world	.01*** (3.54)	.015 (1.43)	.01*** (3.54)	.015 (1.43)	.01*** (3.54)	.015 (1.43)
Dummy for 1995	23.39* (2.02)	19.05 (1.66)	89.59*** (7.99)	70.59*** (4.36)	23.39* (2.02)	19.05 (1.66)
Haessel's[1] R^2	.11		.55		.42	
Berndt's[1] R^2	.99		.99		.99	
Adj. R^2		.40		.40		.40
Observations	39	39	39	39	39	39

Note: t-values in parenthesis,*** P<0.01; **P<0.05; *P<0.10.

[1]See Haessel (1978) and Berndt and Khaled (1979)

Appendix 1 - Definitions of FDI and Statistical Problems

A direct investment implies a permanent relationship between the investor and the object of investment. According to the IMF (1993) definition of a foreign direct investment, the aim is to "acquire a lasting interest in an enterprise operating in an economy other than that of the investor, the investor's purpose being to have an effective voice in the management of the enterprise". The criterion "to have an effective voice" means in the case of Sweden a minimum 10% ownership in the invested object.

Moreover, some general statistical problems have to be clarified. The first issue concerns how FDI is registered. Two major alternatives are commonly found: one classifying the FDI according to the industry to which the investor belongs, the other classifying the FDI according to the industry to which the investment belongs. Hence, a real estate investment abroad by an engineering company may be labeled engineering investment or real estate investment, implying difficulties in efforts to sort out the reaction on domestic manufacturing industries. Classification by investing industry is the most frequently used principle and classification by investment industry is mostly used only as additional information. Here we have reported FDI by investing industry. A second issue regards the distinction between net and gross figures, where the net figures capture divestment in excess of the gross figures. The figures used in the article are net figures.

A third issue concerns how to treat reinvested earnings. In the late 1980s, most countries started to conduct surveys to estimate the size of reinvested earnings as a part of FDI. However, in general, the surveys covered only total FDI and provided no statements about how these earnings were distributed between sectors and host countries. Hence, we have had to use FDI data exclusive of reinvested earnings.

Finally, we are confronted with the problem of measuring stocks of outward FDI. In some countries these stocks are measured and reported, while for most countries they have to be constructed based on cumulative net real FDI flows. When stocks of FDI are presented in this article (Figures 1 and 2, and Tables A and B third column in Appendix 2), they are all based on accumulated flows and should be interpreted with caution.

Appendix 2 - Swedish FDI data 1982-95, disaggregated

Table A. Swedish total foreign investment in Schumpeter-industries and Heckscher-Ohlin-industries, 1982-1995
Net investment, millions of SEK

	Current prices flows		**Real (1991 prices) flows**		**Real (1991 prices) accumulated**	
Year	S-products	H-products	S-products	H-products	S-products	H-products
1982	2,833	987	5,396	1,880	5,396	1,880
1983	4,335	1,159	7,502	2,006	12,898	3,886
1984	4,148	752	6,673	1,210	19,571	5,095
1985	3,970	457	5,989	689	25,560	5,785
1986	13,502	840	19,062	1,186	44,622	6,971
1987	9,377	1,547	12,637	2,085	57,259	9,056
1988	11,587	4,514	14,664	5,713	71,923	14,768
1989	11,680	6,184	13,683	7,245	85,606	22,013
1990	13,140	23,709	14,143	25,519	99,749	47,531
1991	19,013	380	19,013	380	118,762	47,911
1992	-3,390	-4,651	-3,355	-4,603	115,407	43,309
1993	404	1,689	389	1,628	115,796	44,937
1994	10,212	2,785	9,603	2,619	125,399	47,556
1995	26,662	7,119	24,422	6,521	149,821	54,077

Note: Schumpeter (S) denotes knowledge-intensive industries, and Heckscher-Ohlin (H) refers to basic industries.
Sources: Based on data from the Swedish central bank (FDI) and Statistics Sweden (implicit price index).

Table B. Swedish foreign direct investment in the European Union in Schumpeter industries and Heckscher-Ohlin industries, 1982-1995
Net investment, millions of SEK

	Current prices flows		**Real (1991 prices) flows**		**Real (1991 prices) accumulated**	
Year	S-products	H-products	S-products	H-products	S-products	H-products
1982	1,298	502	2,472	956	2,472	956
1983	2,139	143	3,702	247	6,174	1,204
1984	2,453	189	3,946	304	10,120	1,508
1985	1,601	300	2,415	453	12,535	1,960
1986	3,496	420	4,936	593	17,471	2,553
1987	4,615	1,399	6,219	1,885	23,690	4,439
1988	7,377	4,192	9,336	5,305	33,026	9,744
1989	6,883	5,773	8,063	6,763	41,090	16,507
1990	9,941	22,906	10,700	24,654	51,789	41,161
1991	20,433	503	20,433	503	72,222	41,664
1992	-4,842	-4,772	-4,792	-4,722	67,431	36,942
1993	-159	1,888	-153	1,820	67,277	38,761
1994	5,263	2,557	4,949	2,404	72,226	41,166
1995	2,697	6,873	2,470	6,296	74,697	47,462

Note: Schumpeter (S) denotes knowledge-intensive industries, and Heckscher-Ohlin (H) refers to basic industries.
Sources: Based on data from the Swedish Central Bank, *Database*, (FDI), and the Statistical Bureau, *Statistics Sweden* (implicit price index).

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