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EVIDENCE ON DECLINING EXPORTS DUE TO OVERSEAS PRODUCTION

by
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This is a preliminary paper. Comments are welcome.

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Evidence on Declining Exports due to Overseas Production

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Abstract

Using unique data on Swedish multinationals 1974-90, this paper analyzes how production in foreign subsidiaries affects home country exports. The model, which is based on the establishment chain theory, includes all countries where the firm has sales. Special care is taken to investigate how exports from affiliates to 'third countries' influence exports from parent companies. In contrast to earlier empirical studies which have mostly found a positive or at least non-negative relationship, the effect is here demonstrated to be clearly negative. The results suggest that: (1) an increase in foreign production for local sales with $100 leads to a reduction in parent exports by $10; (2) when the affiliate produces for exports, the negative effect is as large as $44.

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1. Introduction

A characteristic feature in the world economy during the last decades is the huge increase in foreign direct investment (FDI). Multinational corporations (MNCs) have become more important in world production and trade. This phenomenon has given the question of how foreign production affects trade renewed attention. In industrialized countries, it is a common belief that FDI substitutes for exports, resulting in losses for the home countries of the MNCs. Neither theoretical nor empirical research has been able to settle the matter, however. In traditional models (cf. Caves [1982]), firms are assumed to supply a foreign market either through affiliate production within the host country, by licensing production to another firm, or by exporting from the home country. A crucial assumption is that a firm's market share in the foreign country is generally treated as given. Accordingly, production abroad simply replaces exports from the home country.

Practically all empirical studies have refuted such a substitution effect. Bergsten et al [1978], using U.S. data, maintained that there is a weak complementary effect between investments and exports up to a certain level, since most of the initial investment goes into marketing and assembly. Lipsey and Weiss [1981, 1984] concluded that production by affiliates in a country and U.S. exports to the same country are complementary. Meanwhile, exports to the country from other industrial countries were negatively affected by the presence of U.S. producing affiliates.

Blomström et al [1989], using firm-level data aggregated to industry level, found a positive causality between foreign production and home country exports. The same conclusion was also reached for changes over time; Swedish exports increased both with high initial levels of production and with large increases in production in a country. For U.S. firms, the causality was not equally clear, but the positive effect on exports dominated.

The most detailed studies have been undertaken by Swedenborg [1979, 1982]. She found a positive effect of affiliate production on Swedish exports, analyzing a part of the firm data set which is also used in this paper. In her 1982 study, she concluded that an increase in foreign production with $10 increases exports from the parent companies with $1. A complementary effect arises, because exports to the affiliates in the country increase by $1.20, while the exports to other recipients in the host country decrease by

only $0.20.

A common problem of all these studies, is that they only look at exports to countries where manufacturing affiliates have already been established. They have not taken into account what happens with exports if there is no production in a country at all. One may suspect that a firm's exports are relatively higher to countries where production is zero. A second and more interesting problem concerns how exports from foreign affiliates influence parent exports to 'third countries'. There are good reasons to believe that a strong substitution effect will arise outside the host country, as there are no exports of intermediate goods to compensate for this effect. In this article, these aspects are taken into consideration for the first time.

The paper is organized as follows. Section 2 discusses how foreign production affects exports from the home country, on both a country and a regional basis. The data base and some descriptive statistics are presented in section 3. In section 4, the models are specified and hypotheses set up. The results are presented in section 5 and the last section concludes the paper.

2. The impact of foreign investments on exports

There are many reasons why a firm establishes parts of its production abroad and becomes a MNC. The transactional approach suggests that a firm which owns firm-specific assets has an absolute advantage over its competitors (cf. Caves [1982]). Since no market exists for such assets, transaction costs and appropriability problems favor internalization by locating production abroad. Several empirical studies have confirmed that such firm-specific advantages enable firms to produce at a lower cost than local suppliers (Swedenborg [1979, 1982]).

General equilibrium theories that incorporate MNCs (Helpman and Krugman [1985]), state that the distribution of FDI across nations is determined by differences in factor endowments, i.e. firms in industrialized countries undertake FDI in less industrialized countries to exploit differences in factor costs. However, the empirical literature gives strong evidence that most of FDIs are directed to countries where the transactional and information-cost disadvantage are small, e.g. Japanese FDIs are directed to Southeast Asia (Tsurumi [1976]), Swedish firms invest in adjacent European countries and North America (Swedenborg [1979, 1982]) and French investments are

located to French ex-colonies and neighboring countries in Europe (Michalet and Delapierre [1976]) etc.

The establishment chain theory starts from a similar argument and states that localization of FDI is determined by risk reduction and uncertainty. When a firm penetrates a foreign market it does so, in the first stage, by exports. In a later stage the firm may set up a sales company and only in the last stage a manufacturing affiliate is established. If the firm wants to locate production in a host country, it needs information about the market in order to reduce risk. A certain amount of information has been acquired, if the firm already has sales on the market. Thus, the FDI decision would be affected indirectly by the trade pattern of the firm, which means that countries to which a firm already has sales should be strong candidates for FDI.[1] Empirical studies (Johansson and Vahlne [1977], Cauvisqil [1980]) give strong support to this view. If a firm has sales, but no affiliate production in a country, it is possible to replace parts of these exports with local production. Accordingly, all markets in which the firm has sales, either in the form of exports from the parent or local production, will be included in the empirical analysis when testing how foreign production affects parent exports.

If exports to a country are large enough, it may be profitable to replace them by local production in order to save transportation costs, or to avoid trade barriers. The firm may also be able to reduce costs of, e.g., information, and it will be more easy to bring the products in line with local demand requirements. The foreign market should become more accessible as the firm enhances its credibility as a reliable source of supply. As a consequence, a part of earlier exports of finished goods can be expected to be substituted by local production when an affiliate is established, while total sales on the market may well increase. However, to evaluate the effects on home country exports correctly, exports to other countries than the host country must also be considered. Firms often locate manufacturing affiliates in a country in order to serve the whole region. In this case, there should be a replacement of parent exports to the rest of the region, outside the host country. When producing for exports, it is not equally obvious that the firm would achieve all of the advantages of information, credibility and transportation costs, as described above, since the firm is not directly present on the market to which it

[1] A notable exception is when a firm integrates backward to gain control of raw materials or other crucial inputs.

exports. Thus, when producing for exports, the net effect on parent exports should be more negative or less positive compared with the case of production for local sales.

One may ask why a firm should produce for export sales in a host country at all, if it should be less advantageous than producing for local sales. It might have been better to locate a manufacturing affiliate in every country in the region. This is, however, not possible, if the demand for the firm's products is not large enough in each individual country, since there is a minimum size of plant under which it is not profitable to produce. When concentrating production to one or a few plants in a region instead, the firm can benefit from economies of scale, which explain the phenomenon of serving the whole region from affiliates in one country.

In empirical analysis, three different forms of foreign production together with some alternative measures of home country exports flows are used.

NLS_{ij} = Net Local Sales. Local sales in country *j* of firm *i's* affiliates in the same country less the part of these sales which is imported from the home country. When subtracting, the affiliate's imports of all finished goods are assumed to go for sales on the local market, while imports of intermediate goods are proportionally shared between NLS and NXS.

NXS_{ij} = Net Export Sales. Export sales to other countries than *j* from firm *i's* affiliates in country *j* less the part of these sales which is imported from the home country. All exports to the home country are excluded.

NS_{ij} = Net Sales. Total sales of firm *i's* affiliates in country *j* less affiliate imports from the parent country. All sales to the home country are excluded.

By definition: $$NS_{ij} \equiv NLS_{ij} + NXS_{ij}$$

$EXP(LS)_{ij}$ = Parent exports of firm *i* to country *j* for sales in *j*. All finished goods and only intermediate goods used in production for local sales are included.

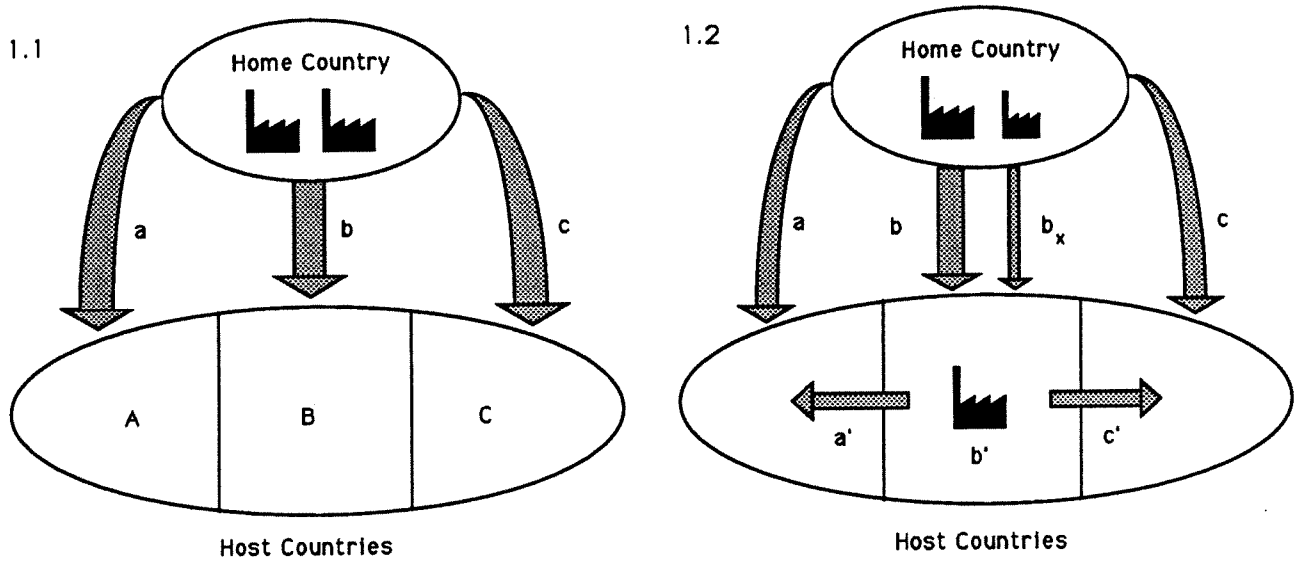
$EXP(XS)_{ij}$ = Parent exports of firm *i* to country *j* for sales in other countries than *j*. Only intermediate goods used in production for export sales are included. If the affiliate has no export sales, EXP(XS) will also be zero.

$EXP(THIRD)_{ij}$ = Parent exports of firm *i* to countries other than *j* in the rest of the region.

EXP(REG)$_i$ = Firm *i's* parent exports to the whole region.

Figure 1 shows a plausible development of a MNC over time. In the first stage the company has no foreign affiliates. The arrows, representing trade flows, indicate the exports *a*, *b* and *c* to the host countries *A*, *B* and *C*, respectively. When a manufacturing affiliate is established in country *B*, as seen in figure 1.2, trade can be affected in various ways. Firstly, what is produced in country *B* for local sales (NLS), i.e. *b'*, can be expected to replace a substantial part of the exports of finished goods that previously went to the host country. Secondly, there will be a complementary effect, as more production may attract intermediate goods from the home country. If the former is the stronger, *b* (EXP(LS)) will decline.

Figure 1. ***Influences of FDIs on trade.***



The rest of the production in *B* will be exported to countries, *A* and *C*, in the same region (NXS), i.e. *a'* and *c'*. If there is any substitution effect, it should arise on parent exports to *A* and *C* (EXP(THIRD)). It is highly likely that affiliate exports compete with home country exports and, therefore, that *a* and *c* should decline as seen in figure 1.2.[2] No such effect has been considered in previous empirical studies, however. There are no exports of intermediate goods to a 'third country', to counteract the affiliate export replacement, unless other affiliates are located in these countries. The production for

[2] If there are no third country exports from *B* to *A* and *C*, then, of course, *a* and *c* will be unaffected.

export sales, will attract some imports of intermediate goods to B (EXP(XS)), i.e. b_x should increase.

The models included in this paper are the following:

Model (I): Here it is tested how NLS influence EXP(LS) on a country basis, i.e. how b' affects b.

Model (II): The impact of NXS on exports from the parent to the neighboring countries is examined, i.e. the impact of $a'+c'$ on $a+c+b_x$. Two variants of this model will be estimated: model (IIx) tests how $a'+c'$ influence $a+c$ and model (IIy) checks if $a'+c'$ attract some intermediate goods to country B, i.e. b_x. The sum of both these effects is the net effect of model (II), which is expected to be more negative or less positive than the net effect in model (I).

Model (III): This model analyzes if net sales (NS) from the affiliates in a country substitute for exports to the whole region, EXP(REG), i.e. if $a'+b'+c'$ affect $a+b+b_x+$c. The effect is expected to lie somewhere between the effects in model (I) and (II).

3. The data base and descriptive statistics

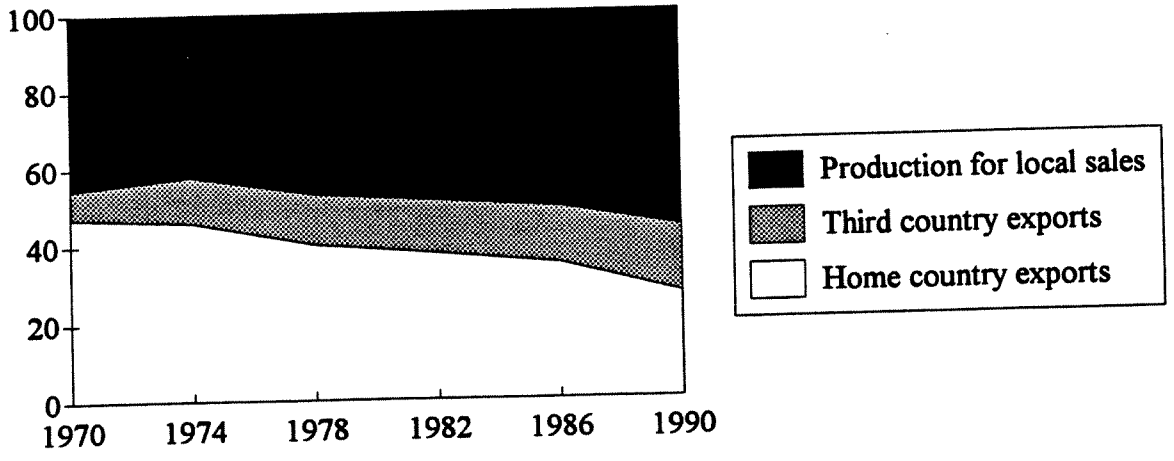
The data base on Swedish MNCs used in the empirical analysis has been collected by the Industrial Institute for Economic and Social Research (IUI) in Stockholm and covers six years (1965, 1970, 1974, 1978, 1986 and 1990). This is amongst the best available data bases on multinationals, since all majority-owned producing affiliates located abroad are included, which enables us to study foreign production at firm-level in each country. Trade statistics, especially exports from the Swedish part of the MNC, exports from the foreign affiliates and intra-firm trade are closely detailed. For the surveys included in the empirical analysis[3], we have data on exports to almost all developed countries, but only to a few developing countries. MNCs which only have manufacturing affiliates in one host country have been excluded to avoid the possibility that small MNCs will dominate

[3] Exports from Sweden are measured consistently only since 1974. The surveys of 1965 and 1970 have therefore been excluded in our analysis.

the results. Furthermore, such small MNCs often have an incomplete answer frequency according to export figures, which may bias the results.

- Model (I) will be biased towards industrialized countries, but this is not a cause of great concern, since 87% of the exports and 98% of the foreign production of Swedish MNCs are directed to the countries included in the model. As mentioned in section 2, every time the firm has sales on a foreign market, it is included once - whether the firm has production there or not.
- When testing hypotheses in models (II) & (III) on a regional basis, only the EC is analyzed, for two reasons. First, exports from affiliates to neighboring countries mainly take place in the industrialized world, especially within the EC, as can be seen in Figure 3 below.[4] Second, we need a geographically and economically integrated region, which is also relatively homogeneous. Unfortunately, we do not have data on exports from foreign subsidiaries to specific countries other than the parent country. It is assumed that the rest of the export sales are directed to the rest of the region, i.e., in this case to the other EC-countries. In model (II), when the firm has any sales in the rest of the region, outside the host country, the firm is included once. In model (III), the criteria is the

Figure 2. ***Breakdown of foreign sales by home country exports, third country exports and production for local sales 1970-90. Per cent. Discrete points in time.***



Source: IUI data base.

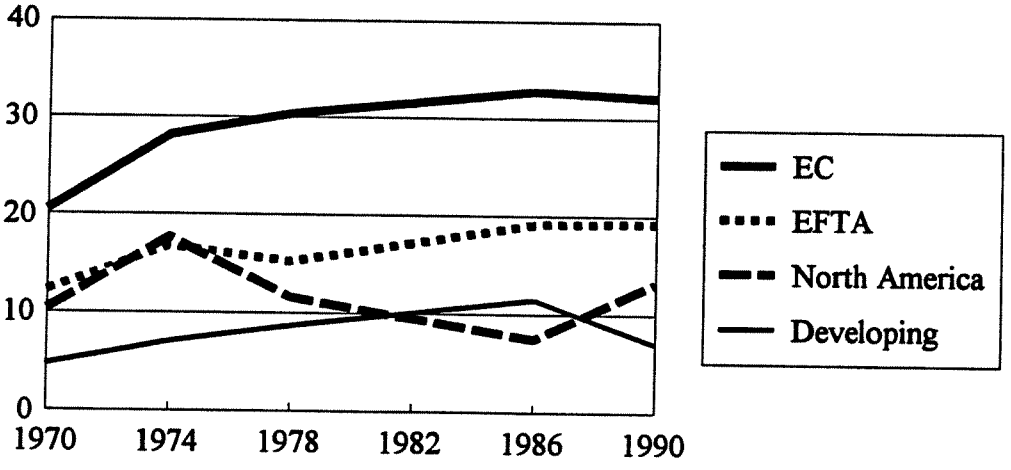
[4] According to the product-cycle-theory (Vernon [1966]), one could expect that affiliates' exports to third countries should be especially high from developing countries, where factor prices are low. In contrast to MNCs from the U.S. and Japan, however, Swedish MNCs have not used off-shore production to any greater extent.

same as in model (I).

There is a clear trend over time that Swedish MNCs have a higher propensity to support their foreign markets through production abroad, as shown in figure 2 above. Exports from Sweden accounted for 47% of total foreign sales in 1970 and have fallen stepwise to 27% 1990. Meanwhile, exports from foreign manufacturing affiliates have more than doubled their share of foreign sales. In absolute terms, fixed prices, this means that foreign production for local sales and exports is three times and six times higher, respectively, in 1990 than in 1970. On the other hand, home country exports have only doubled in real terms. This suggests that Swedish MNCs have shifted their exports from Sweden towards affiliates' exports from abroad or, at least, MNCs' exports from Sweden have become relatively less important.

Figure 3 clearly shows that net export sales as a percentage of net sales varies across regions. In the EC-countries, the share has been large throughout and there has been some growth both in the EC and EFTA.[5] In North America and developing countries, affiliates' exports have always been fairly limited.[6] This indicates that third

Figure 3. ***Net export sales as a percentage of net sales in foreign affiliates across regions 1970-90. Discrete points in time.***



Source: IUI data base.

[5] Members of the EC and EFTA in 1990, are included in the same region all years, in order to obtain statistics over time which are consistent.

[6] Not surprisingly, the share of Latin America is very small. Here, each country is a separate market due to high tariff barriers between the countries in the region. North America only consists of two countries, which may explain the low level.

country exports, as a way to supply foreign markets, have become more important and have had a larger extent when the whole region is integrated as a market.

4. Econometric specification and hypotheses for empirical testing.

The endogenous variables are foreign production (FQ_{ijt}) and exports from the parent country (EXP_{ijt}).[7] The following specification is only valid for models (I), (IIx) and (III). Model (IIy) will be discussed later. These models are characterized by simultaneity, since the FDI-decision is partly determined by the trade pattern of the firm. Only equation (2) will be estimated, since we want to focus on the effects of foreign production on exports. The model is a variant of 2SLS with limited endogenous variables outlined in Nelson and Olson [1978] and is specified as:[8]

$$FQ^{*}_{ijt} = \alpha_0 + \alpha_1 EXP_{ijt} + Z_1'\alpha + \mu_{ijt} \qquad \textbf{(1a)}$$

$$FQ_{ijt} = \begin{cases} FQ^{*}_{ijt} & \text{if } FQ^{*}_{ijt} > 0 \\ 0 & \text{if } FQ^{*}_{ijt} \leq 0 \end{cases} \qquad \textbf{(1b)}$$

$$EXP_{ijt} = \beta_0 + \beta_1 FQ^{*}_{ijt} + Z_2'\beta + \epsilon_{ijt} \qquad \textbf{(2)}$$

Here, the Z's correspond to either attributes of the MNC (i) or attributes of the host country (j). The first endogenous variable, FQ, is characterized by a large share of zeroes (about 50%). It is assumed here that when it takes on non-zero values it is normally distributed. In the first stage of 2SLS, the reduced form of equation (1) is estimated by

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[7] In models (I), (IIx) and (III), FQ is replaced by NLS, NXS and NS, and EXP by EXP(LS), EXP(THIRD) and EXP(REG), respectively, as mentioned in section (2).

[8] Preferably, equation (2), in the simultaneously system, should be specified as:

$$EXP_{ijt} = \beta_0 + \beta_1 NLS^{*}_{ijt} + \beta_2 NIS^{*}_{ijt} + Z'_2\beta + \epsilon_{ijt} \qquad (2')$$

Here, EXP are firm *i's* parent exports to country *j* and NIS represent firm *i's* exports from 'third countries' to country *j*. Thus, it would be a nice uniting of model (I) & (IIx). This is, however, not possible, since the data base does not show to which countries an affiliate's exports are directed.

means of the 'Tobit model' via maximum likelihood procedures, in order to create an instrument for FQ. The second endogenous variable, EXP, also includes zeroes (1-2%), but there are no concentration of observations at the lower limit. Multiple regression is the appropriate statistical technique to estimate the structural form of equation (2) in the second stage of 2SLS. The latent variable, FQ*, can be interpreted as an index of production, of which EXP will be a function. The residuals are assumed to have the desired properties: $\epsilon \sim N(0,\sigma_\epsilon^2)$, $\mu \sim N(0,\sigma_\mu^2)$ and $E(\epsilon_{ijs}\epsilon_{ijt})=0$ and $E(\mu_{ijs}\mu_{ijt})=0$ for $s \neq t$. However, $E(\epsilon_{ijt}\mu_{ijt}) \neq 0$, since simultaneity is present. The estimation technique yields consistent parameter estimates as the sample size gets arbitrarily large, but the standard errors of the parameter estimates will be underestimated. In order to avoid this, the asymptotic variance-covariance-matrix is derived and the standard errors are recalculated according to Amemiya [1979].

It should be emphasized that it is important to include countries where production is zero in these models. Otherwise, the parameter estimates will be biased and inconsistent. Difficulties would also arise in the interpretation of what would have happened to exports if a firm had not had any production in a country. When estimating model (IIy), however, only countries where the firm has any production for exports are included. If NXS equal zero, home country exports of intermediate goods for use in production for exports, will also be zero and there will be no simultaneity present. Thus, only an export-equation will be estimated by means of OLS:

$$EXP(XS)_{ijt} = \gamma_0 + \gamma_1 NXS_{ijt} + Z_3'\gamma + \eta_{ijt} \qquad (3)$$

where EXP(XS) is a function of NXS and Z's. The residuals are assumed to have the desired properties; $\eta \sim N(0,\sigma_\eta^2)$ and $E(\eta_{ijs}\eta_{ijt})=0$ for $s \neq t$.

In all of the models, the endogenous variables are weighted with the inverse size of the firm, since one should expect both production and exports to be increasing in firm size.[9] Thus, FQ and EXP measure firm *i*'s propensities to produce in, and to export to country *j* (region as alternative), respectively. Furthermore, all variables are expressed in logarithmic form in order to obtain elasticities, which will make it easier to calculate the effect of β_1 and γ_1 in dollars. A problem emerges, however, when we take the

[9] The size of the firm is measured as the turnover of the whole MNC.

logarithm of a zero. To get round this, such observations are given an arbitrarily small number.[10]

Among the exogenous variables, factors have been included which are expected to influence both foreign production and exports from the home country. These are characteristics of firms, industries, and countries, which we want to make use of to explain the variation in propensities to export and to produce abroad.[11] Most of the variables are known from earlier related studies, especially Swedenborg [1979, 1982]. In the end of this section, Table 1 enumerates the exogenous variables included in each model.

According to the transactional approach to MNCs, one would expect the existence of firm-specific advantages to create absolute advantages vis-à-vis competitors. In the model we use R&D-intensity (RD_{it}), here measured as total R&D expenditures divided by the size of the firm, and the average wage (LS_{it}) in the home country part of the MNC, as measures for firm-specific advantages. The former is expected to reflect the knowledge stock of the firm and the latter to be correlated with the human capital within the company. Thus, both RD and LS should exert a positive impact on the propensities to export and produce abroad.

Firms, which are dependent on natural resources in Sweden, are supposed to be more willing to export rather than produce abroad. For that reason we include a dummy variable (NR_{it}) taking the value one for the pulp & paper, and iron & steel industries, and zero otherwise. This is the only industry dummy which can be expected, a priori, to affect the location of production. If operations within a firm are characterized by economies of scale (SC_{it}), it should be advantageous to concentrate production to a few, larger units of production. SC, here measured as the average production in the foreign subsidiaries[12], is expected to have a positive influence on foreign production - especially production for export sales.. This is logical if the MNC originates from a small economy

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[10] The number is smaller than the smallest non-zero observation, but greater than the accuracy of the computer. Some experiments were done with different arbitrarily numbers, but this only affected the results marginally.

[11] It should be noted that equation (1) can not be estimated in the form of a production function. If affiliate production in a country is zero, labor and capital are zero as well.

[12] This definition is done under the assumption that each subsidiary is operating at the optimal level of scale.

like Sweden, where ddomestic demand is limited.

There are also some country variables included in the model. The greater the size of the host country (GDP_{jt}), the more exports as well as FDIs should be attracted, meaning that the coefficients for GDP are expected to be positive in both equations. Regarding production for exports, this variable is also an indicator of economies of scale, which should strengthen its effect. The income level of the host country, measured as GDP per capita ($GDPCAP_{jt}$), will influence exports and foreign production in two ways. First, high incomes mean high demand, which should have a positive effect in both equations. Second, one may expect income to be strongly correlated with the wage level, which would stimulate exports rather than foreign production, unless differences in wage levels across countries reflect differences in labor productivity. The effect on exports is clearly positive, but the impact on foreign production is ambiguous and depends on which of the two mentioned factors above is strongest. However, only the second effect is assumed to have any significance when producing for exports, since demand in the host country does not affect products which are exported to other countries.

An index measuring the host country trade policy used in Wheeler and Mody [1992] has been included ($OPEN_{jt}$).[13] This index will take on a higher value the more open the host country economy is. High openness is hypothesized to encourage exports at the expense of production within the host country. Another index from Nordström [1991] measuring the physical distance from Sweden ($DIST_{jt}$), tries to capture 'How difficult it is to do business with a paricularly country' from the Swedish point of view. The higher the value of DIST, the longer is the distance from Sweden and this should imply a lower propensity to produce in, and especially to export to the host country.[14]

By including dummy variables, it is possible to examine if there are any shifts in the level of the endogenous variables over time or between regions. We will also check if there are any industry-specific fixed effects which may explain the variation between

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[13] The index includes limits on foreign ownership and government requirements that a certain percentage or specific type of local components be used when setting up manufacturing operations.

[14] This variable takes both geographical as well as cultural and linguistic distance into account. The former effect should favor production relative to exports to avoid the high costs of shipping exports over long distances, but the latter two should exert a negative impact on both of them according to the transactional approach. In practice, this means the following ranking: Nordic countries, other North European countries, North America, South European countries, other industrialized countries, and, finally, Latin America.

Table 1. ***Survey of variables included in respective model.***

Variables		Model (I)	Model (IIx)	Model (IIy)	Model (III)
Endogenous	Production	NLS	NXS	NXS	NS
Exogenous	Exports	EXP(LS)	EXP(THIRD)	EXP(XS)	EXP(REG)
RD		q(+) x(+)	q(+) x(+)	x(+)	q(+) x(+)
LS		q(+) x(+)	q(+) x(+)	x(+)	q(+) x(+)
NR		q(-) x(+)	q(-) x(+)	x(+)	q(-) x(+)
SC		q(+)	q(+)		q(+)
GDP		q(+) x(+)	q(+)	x(+)	q(+)
GDPCAP		q(?) x(+)	q(-)	x(+)	q(?)
OPEN		q(-) x(+)			
DIST		q(-) x(-)			

A 'q' indicates that the variable is included in equation (1) and a 'x' in equation (2). The signs in the parentheses show the expected impact. In model (IIx) and (III), GDP and GDPCAP for the whole region, respectively, the rest of the region, are excluded in equation (2), since multicollinearity arises together with the time dummies. However, GDP and GDPCAP in the host country, where the production is located, are withtaken in equation (1).

firms, which is done by assigning dummies for different industries.[15] Furthermore, our main parameter, β_1, may shift over time or across regions. This will be tested through interaction dummies.

5. Results of the estimations.

In all models, two variants were run, one without (a) and another with (b) industry dummies. Experiments were undertaken with firm-specific fixed effects included, but

[15] The industries, which are assigned dummies are: food, textile, chemical, metal, machinery, electronics and transport. The iron & steel and paper & pulp industries have already got a dummy in the variable NR.

these resulted in multicollinearity between the firm dummies and the firm variables, RD, LS and NR.[16] The F-values are satisfactorily high in all models except (IIy), but R^2, adjusted for degrees of freedoms, are relatively low. The latter is partly due to the fact that the endogenous variables are measured as propensities and not as absolute values.

Model (I)

The resulting estimates are given in Table 2 below. In model (I-a), all exogenous variables except GDPCAP have the expected sign and are significant at the 5%-level. This is consistent with results in the earlier literature. However, when including industry dummies, in model (I-b), besides GDPCAP, RD was also insignificant. The parameter estimates and t-values are stable across the runs, and the industry dummies do not appear to make any major difference.

Turning next to our main variable NLS, an increase in foreign production clearly exerts a negative impact on home country exports, confirming our hypothesis of a substitution effect. The coefficient is significant at the 1%-level, also when industry dummies are included. The results contradict earlier empirical studies and suggest that a firm's home country exports are relatively larger to countries, where the firm has less or no production.

How large is the effect of an increase in foreign production on exports in dollars? It is possible to calculate the effect around the means of NLS and EXP(LS), since the coefficients equal elasticities in this logarithmic model. When foreign production in a certain country increases with \$100 in model (I-b), the exports to the same country decrease with \$10.2, with a 95% confidence interval of $\pm$\$4.8. This net effect is negative but of moderate size as some of the substituted exports are compensated by increased exports of intermediate goods to the manufacturing affiliates in the host country. The specification of the model allows us to stretch so far as to say that parent exports are larger to a certain country if production is zero. It is not possible, however, to say anything about the total exports of a parent firm, if it had not established any foreign

[16] Multicollinearity also arose when only the largest and most experienced firms were assigned firm dummies. The firm-specific fixed effects did not seem to improve the models and were, therefore, replaced by industry dummies. When running separate OLS with firm dummies as independent variables and RD, LS and NR, respectively, as dependent variables, it was verified that the variations in the latter variables to a great extent could be explained by the firm dummies.

Table 2. ***Estimation results of model (I).***

Method	Simultaneous Tobit Model	
Dependent variable	EXP(LS)	
Explaining variables	(I-a)	(I-b)
Intercept	-13.0930 ***	-14.2854 ***
	(-5.88)	(-6.40)
NLS*	-0.0800 ***	-0.1038 ***
	(-3.12)	(-4.22)
RD	0.0737 **	0.0428
	(2.31)	(1.50)
LS	0.5822 ***	0.6645 **
	(2.06)	(2.43)
NR	0.3349 **	0.3606 **
	(2.18)	(2.21)
GDP	0.8358 ***	0.9094 ***
	(8.27)	(8.11)
GDPCAP	-0.0948	-0.0793
	(-0.43)	(-0.41)
OPEN	0.1855 ***	0.2089 ***
	(2.98)	(2.91)
DIST	-0.6939 ***	-0.7458 ***
	(-8.43)	(-7.48)
F-value	53.24	42.15
R^2	0.24	0.27
DF	2416	2409

All variables are in logarithmic form. The numbers in parenthesis are t-statistics. Levels of significance are ***, ** and * significant at 1, 5 and 10 per cent respectively. Dummies for time and regions in both runs and for industries in the last one are not shown.

production abroad at all.

By using interaction dummies, we also verified that the parameter estimate of NLS was stable over time. All dummies were insignificant and the recalculated values

for each period are depicted at the top of Table 5 in appendix. Another separate run showed, however, that the parameter estimate was not stable across all regions. The recalculated estimates of the coefficient show that the replacement of exports in North America is at a lower level and is hardly significant, while the substitution effect is the strongest in EFTA, Latin America and other countries.

Model (II)

As discussed in section 3, we now focus on production in the EC.[17] The effect of affiliates' exports on home country exports is estimated in two separate sub-models. As model (IIx) in Table 3 shows, there is, as expected, a strong negative effect in the rest of the region when the affiliates in a country produce for exports. The coefficient of NXS^* is significant at the 5%-level in both runs. The gross substitution effect is, in fact, as large as \$53, if the affiliates increase production for exports with \$100 (model IIx-b). This negative effect of affiliates' exports on parent exports to 'third countries' has not been analyzed in earlier studies. Referring to the estimates of the interaction dummies in Table 6 in appendix, the coefficient of NXS is stable for the years 1978-90, but in the first time period, 1974, it is positive.

Production for export sales to third countries may also attract imports of intermediate goods to the host country, where production is located. If there is any variable which affects this form of home country exports, it should be NXS. This is also verified in the results and the coefficient of NXS is significant on the 1%-level. The complementary effect is estimated to \$9. The total effect of increasing affiliates' exports with \$100 is then the sum of these two effects: -\$53 + \$9 = -\$44. As hypothesized in section 2, this net effect is more negative than in model (I). The coefficients of the exogenous variables they all significant on the 5%-level in model (IIx), but only RD and NR are significant in model (IIy). The industry dummies have some influence on the parameter estimates, but the effect on the t-values is limited.

[17] Luxembourg has been excluded all years and Ireland was only included 1990 due to lack of data. Greece, Portugal and Spain were not included in 1974 and 1978, when they were not members in the EC.

Table 3. *Estimation results of model (II).*

Method	Simultaneous Tobit Model		OLS	
Dependent variable	EXP(THIRD)		EXP(XS)	
Explaining variables	(IIx-a)	(IIx-b)	(IIy-a)	(IIy-b)
Intercept	-8.3484 ***	-8.7833 ***	-7.6555	-6.5611
	(-4.90)	(-5.18)	(-0.77)	(-0.67)
NXS*	-0.0319 **	-0.0315 **	---	---
	(-2.00)	(-2.09)		
NXS	---	---	0.3465 ***	0.4135 ***
			(2.91)	(3.51)
RD	0.1159 ***	0.0809 **	0.2743 **	0.2543 **
	(3.34)	(2.18)	(2.23)	(2.17)
LS	1.2369 ***	1.2276 ***	1.6310	1.3742
	(3.09)	(3.04)	(1.35)	(1.11)
NR	1.3378 ***	1.5825 ***	3.0532 ***	3.9959 ***
	(5.82)	(6.32)	(3.98)	(4.84)
GDP	---	---	0.0375	0.0432
			(0.16)	(0.19)
GDPCAP	---	---	-0.8461	-0.7967
			(-1.01)	(-0.98)
F-value	15.02	11.00	4.13	5.56
R^2	0.09	0.10	0.09	0.13
DF	1042	1035	402	395

All variables are in logarithmic form. The numbers in parenthesis are t-statistics. Levels of significance are ***, ** and * significant at 1, 5 and 10 per cent respectively. Dummies for time in all runs and for industries in model (IIx-b) and (IIy-b) are not shown.

Model (III)

The results of estimating model (III), which in reality is a fusion of models (I) and (II), are displayed in Table 4 below. The model provides strong evidence that exports to the region from the parent decline when affiliates in a certain country produce for sales to

the whole region. The coefficients of NS are significantly different from zero on the 5%-level in both runs. Recalculated in dollars in model (III-b), this means that an increase of \$100 in net sales reduces exports by \$22.5 (±16.5). This figure is consistent with the results in model (I) and (II), since the effect of NS on exports according to these estimates should be 0.69*(-)\$10.2 + 0.31*(-)\$44 = -\$20.6. Here, the weights refer to that, on average, 69 per cent of net sales are local sales and 31 per cent are exported. Just as in model (IIx), the coefficient of NS is reasonably stable for the years 1978-90, but in the first time period, 1974, it is insignificant. Finally, the coefficients of all exogenous variables have the expected sign and are mostly significant on the 1%-level.

Table 4. ***Estimation results of model (III).***

Method	Simultaneous Tobit Model	
Dependent variable	EXP(REG)	
Explaining variables	(III-a)	(III-b)
Intercept	-5.7205 ***	-5.7849 ***
	(-5.71)	(-5.97)
NS	-0.0330 **	-0.0383 ***
	(-2.19)	(-2.75)
RD	0.0604 ***	0.0413 *
	(3.12)	(1.91)
LS	0.7171 ***	0.6969 ***
	(3.06)	(3.02)
NR	1.2732 ***	1.1948 ***
	(10.45)	(8.42)
F-value	22.95	22.57
R^2	0.13	0.22
DF	1065	1058

All variables are in logarithmic form. The numbers in parenthesis are t-statistics. Levels of significance are ***, ** and * significant at 1, 5 and 10 per cent respectively. Dummies for time in both runs and for industries in the last one are not shown.

6. Conclusions

The results give strong evidence for a negative net effect of production abroad on exports from a parent company. Increased production in affiliates is not able to attract enough intermediate goods from the parent to compensate for the substitution of finished goods. The model, which includes all countries where firms have sales, shows that exports are larger to countries where production in affiliates is small or zero. When considering the EC, it is verified that affiliates' exports create a particularly strong substitution effect in 'third countries'. It is true that intermediate goods are imported from the parent also in this case, but this effect is, however, small relative to the former, negative effect. The size of this replacement can not be taken lightly, since as much as 31 per cent of the production in affiliates of Swedish MNCs in the EC is exported to neighboring countries. Previous empirical studies have not taken the latter phenomenon into account and have only considered countries where affiliates have production, which is likely to explain the fact that only positive or non-negative causalities have been found.

The negative net effect is convincingly stable for the years 1978-90. 1974, it is significant only for production for local sales. One explanation may be that firms have changed their strategy when investing abroad, e.g., investing abroad was in the beginning of the 1970's a way to complement home country exports. It should be kept in mind, however, that the replacement is only an effect on the margin. At the end of the 1980's, Swedish FDI increased substantially. Consequently, the absolute effect on home country exports should then have been much larger than before.

The results also indicate that by organizing more production in foreign subsidiaries, firms are able to increase their total sales on foreign markets. This is logical, since firms should be expected to do what is best for themselves. Although no welfare-analysis has been undertaken in this study, it is obvious that negative effects on home country exports may be unfavorable for social welfare in that economy as well. That is, what is good for firms is not necessarily good for their home country.

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Appendix

Table 5. ***Parameter estimates of NLS when including interaction dummies.***

	NLS	t-statistics
1974	-0.0765 ***	-3.53
1978	-0.0897 ***	-4.01
1986	-0.1065 ***	-4.67
1990	-0.1122 ***	-4.80
EC	-0.0979 ***	-3.47
EFTA	-0.1254 ***	-4.70
North America	-0.0558 *	-1.77
Latin America	-0.1240 ***	-3.51
Other	-0.1292 ***	-5.02

Here, 'other' countries include Australia, New Zealand, South Africa, Japan and India.

Table 6. ***Parameter estimates of NXS when including interaction dummies.***

	NXS	t-statistics
1974	0.0288	1.49
1978	-0.0296 *	-1.75
1986	-0.0534 **	-2.48
1990	-0.0402 **	-2.03

Table 7. ***Parameter estimates of NS when including interaction dummies.***

	NS	t-statistics
1974	0.0068	0.23
1978	-0.0508 **	-2.18
1986	-0.0710 ***	-3.60
1990	-0.0407 **	-2.18