Production in Foreign Affiliates

Effects on home country exports and modes of entry

Roger Svensson

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Foreword

Foreign direct investment has increased significantly in the last decades with consequences for the home countries of the multinational corporations (MNCs) as well as for their host countries. The Industrial Institute for Economic and Social Research (IUI) has a long tradition in studying international investment flows and has updated its data base over Swedish MNCs about every four years since 1965.

This study is part of a larger project on the internationalization of the Swedish production system. In the two essays of this volume, Roger Svensson analyzes the effects of foreign production on parent exports of MNCs and their mode of entry when establishing new subsidiaries abroad. The first chapter demonstrates that to understand the effects of foreign subsidiary activities on exports, countries where the MNC has no affiliates must be included in the analysis. Foreign affiliates often produce for exports, with significant effects on the industrial base in the home country of the MNC.

This book has been submitted as a licentiate thesis at Gothenburg University. It is the 48th doctoral or licentiate dissertation completed at the Institute since its foundation in 1939. IUI would like to thank the thesis advisor, Professor Anders Klevmarken at Gothenburg University, for his encouragement and guidance.

Stockholm in May 1993

Gunnar Eliasson

PRODUCTION IN FOREIGN AFFILIATES - EFFECTS ON HOME COUNTRY EXPORTS AND MODES OF ENTRY

Roger Svensson

Dissertation for the degree of Licentiate of Philosophy, Gothenburg University, June, 1993.

ABSTRACT

The mode of growth of Swedish multinationals and the effects on home country exports are analyzed in this dissertation. Both studies are based on a unique data set, collected over many years by the Industrial Institute for Economic and Social Research (IUI) in Stockholm.

The effects on home country exports of production in foreign subsidiaries are studied in Chapter I. The model, which is based on the establishment chain theory, includes all countries where the firm has sales. Special care is taken to incorporate the effects of exports from affiliates to 'third countries' on 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 by $100 leads to a reduction in parent exports by $14; (2) when the affiliate produces for exports, the negative effect is as large as $42.

Chapter II examines the distribution of greenfield operations *vis-à-vis* takeovers as mode of entry for foreign direct investment. The traditional view that takeovers are less risky than greenfield operations, but have a lower expected rate of return, is replaced by the perspective that different entry modes require different skills. An estimation based on the logit method finds that relatively more organizational skill, as reflected in company size and number of affiliates, favours takeovers. On the other hand, relatively more technological skill, associated with R&D intensity, favours greenfield operations.

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Stockholm in May 1993

Roger Svensson

Contents

Chapter I

Evidence on Declining Exports Due to Overseas Production

1. Introduction

The expansion of foreign direct investment (FDI) has been a characteristic feature of the world economy during the last decades. Multinational corporations (MNCs) have become increasingly important in world production and trade. Renewed attention is also being paid to the effects of foreign production on trade. A common belief is that FDI substitutes for exports, resulting in losses for the home countries of the MNCs. However, neither theoretical nor empirical research has been able to settle the matter. 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. The firm's market share in the foreign country is in these models assumed to be given. Accordingly, production abroad simply replaces exports from the home country.

Practically all empirical studies have refuted the existence of such a substitution effect. Using U.S. data, Bergsten et al. [1978] maintained that there is a weak complementary effect between investments and exports up to a certain level, arguing that 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. manufacturing affiliates.

Blomström et al. [1988], 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 by $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 disregarded the effects on exports to countries with no subsidiary production. One may suspect that a firm's exports are relatively larger 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 chapter, these aspects are considered for the first time.

The chapter 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 chapter.

2. The impact of foreign investment 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], Gruber et al. [1967] and Bergsten et al. [1978]).

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. The empirical literature, however, gives strong evidence that most FDIs are directed to countries where the transactional and information-cost disadvantages 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 (Cauvisqil [1980]) 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 its risk. A certain amount of information has been acquired, if the firm already sells in 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 exports 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

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

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 the advantages of information, credibility and transportation costs, as described above, since the firm is not directly present in the market to which it exports. Thus, when an affiliate produces for exports, the net effect on parent exports can be expected more negative, or less positive, compared with the case of production for local sales.

One may ask why a firm would produce for export sales in a host country at all, if it is 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 there is insufficient demand for the firm's products in each individual country, since there is a minimum plant size 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. Another interesting aspect, which is not analyzed in this paper due to lack of data, is the effect of foreign investment on subcontractors. When a MNC establishes more units of production abroad, there is a possibility that subcontractors in the home country are able to raise their exports. On the other hand, there is ample empirical evidence in Sweden that domestic subcontracters are replaced by foreign ones (Braunerhjelm [1991]).

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

XF_{ij} = Parent exports of finished goods of firm *i* to country *j*. Here it is assumed that the exports of finished goods are sold on the local market and not reexported to other countries.

XIL_{ij} = Parent exports of intermediate goods of firm *i* to country *j*. Only intermediate goods used in production for local sales are included.

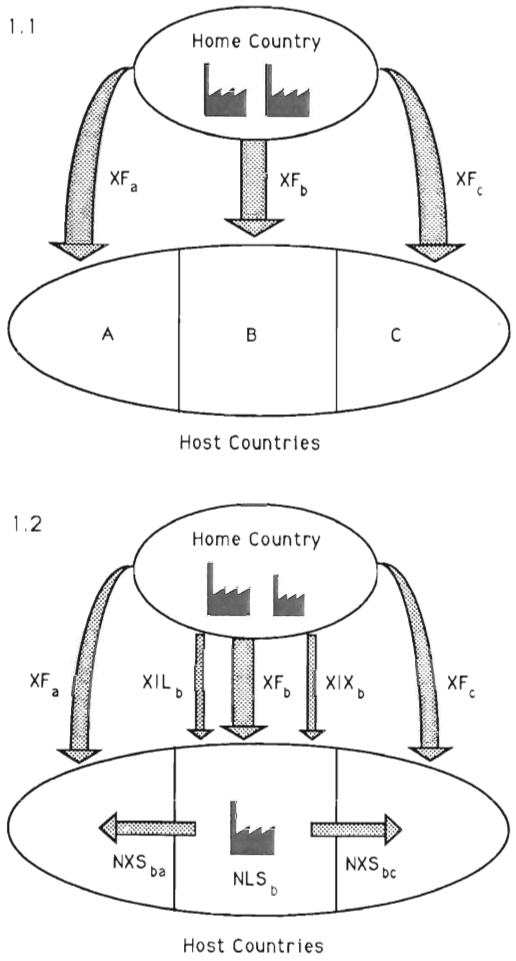
XIX_{ij} = Parent exports of firm *i* to country *j* for sales in other countries than *j*. Only intermediate goods used in production for export sales are included. If the affiliate has no export sales, *XIX* will also be zero.

XTH_{ij} = Parent exports of firm *i* to countries other than *j* in the rest of the region, i.e. to third countries..

XR_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 of finished goods, XF_a, XF_b and XF_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

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



country *B* for local sales, i.e. NLS_b, can be expected to replace a substantial part of the exports of finished goods that previously went to the host country, i.e. XF_b should decline. Secondly, there will be a complementary effect, as more production may attract intermediate goods from the home country, i.e. XIL_b should arise.

The rest of the production in *B* will be exported to countries, *A* and *C*, in the same region, i.e. NXS_{ba} and NXS_{bc}. If there is any substitution effect, it should arise on parent exports to *A* and *C*. It is highly likely that affiliate exports compete with home country exports and, therefore, that XF_a and XF_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 export sales, will attract some imports of intermediate goods to *B*, i.e. XIX_b should increase.

The models included in this paper are the following:

Model (I): Here it is tested how *NLS* influence parent exports on a country basis, i.e. how NLS_b affect XF_b+XIL_b. This model will be tested in two submodels: model (Ix) examines how NLS_b affect XF_b and model (Iy) tests if NLS_b attract any intermediate goods, XIL_b. The sum of both these effects is the net effect of model (I).

Model (II): The impact of *NXS* on exports from the parent to the neighboring countries is examined, i.e. the impact of $NXS_{ba}+NXS_{bc}$ on $XF_a+XF_c+XIX_b$. Two variants of this model will be estimated: model (IIx) tests how $NXS_{ba}+NXS_{bc}$ influence XF_a+XF_c and model (IIy) checks if $NXS_{ba}+NXS_{bc}$ attract some intermediate goods to country *B*, i.e. XIX_b. Also in this model, 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 *NS* from the affiliates in a country substitute for exports to the whole region, *XR*, i.e. if $NLS_b+NXS_{ba}+NXS_{bc}$ affect $XF_a+XF_b+XF_c+XIL_b+XIX_b$. The effect is expected to lie somewhere between the net effects in models (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

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

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. For the surveys of 1974 and 1978 there is some incomplete answer frequency according to export figures. As a consequence, many small MNCs with only one or two foreign affiliates have been excluded for these years.

-- 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.[5] 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 models (II) and

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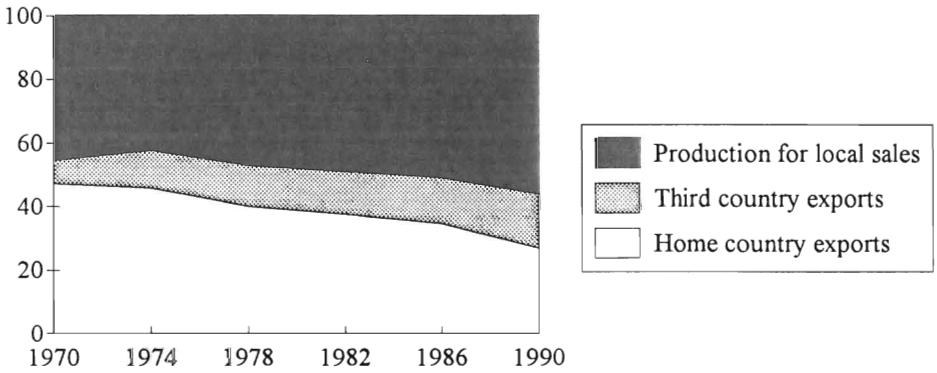
[3] Exports from Sweden are measured consistently only since 1974. The surveys of 1965 and 1970 have therefore been excluded in our analysis.

[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.

[5] One may argue that both the EC and EFTA should be included in these models, e.g., an affiliate located in an EC-country may export to EFTA or vice versa. The integration of these two regions is, however, not as comprehensive as that of the EC-countries. MNCs, which locate affiliates in the EC, generally aim at an increased market share in the Single Market, rather than exports to countries outside the EC.

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



Source: IUI data base.

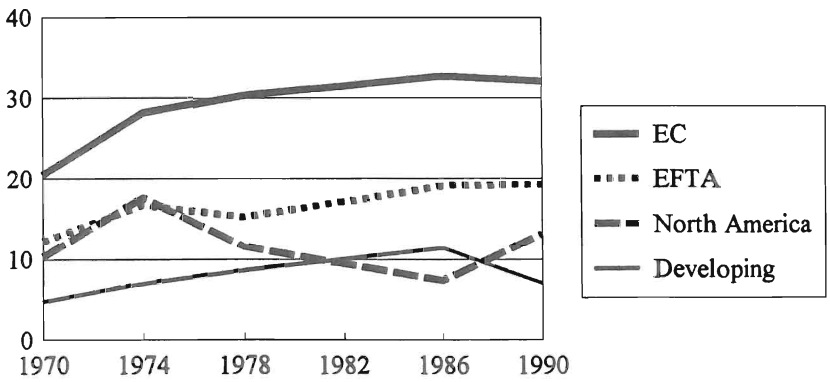
(III), the selection criteria is the same as in model (I), but in model (II) the MNC must also have any sales in the rest of the region, outside the host country. If this is fulfilled for a firm in a specific country, it is included once.

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% in 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.[6] In North America and developing countries, affiliates' exports have always been fairly limited.[7] This indicates that third 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.

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.

4. Econometric specification and hypotheses for empirical testing

Our main variables are foreign production (FQ_{ijt}) and exports from the parent country (EXP_{ijt}). In all of the models, FQ and EXP are divided by the size of the firm, SZ, since one should expect both production and exports to be increasing in firm size.[8] This is also a way to avoid heteroscedasticity. Thus, FQ_{ijt}/SZ_{it} and

[6] Members of the EC and EFTA in 1990, are included in the same region all years, to obtain comparable statistics over time.

[7] 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.

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

EXP_{ijt}/SZ_{it} measure firm *i*'s propensities to produce in, and to export to country *j*, respectively. The following specification is only valid for models (Ix), (IIx) and (III). Models (Iy) and (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.[9] Only equation (2) will be estimated, since we want to focus on the effects of foreign production on exports. The method is a variant of 2SLS with limited endogenous variables outlined in Nelson and Olson [1978] and is specified as:[10]

$$\frac{FQ_{ijt}^{*}}{SZ_{it}} = \alpha_0 + \alpha_1 \frac{EXP_{ijt}}{SZ_{it}} + Z_1'\alpha + \mu_{ijt} \qquad (1a)$$

$$\frac{FQ_{ijt}}{SZ_{it}} = \begin{cases} \dfrac{FQ_{ijt}^{*}}{SZ_{it}} & \text{if } \dfrac{FQ_{ijt}^{*}}{SZ_{it}} > 0 \\ 0 & \text{if } \dfrac{FQ_{ijt}^{*}}{SZ_{it}} \leq 0 \end{cases} \qquad (1b)$$

$$\frac{EXP_{ijt}}{SZ_{it}} = \beta_0 + \beta_1 \frac{FQ_{ijt}^{*}}{SZ_{it}} + Z_2'\beta + \epsilon_{ijt} \qquad (2)$$

Here, the Z's correspond to either attributes of the MNC or attributes of the host country. The first endogenous variable, FQ/SZ, is characterized by a large share of

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[9] In models (Ix), (IIx) and (III), FQ is replaced by NLS, NXS and NS, and EXP by XF, XTH and XR, respectively, as mentioned in section 2.

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

$$(EXP_{ijt}/SZ_{it}) = \beta_0 + \beta_1(NLS_{ijt}/SZ_{it})^{*} + \beta_2(NIS_{ijt}/SZ_{it})^{*} + Z'_2\beta + \epsilon_{ijt} \qquad (2')$$

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 (Ix) & (IIx). This is, however, not possible, since the data base does not show to which countries an affiliate's exports are directed.

zeroes (more than 50%). In the first stage of 2SLS, the reduced form of equation (1) is estimated by means of the 'Tobit method' via maximum likelihood procedures, in order to create an instrument for FQ/SZ.[11] The second endogenous variable, EXP/SZ, also includes zeroes (1-2%), but there is 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. Here, the actual values of FQ/SZ are replaced by the first-stage fitted values. This means that the marginal effect of FQ on EXP in dollars can be observed directly from the estimate of β_1. The latent variable, $(FQ/SZ)^*$, can be interpreted as an index of the propensity to produce abroad, of which EXP/SZ 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, but the standard errors of the β's 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 models (Iy) and (IIy) to check if foreign production attracts exports of intermediate goods, however, only countries where the firm has any production are included. If FQ/SZ equal zero, EXP/SZ will also be zero and there will be no simultaneity present.[12] The dependent variable EXP/SZ includes a large share of zeroes (about 40%), i.e. the affiliates in some host countries do not import any intermediate goods at all from the home country. Thus, only an export-equation will be estimated by means of the Tobit method via maximum likelihood procedures:

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[11] Estimating the reduced form is accomplished by regressing the dependent variable FQ/SZ on all exogenous variables included in the system by means of the Tobit method.

[12] In models (Iy) and (IIy), FQ is replaced by NLS and NXS, and EXP by XIL and XIX, respectively.

$$\frac{EXP_{ijt}^{*}}{SZ_{it}} = \gamma_0 + \gamma_1 \frac{FQ_{ijt}}{SZ_{it}} + Z_3'\gamma + \eta_{ijt} \qquad (3a)$$

$$\frac{EXP_{ijt}}{SZ_{it}} = \begin{cases} \dfrac{EXP_{ijt}^{*}}{SZ_{it}} & if \quad \dfrac{EXP_{ijt}^{*}}{SZ_{it}} > 0 \\ 0 & if \quad \dfrac{EXP_{ijt}^{*}}{SZ_{it}} \leq 0 \end{cases} \qquad (3b)$$

where EXP/SZ is a function of FQ/SZ and Z's. (EXP/SZ)* is a latent variable, which can be interpreted as an index of the propensity to import intermediate goods. The residuals are assumed to have the desired properties; $\eta \sim N(0,\sigma_\eta^2)$ and $E(\eta_{ijs}\eta_{ijt})=0$ for $s \neq t$. The estimate of γ_1 may not be interpreted as the marginal effect of FQ on EXP in this model, however. γ_1 must first be recalculated as described in McDonald and Moffitt [1980].[13]

Among the exogenous variables, factors which are expected to influence both foreign production and exports from the home country have been included. 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.[14] Most of the variables are known from earlier related studies, especially Swedenborg [1979, 1982]. In the end of this section, Table 1 depicts the exogenous variables included in each model.

According to the transactional explanation to MNCs, one would expect the existence of firm-specific advantages to create absolute advantages vis-à-vis competitors. MNCs based on intangible assets tend also to trade internally, i.e. a

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[13] The marginal effect of FQ on EXP, dE(EXP)/dFQ, simply equals $F(z)\gamma_1$, where F(z) is the cumulative normal distribution and $z=X'\gamma/\sigma_\eta$. X is a vector of independent variables and γ is the vector of estimated Tobit parameters. The z is calculated around the means of X.

[14] 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.

high degree of intermediate goods between units of production is expected. In the analysis, we use R&D-intensity (RD_{it}), 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 finished as well as intermediate goods, and to produce abroad.

Firms which are dependent on natural resources in Sweden, are supposed to be more willing to export rather than to 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, a priori, is expected to affect the propensity to produce abroad and to export. Foreign affiliates in such industries are especially likely to be dependent on intermediate goods from the home country. If operations within a firm are characterized by economies of scale (SC_{it}), it should be advantageous to concentrate production to a relatively few, larger units of production. SC, measured as average production in the foreign subsidiaries[15], 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 like Sweden, where domestic demand is limited. It should also be noted that the firm variables (except the dummy NR) are somehow divided with the size of the firm. This is in line with the treatment of EXP and FQ.

Some country variables are also included in the model. The greater the size of the host country (GDP_{jt}), the more exports of finished goods as well as production should be attracted, meaning that the coefficients for GDP are expected to be positive in both equation (1) and (2). Regarding production for exports, this variable is also an indicator of economies of scale, which should strengthen the effect. GDP is not expected to have any influence on exports of intermediate goods, however. The income level of the host country, measured as GDP per capita

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

($GDPCAP_{jt}$), 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 the 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 ($OPEN_{jt}$).[16] 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 particular 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.[17] Furthermore, two variables measuring the relative factor endowments of technology and skilled labor in the host country are included. These are defined as Gross domestic Expenditure on R&D as a percentage of GDP ($GERD_{jt}$) and the number of Research Scientists, Engineers and Technicians per 1000s of the population ($RSET_{jt}$) and are taken from UN [1992] statistics. Both GERD and RSET are primarily expected to attract production and are, therefore, only included in equation (1). One can also note that these two host country variables correspond to the firm variables RD and LS.

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[16] 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.

[17] 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 (Ix)	Model (Iy)	Model (IIx)	Model (IIy)	Model (III)
Endogenous	FQ	NLS	NLS	NXS	NXS	NS
Exogenous	EXP	XF	XIL	XTH	XIX	XR
RD		q(+) x(+)	w(+)	q(+) x(+)	w(+)	q(+) x(+)
LS		q(+) x(+)	w(+)	q(+) x(+)	w(+)	q(+) x(+)
NR		q(-) x(+)	w(+)	q(-) x(+)	w(+)	q(-) x(+)
SC		q(+)		q(+)		q(+)
GDP		q(+) x(+)		q(+)		q(+)
GDPCAP		q(?) x(+)	w(+)	q(-)	w(+)	q(?)
OPEN		q(-) x(+)	w(+)			
DIST		q(-) x(-)	w(-)	q(-)	w(-)	q(-)
GERD		q(+)		q(+)		q(+)
RSET		q(+)		q(+)		q(+)

Note: A 'q' indicates that the variable is included in equation (1), a 'x' in equation (2) and a 'w' in equation (3). 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 included in equation (1).

By including additive dummy variables, it is possible to examine if there are any shifts in the level of the endogenous variables over time or between regions.[18] We will also check if there are any industry-specific fixed effects which may explain the variation between firms. This is done by assigning additive dummies for different

[18] When using time dummies, 1974 will always be the reference period. The regions, included in model (I), are the EC, EFTA, North America (Nam), Latin America (Lam) and other countries. The last group includes Japan, India, Australia, New Zealand and South Africa. EC is always the reference region. In models (II) and (III), where only the EC is analyzed, we include a dummy called LAND, which takes on the value of 1 if the country lies in the periphery of the EC (Greece, Spain, Portugal, Italy or Ireland), from the Swedish point of view, and zero otherwise.

industries.[19] Furthermore, our main parameters, β_1 and γ_1, may shift over time or across regions. This will be tested through interaction dummies:

$$\beta_1 = \delta_0 + \delta_1 D_1 + \delta_2 D_2 + \delta_3 D_3$$

$$\gamma_1 = \theta_0 + \theta_1 D_1 + \theta_2 D_2 + \theta_3 D_3$$

where the 'D'-variables refer to dummies for different time periods or regions.

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 these resulted in multicollinearity between the additive firm dummies and the firm variables, RD, LS and NR.[20] The F-values and log likelihood ratios are satisfactorily high in all models, 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 (Ix), there is clear evidence that an increase in foreign production exerts a negative impact on parent exports of finished goods, confirming our hypothesis of a substitution effect. The

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[19] 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.

[20] 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		Tobit Model	
Dependent variable	XF/SZ		XIL/SZ	
Explaining variables	(Ix-a)	(Ix-b)	(Iy-a)	(Iy-b)
Intercept	0.0443 *** (0.0070)	0.0432 *** (0.0068)	-0.0136 (0.0098)	-0.0169 * (0.0097)
(NLS/SZ)*	-0.1594 *** (0.0394)	-0.1800 *** (0.0384)	---	---
NLS/SZ	---	---	0.0545 *** (0.0095)	0.0602 *** (0.0095)
RD	0.0358 ** (0.0170)	0.0276 (0.0174)	0.0858 *** (0.0213)	0.1067 *** (0.0240)
LS	5.18 E-5 (5.68 E-5)	7.519 E-5 (4.89 E-5)	-1.134 E-4 * (6.09 E-5)	-7.163 E-5 (6.07 E-5)
NR	0.0072 *** (0.0017)	0.0074 *** (0.0019)	0.0109 *** (0.0022)	0.0095 ** (0.0024)
GDP	5.95 E-6 *** (5.89 E-7)	6.22 E-6 *** (5.32 E-7)	---	---
GDPCAP	7.94 E-8 (8.20 E-8)	9.19 E-8 (9.35 E-8)	1.780 E-8 (1.10 E-7)	9.935 E-8 (1.09 E-7)
DIST	-9.49 E-4 *** (8.82 E-5)	-9.89 E-4 *** (8.14 E-4)	-1.77 E-4 ** (8.63 E-5)	-1.89 E-4 ** (8.59 E-5)
OPEN	-0.0020 *** (7.02 E-4)	-0.0021 *** (7.19 E-4)	0.0018 ** (9.35 E-4)	0.0018 ** (9.24 E-4)
F-value	41.79	33.07	---	---
Adjusted R^2	0.15	0.18	---	---
Log likelihood ratio	---	---	422.66	473.22
No. of observations	3341	3341	1003	1003
Left censored obs.	---	---	418	418

Note: The numbers in parentheses are standard errors. Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. First-stage estimates of model (Ix) are shown in appendix Table 8. Dummies for time in all runs and for industries in models (Ix-b) and (Iy-b) are shown in appendix Table 9.

coefficient of (NLS/SZ)* is significant at the 1%-level, also when industry dummies are included. When production for local sales in a certain country increases with \$100 in model (Ix-b), the exports of finished goods to the same country decrease with \$18.0, with a 95% confidence interval of ±\$7.5. By using interaction dummies, we also verified that the parameter estimate of β_1 was stable over time. All interaction time dummies were insignificant, which can be seen in Table 5 in appendix. Another separate run showed, however, that the parameter estimate was not stable across all regions. The coefficients of the interaction dummies show that the substitution effect of finished goods is at an inexplicable high level in North America, while it is rather stable for the other regions. 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 less or zero. It is not possible, however, to say anything about the total exports of a parent firm, if it had not established any foreign production abroad at all.

Turning next to model (Iy), it is verified that increased foreign production attracts intermediate goods from the home country. The coefficient of NLS/SZ is significant on the 1%-level in both runs. The complementary marginal effect is, however, not larger than \$4.1 (±1.3) when production for local sales increases with \$100. Referring to the interaction dummies, it seems that γ_1 is rather stable across time, but it is not significant for North America and is on a higher level for 'other' countries. The net effect of model (I) is the sum of the effects in models (Ix) and (Iy): -\$18.0 + \$4.1 = -\$13.9. The corresponding figure for the EC-countries is -\$20.4 + \$5.2 = -\$15.2 (from appendix Table 5). This negative net effect contradicts earlier empirical studies and shows that the substitution effect dominates.

The coefficients of the exogenous variables are mostly significant at the 5%-level in model (Ix), although the variable OPEN exerts an unexpected negative impact. In model (Iy), only the coefficients of GDPCAP and LS are not significant at the 5%-level. The parameter estimates and standard errors are stable across the runs, and the industry dummies do not appear to make any major difference.

Model (II)

As discussed in section 3, we now focus on production in the EC.[21] 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 $(NXS/SZ)^*$ is significant at the 1%-level in both runs. The gross substitution effect is, in fact, as large as \$46.9 ($\pm$\$32.7), 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 $(NXS/SZ)^*$ is stable for all years.

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/SZ is significant on the 1%-level. The complementary, marginal effect is estimated to \$5.2 ($\pm$\$1.3). The interaction time dummies for the coefficient of NXS/SZ are all insignificant different from the reference year 1974, although the recalculated value for the year 1978 seems to lie on a lower level. The total effect of increasing affiliates' exports with \$100 is then the sum of these two effects: -\$46.9 + \$5.2 = -\$41.7. As hypothesized in section 2, this net effect is more negative than in model (I). The coefficients of the exogenous variables are all significant on the 5%-level in model (IIx), but only RD and NR are significant in both runs in model (IIy). The industry dummies have some influence on the parameter estimates, but the effect on the significance is limited.

[21] 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		Tobit Model	
Dependent variable	XTH/SZ		XIX/SZ	
Explaining variables	(IIx-a)	(IIx-b)	(IIy-a)	(IIy-b)
Intercept	0.0336 * (0.0172)	0.0331 * (0.0175)	0.00461 (0.00504)	0.00205 (0.00420)
(NXS/SZ)*	-0.4959 *** (0.1711)	-0.4692 *** (0.1670)	---	---
NXS/SZ	---	---	0.1002 *** (0.0139)	0.0930 *** (0.0113)
RD	0.2889 *** (0.1025)	0.3355 *** (0.0925)	0.0976 *** (0.0214)	0.0752 ** (0.0204)
LS	5.283 E-4 ** (2.64 E-4)	5.118 E-4 ** (2.52 E-4)	-8.852 E-5 (6.09 E-5)	-2.541 E-5 (5.06 E-5)
NR	0.1420 *** (0.0093)	0.1383 *** (0.0117)	0.00381 ** (0.00183)	0.00376 ** (0.00191)
GDPCAP	---	---	-2.117 E-7 (1.390 E-7)	-1.562 E-7 (1.129 E-7)
DIST	---	---	-8.714 E-6 (3.462 E-5)	-4.231 E-5 * (2.489 E-5)
F-value	65.31	39.39	---	---
Adjusted R^2	0.22	0.26	---	---
Log likelihood test	---	---	205.68	325.20
No. of observations	1561	1561	382	382
Left censored obs.	---	---	160	160

Note: The numbers in parentheses are standard errors. Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. First-stage estimates of model (IIx) are shown in appendix Table 10. Dummies for time in all runs and for industries in models (IIx-b) and (IIy-b) are shown in appendix Table 11.

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 1%-level in both runs. In model (III-b), this means that an increase of $100 in net sales reduces exports by $24.2 ($\pm$14.2). This figure is consistent with the results in model (I) and (II), since the effect of NS on exports according to these estimates in the EC should be 0.69*(-)$15.2 + 0.31*(-)$41.7 = -$23.4. Here, the weights refer to that, on average, 69 per cent of net sales are local

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

Method	Simultaneous Tobit Model	
Dependent variable	XR/SZ	
Explaining variables	(III-a)	(III-b)
Intercept	0.0627 *** (0.0162)	0.0544 *** (0.0164)
(NS/SZ)*	-0.1943 *** (0.0703)	-0.2423 *** (-0.0727)
RD	0.2781 *** (0.1122)	0.3249 *** (0.1114)
LS	0.00040 (0.00024)	0.00052 ** (0.00025)
NR	0.1754 *** (0.0099)	0.1692 *** (0.0122)
F-value	68.23	42.90
Adjusted R^2	0.23	0.27
No. of observations	1551	1551

Note: The numbers in parentheses are standard errors. Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. First-stage estimates are shown in appendix Table 12. Dummies for time in both runs and for industries in the last one are shown in appendix Table 13.

sales and 31 per cent are exported. The coefficient of $(NS/SZ)^*$ is stable for all years 1974-90, which can be seen in Table 7 in appendix. Finally, the coefficients of all exogenous variables have the expected sign and are, mostly, significant on the 1%-level.

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 all years 1974-90. 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. That is, what is good for firms is not necessarily good for their home country.

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Appendix

Table 5. ***Estimation of interaction dummies for model (I). Reference period=1974 and reference region=EC.***

	Model (Ix-b)		Model (Iy-b)	
Interaction dummies	Estimates	Std. errors	Estimates	Std. errors
NLS/SZ	-0.1550 ***	0.0443	0.0905 **	0.0380
T1978×(NLS/SZ)	0.0008	0.0420	-0.0225	0.0472
T1986×(NLS/SZ)	-0.0359	0.0386	-0.0114	0.0399
T1990×(NLS/SZ)	-0.0396	0.0384	-0.0621	0.0406
Recalculated values	β_1	Std. errors	γ_1	Std. errors
1974	-0.1550 ***	0.0443	0.0905 **	0.0380
1978	-0.1552 ***	0.0404	0.0681 **	0.0282
1986	-0.1909 ***	0.0366	0.0790 ***	0.0129
1990	-0.1946 ***	0.0363	0.0282 *	0.0150
	Model (Ix-b)		Model (Iy-b)	
Interaction dummies	Estimates	Std. errors	Estimates	Std. errors
NLS/SZ	-0.2037 ***	0.0368	0.0729 ***	0.0119
EFTA×(NLS/SZ)	0.0634 *	0.0372	1.79 E-4	0.0290
Nam×(NLS/SZ)	-0.3906 ***	0.0515	-0.0546 ***	0.0208
Lam×(NLS/SZ)	0.0444	0.0790	0.0602	0.0576
Other×(NLS/SZ)	0.0342	0.0779	0.4353 ***	0.1657
Recalculated values	β_1	Std. errors	γ_1	Std. errors
EC	-0.2037 ***	0.0368	0.0729 ***	0.0119
EFTA	-0.1413 ***	0.0395	0.0731 ***	0.0270
North America	-0.5943 ***	0.0588	0.0183	0.0175
Latin America	-0.1593 **	0.0783	0.1331 **	0.0565
Other countries	-0.1695 **	0.0861	0.5082 ***	0.1655

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively.

Table 6. ***Estimation of interaction dummies for model (II). Reference period=1974.***

	Model (IIx-b)		Model (IIy-b)	
Interaction dummies	Estimates	Std. errors	Estimates	Std. errors
NXS/SZ	-0.5737 *	0.3332	0.0959 **	0.0383
T1978×(NXS/SZ)	-0.0201	0.3834	-0.0598	0.0483
T1986×(NXS/SZ)	-0.1860	0.3666	0.0217	0.0447
T1990×(NXS/SZ)	0.2342	0.3344	-0.0011	0.0408
Recalculated values	β_1	Std. errors	γ_1	Std. errors
1974	-0.5737 *	0.3332	0.0959 **	0.0383
1978	-0.5938 **	0.2700	0.0361	0.0314
1986	-0.7596 ***	0.2462	0.1175 ***	0.0239
1990	-0.3395 **	0.1664	0.0949 ***	0.0143

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively.

Table 7. ***Estimation of interaction dummies for model (III). Reference period=1974.***

	Model (III-b)	
Interaction dummies	Estimates	Std. errors
NS/SZ	-0.3730 **	0.1507
T1978×(NS/SZ)	0.1038	0.1877
T1986×(NS/SZ)	0.1143	0.1704
T1990×(NS/SZ)	0.1621	0.1592
Recalculated values	β_1	Std. errors
1974	-0.3730 **	0.1507
1978	-0.2692 **	0.1304
1986	-0.2586 ***	0.0968
1990	-0.2109 ***	0.0692

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively.

Table 8. ***First-stage estimates of model (Ix). Tobit method.***

Model	Ix-a		Ix-b	
Dependent variable	NLS/SZ		NLS/SZ	
Exogenous variables	Estimates	Std. errors	Estimates	Std. errors
Intercept	0.0231	0.0277	0.0292	0.0277
RD	-0.1322 **	0.0631	-0.1572 **	0.0691
LS	8.64 E-4 ***	1.73 E-4	6.33 E-4 ***	1.75 E-4
NR	-0.0051	0.0062	-0.0039	0.0070
SC	1.24 E-7 ***	2.10 E-8	1.66 E-7 ***	2.39 E-8
GDP	1.02 E-5 ***	1.37 E-6	1.02 E-5 ***	1.36 E-7
GDPCAP	2.29 E-7	3.51 E-7	-2.17 E-7	3.49 E-7
DIST	-0.0018 ***	2.37 E-4	-0.0018 ***	2.36 E-4
OPEN	-0.0096 ***	0.0029	-0.0085 ***	0.0025
RSET	0.0071 ***	0.0020	0.0071 ***	0.0020
GERD	0.0355 **	0.0164	0.0312 *	0.0174
T1978	-0.0210 ***	0.0066	-0.0183 ***	0.0066
T1986	-0.0217 ***	0.0064	-0.0198 ***	0.0065
T1990	-0.0316 ***	0.0076	-0.0279 ***	0.0077
EFTA	-0.0555 ***	0.0074	-0.0546 ***	0.0073
North America	-0.0372 ***	0.0101	-0.0366 ***	0.0101
Latin America	0.0598 ***	0.0140	0.0604 ***	0.0140
Other countries	-0.0423 ***	0.0100	-0.0421 ***	0.0099
B1	--	--	-0.0171	0.0120
B2	--	--	-0.0412 ***	0.0130
B3	--	--	0.0332 ***	0.0104
B4	--	--	0.0093	0.0064
B5	--	--	0.0014	0.0056
B6	--	--	0.0227 ***	0.0068
B7	--	--	-0.0372 ***	0.0102
Log likelihod ratio	3499.32		3561.58	
No. of observations	3341		3341	
Left censored obs.	2300		2300	

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. The 'T'-variables refer to time dummies and the 'B'-variables refer to industry dummies.

Table 9a. ***Supplement to Table 2. Second-stage estimates of dummies for model (Ix).***

Model	Ix-a		Ix-b	
Dependent variable	XF/SZ		XF/SZ	
Explaining dummies	Estimates	Std. errors	Estimates	Std. errors
T1978	-3.71 E-4	0.0019	1.18 E-4	0.0019
T1986	-0.0014	0.0019	-2.14 E-4	0.0020
T1990	-0.0026	0.0024	-0.0027	0.0024
EFTA	-0.0165 ***	0.0026	-0.0176 ***	0.0026
North America	-0.0256 ***	0.0030	-0.0266 ***	0.0029
Latin America	0.0244 ***	0.0046	0.0258 ***	0.0043
Other countries	-0.0077 ***	0.0025	-0.0083 ***	0.0024
B1	--	--	-0.0101 ***	0.0030
B2	--	--	0.0082 ***	0.0032
B3	--	--	-0.0036	0.0033
B4	--	--	-9.59 E-4	0.0017
B5	--	--	0.0017	0.0015
B6	--	--	0.0013	0.0022
B7	--	--	-7.51 E-4	0.0023

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. The 'T'-variables refer to time dummies and the 'B'-variables refer to industry dummies.

Table 9b. ***Supplement to Table 2. Estimates of dummies for model (Iy).***

Model	Iy-a		Iy-b	
Dependent variable	XIL/SZ		XIL/SZ	
Explaining dummies	Estimates	Std. errors	Estimates	Std. errors
T1978	-2.77 E-4	0.0021	-9.78 E-4	0.0021
T1986	-0.0038 *	0.0020	-0.0036 *	0.0020
T1990	-0.0023	0.0025	-0.0038	0.0025
EFTA	-0.0025	0.0025	-0.0036	0.0025
North America	0.0056 **	0.0028	0.0049 *	0.0028
Latin America	0.0125 **	0.0049	0.0145 ***	0.0049
Other countries	0.0097 **	0.0037	0.0089 **	0.0053
B1	--	--	-0.0169 ***	0.0053
B2	--	--	0.0159 ***	0.0053
B3	--	--	-0.0046	0.0035
B4	--	--	-0.0085 ***	0.0022
B5	--	--	-0.0020	0.0019
B6	--	--	0.0033	0.0021
B7	--	--	-1.21 E-4	0.0030

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. The 'T'-variables refer to time dummies and the 'B'-variables refer to industry dummies.

Table 10. ***First-stage estimates of model (IIx). Tobit method.***

Model	IIx-a		IIx-b	
Dependent variable	NXS/SZ		NXS/SZ	
Exogenous variables	Estimates	Std. errors	Estimates	Std. errors
Intercept	-0.1550 ***	0.0224	-0.1566 ***	0.0226
RD	-0.0931	0.0634	-0.1095	0.0703
LS	8.60 E-4 ***	1.69 E-4	7.55 E-4 ***	1.71 E-4
NR	-0.0120 **	0.0062	-0.0079	0.0067
SC	5.34 E-5 ***	1.13 E-5	4.38 E-5 ***	1.21 E-5
GDP	-5.94 E-6	4.95 E-6	-6.42 E-6	4.95 E-6
GDPCAP	2.10 E-6 ***	5.53 E-7	2.14 E-6 ***	5.54 E-7
DIST	5.73 E-5	2.03 E-4	-2.87 E-6	2.03 E-4
RSET	-0.0029	0.0021	-0.0028	0.0021
GERD	0.0255 ***	0.0079	0.0262 ***	0.0079
LAND	0.0268 **	0.0123	0.0279 **	0.0123
T1978	-0.0372 ***	0.0078	-0.0334 ***	0.0078
T1986	-0.0260 ***	0.0068	-0.0214 ***	0.0069
T1990	-0.0486 ***	0.0089	-0.0439 ***	0.0089
B1	--	--	-0.0137	0.0118
B2	--	--	-0.0684 ***	0.0217
B3	--	--	0.0035	0.0111
B4	--	--	-0.0033	0.0064
B5	--	--	0.0166 ***	0.0053
B6	--	--	0.0109	0.0068
B7	--	--	-0.0098 ***	0.0090
Log likelihod ratio	1639.34		1678.50	
No. of observations	1561		1561	
Left censored obs.	1154		1154	

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. The 'T'-variables refer to time dummies and the 'B'-variables refer to industry dummies.

Table 11a. ***Supplement to Table 3. Second-stage estimates of dummies for model (IIx).***

Model	IIx-a		IIx-b	
Dependent variable	XTH/SZ		XTH/SZ	
Explaining dummies	Estimates	Std. errors	Estimates	Std. errors
T1978	0.0292 **	0.0114	0.0355 ***	0.0104
T1986	0.0339 ***	0.0097	0.0432 ***	0.0108
T1990	0.0434 ***	0.0124	0.0482 ***	0.0120
B1	--	--	-0.0557 ***	0.0152
B2	--	--	0.0023	0.0190
B3	--	--	-0.0530 ***	0.0164
B4	--	--	-0.0247 ***	0.0081
B5	--	--	0.0212 ***	0.0075
B6	--	--	-0.0259 ***	0.0096
B7	--	--	0.0196 *	0.0118

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. The 'T'-variables refer to time dummies and the 'B'-variables refer to industry dummies.

Table 11b. ***Supplement to Table 3. Estimates of dummies for model (IIy).***

Model	IIy-a		IIy-b	
Dependent variable	XIX/SZ		XIX/SZ	
Explaining dummies	Estimates	Std. errors	Estimates	Std. errors
LAND	-0.00449 *	0.00247	-0.00202	0.00203
T1978	0.00139	0.00227	0.00029	0.00184
T1986	-0.00109	0.00197	-0.00157	0.00161
T1990	0.00027	0.00257	-0.00202	0.00211
B1	--	--	-0.00736	0.00494
B2	--	--	0.07526 ***	0.00858
B3	--	--	-0.00688 *	0.00389
B4	--	--	-0.00269	0.00190
B5	--	--	-6.110 E-6	0.00140
B6	--	--	0.000292	0.00172
B7	--	--	0.01507 ***	0.00231

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. The 'T'-variables refer to time dummies and the 'B'-variables refer to industry dummies.

Table 12. *First-stage estimates of model (III). Tobit method.*

Model	III-a		III-b	
Dependent variable	NS/SZ		NS/SZ	
Exogenous variables	Estimates	Std. errors	Estimates	Std. errors
Intercept	-0.1778 ***	0.0439	-0.1581 ***	0.0440
RD	-0.3747 ***	0.1345	-0.3083 **	0.1456
LS	0.0012 ***	3.36 E-4	8.56 E-4 **	3.39 E-4
NR	-0.0101	0.0122	-0.0175	0.0136
SC	2.75 E-7 ***	4.10 E-8	3.17 E-7 ***	4.55 E-8
GDP	2.34 E-5 **	1.04 E-5	2.25 E-5 **	1.11 E-5
GDPCAP	1.56 E-6	1.12 E-6	1.72 E-6	1.11 E-6
DIST	-0.0012 ***	4.18 E-4	-0.0012 ***	4.16 E-4
RSET	-0.0023	0.0045	-0.0031	0.0044
GERD	0.0290 *	0.0162	0.0311 *	0.0161
LAND	0.0272	0.0252	0.0274	0.0250
T1978	-0.0515 ***	0.0156	-0.0480 ***	0.0156
T1986	-0.0482 ***	0.0139	-0.0481 ***	0.0140
T1990	-0.0837 ***	0.0180	-0.0800 ***	0.0180
B1	--	--	-0.0193	0.0225
B2	--	--	-0.1333 ***	0.0332
B3	--	--	0.0231	0.0209
B4	--	--	-0.0086	0.0129
B5	--	--	0.0080	0.0110
B6	--	--	0.0015	0.0141
B7	--	--	-0.0740 ***	0.0208
Log likelihod ratio	1479.84		1522.26	
No. of observations	1553		1553	
Left censored obs.	1032		1032	

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. The 'T'-variables refer to time dummies and the 'B'-variables refer to industry dummies.

Table 13. ***Supplement to Table 4. Second-stage estimates of dummies for model (III).***

Model	III-a		III-b	
Dependent variable	XR/SZ		XR/SZ	
Explaining dummies	Estimates	Std. errors	Estimates	Std. errors
T1978	0.0417 ***	0.0112	0.0456 ***	0.0114
T1986	0.0414 ***	0.0104	0.0486 ***	0.0100
T1990	0.0516 ***	0.0117	0.0516 ***	0.0109
B1	--	--	-0.0600 ***	0.0162
B2	--	--	0.0235	0.0180
B3	--	--	-0.0574 ***	0.0171
B4	--	--	-0.0272 ***	0.0104
B5	--	--	0.0190 **	0.0092
B6	--	--	-0.0301 ***	0.0112
B7	--	--	0.0127	0.0140

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. The 'T'-variables refer to time dummies and the 'B'-variables refer to industry dummies.

Chapter II

Entry Modes for Direct Investment Determined by the Composition of Firm-Specific Skills

(with Thomas Andersson and Niklas Arvidsson)

1. Introduction

When undertaking direct investment in a foreign country a firm can choose between different modes of entry. Broadly speaking, an investor may either acquire an existing firm, or set up a new venture, i.e. perform a greenfield investment.[1] The mainstream perspective on this choice stipulates that takeovers are less risky than greenfield investments, but yield a lower expected rate of return (Caves [1982]). Consequently, a firm would become more willing to perform greenfield investments as greater capabilities and international experience increase its ability to handle risks. This view has been supported by a number of empirical studies. For example, Dubin [1976] and Stopford [1976] found that firms with a large portfolio of already established subsidiaries, and a greater geographical diversification have a greater propensity to undertake greenfield investments. Meanwhile, the greater a firm's diversification in terms of industries, and the faster it's growth - indicating less "knowledge" and experience "per unit of activity" - the greater the propensity to use takeovers.

In contrast to what might have been expected, however, there has been a marked tendency towards more takeovers, and less greenfield investments, in the last decades. Zejan [1990] interpreted this as evidence of a generally increasing instability and uncertainty in the financial markets between 1969 and 1978, which

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[1] With "greenfield investment" is understood the establishment of a "new venture" which is not based on a former domestic firm. It may be organized as the restructuring of a former sales affiliate belonging to the foreign firm itself.

were the years he investigated. As discussed in UN [1992], the trend towards takeovers has continued in the 1980s. Meanwhile, the bulk of direct investment is established by a relatively small number of multinational corporations which continuously upgrade their experience and capabilities. The conventional view hardly appears consistent with the ongoing decline in greenfield establishments and increase in takeovers.

In practice, the riskiness as well as expected profitability of alternative modes of entry will be influenced not only by the amount of capabilities in a firm, but also by their composition. This chapter separates between organizational and managerial skill on the one hand, and skill which is related to specific technology on the other hand. Concerning the characteristics of host countries, the internationalization and integration of factor markets have made purely national variables, like the size or growth of the host economy, less relevant for the supply and demand conditions that determine the pricing of firms. Compared to the previous literature, this set-up leads us to conclude on quite different influences from various industry and country-characteristics on the choice between takeovers and greenfield operations.

For examination of hypotheses, we use the most detailed data base which exists on multinational firms. This builds on surveys of all Swedish multinationals undertaken by the Industrial Institute for Economic and Social Research (IUI) in Stockholm since the 1960s, which have been updated about every fourth year. In contrast to the study of entry modes by Zejan [1990], which considered only the data provided in a single year, this paper examines all surveys from 1965 to 1990. Thus, we cover three decades of internationalization and a total of more than 1100 affiliates scattered all over the world.

Section 2 discusses the determinants of the choice of entry. Section 3 presents the data base and some pertinent empirical observations. A logit model and hypotheses for empirical testing are set up in section 4. The results of the estimation are presented in section 5. Section 6 concludes the chapter.

2. The choice of entry

According to now mainstream theory, direct investment requires that it is more advantageous for a firm to internalize its assets, rather than trade with another firm at arm's length (Dunning [1977]). Establishing a manufacturing subsidiary means that a whole set of activities must be organized in a foreign market. A cluster of functions is required, e.g. the purchasing of inputs, engagement of personnel, production, marketing, distribution, etc. Arrow [1985] explains vertical integration by the need of different units to communicate closely given demand or supply uncertainty, while Milgrom and Roberts [1990] emphasize the need to exploit complementarities between different units. Most literature views vertical integration as an attempt to handle problems between separate firms which relate to risk-sharing, moral hazard or adverse selection. When separate units must exchange a considerable amount of diverse information, it is impossible to construct contracts which make interaction at arm's length identical to interaction internalized within a firm.

The conditions under which internalization effectively does away with the problems of arm's length contracts are far from clear, however. For example, most of the literature on vertical integration assumes that complete harmonization of interests is established, while Grossman and Hart [1986] take the position that takeovers do not solve the problems at all. In practice, one will not end up at either of these endpoints. The extent to which internalization is efficient depends on the compatibility of different units, as well as managerial and organizational capabilities. In this context, acquisitions and greenfield operations raise partly different issues. Through acquisition, an investor is able to utilize synergetic effects with the special assets of an already established local firm. On the other hand, the acquired activities must be adjusted so as to comply with the activities and needs of the purchaser. Meanwhile, a new venture can be streamlined with the objectives and priorities of the parent company from the start. It draws on the special assets and capabilities of the investor and the problems of harmonization with an already existing firm are avoided.

These differences call for attention to the capabilities of firms. Rather than

considering the amount of knowledge and experience, the focus is here on the nature of skills. It is well known that a distinction should be made between the ability of developing new technology and that of refining and applying existing ones (Winter [1971]). The point of departure for the present analysis is that a distinction can be made between skills related to a specific production technology, and skills in the organization and management of technologies in general. "Technological skill" is related to invention and the ability to innovate with respect to a specific production technology. This is likely to be close related to investment in own R&D. "Organizational skill" grows with experience and can also be developed through the diffusion of information and management techniques. The usefulness of experience and learning by doing in the interaction between firms has been explored since Spence [1981].

On this basis, we can formulate two fundamental hypotheses: First, acquisition is more desirable the greater the ability of a firm to exploit and reorganize another firms' assets under its own control. Thus, organizational skill favours takeovers as the mode of entry. Second, greenfield operations are more preferable the greater the ability of a firm to exploit its specific production technology. Technological skill, consequently, favours greenfield operations. A firm's relative endowment of these skills will determine the outcome.

Except for the relative endowment of skills, supply and demand conditions within the host country affect the opportunities and difficulties that confront new entrants. Let us consider three aspects of this:

-- When stock prices are high, it is more expensive to buy an already existing firm, which favours greenfield operations. On the other hand, a shortage of attractive locations may make it costly to set up a new firm. Broadly speaking, however, the market situation in individual economies is becoming less influential, since the continuing internationalization of financial markets reduces the extent to which local prices differ from international ones.

-- Establishing a new firm takes more time than buying an already existing one. Thus, the need of rapid success, as well as the patience of the investing firm, will influence the mode of entry.

-- A firm's previous presence in a host country may influence the attractiveness of additional takeovers or greenfield operations, as new subsidiaries should complement already existing ones.

Our hypotheses are based on the assumptions that the decision to undertake foreign direct investment has already been made. One might object that a takeover may be motivated by the benefits of acquiring a particular firm, rather than investing in a particular market. This should not distort our results, however, as there always remain a choice between a new venture and takeover. It is only this choice that is analyzed in this paper, which is in line with the literature on entry modes.

3. The data base and some empirical observations

The data base consists of a questionnaire sent to all Swedish multinationals, covering the years 1965, 1970, 1974, 1978, 1986 and 1990. The survey includes questions about firms' consolidated operations, as well as questions regarding specific affiliates. There have been two sets of conditions for firms to be included. Firstly, firms must have been registered in Sweden, have had more than 50 employees and operated in manufacturing in the year of study. Firms located in Sweden but owned by foreign multinationals have been excluded. Secondly, firms must have been multinational, i.e. they must have owned more than 50 percent of at least one foreign affiliate in the year of study. Throughout, more than 90 percent have answered the questionnaire, except for 1990 (75 percent have answered so far). In the tests, each affiliate is included only once, i.e. the first time it enters a multinational group. This means, for example, that only affiliates established from 1971 until 1974 are included from the survey of 1974.

As already pointed out, takeovers have become increasingly common over time, which can be seen in Table 1. Let us briefly consider how manufacturing affiliates established in alternative ways differ from each other. Table 2 shows figures per firm and per employee for all affiliates operating in 1990, divided according to mode of

Table 1. *Modes of entry during different time periods. Percent.*

Period	Greenfield	Takeover
Before 1961	78	22
1961-65	61	39
1966-70	55	45
1971-75	42	58
1976-80	33	67
1981-85	26	74
1986-90	16	84

entry. All in all, 329 affiliates had been established through takeovers, and 195 through greenfield operations. As can be seen, takeovers are larger when considering employees and total assets, but there is a less marked difference in total sales. Concerning profitability, there is a certain edge for greenfield operations. The relative profitability of the two modes of entry has shifted over time, however.

The geographical division in Table 3 shows that an increasing share of new

Table 2. *Figures per firm and employee, for 1990, for firms established through different modes of entry.*

	Per firm (MSEK)		Per employee (1000 SEK)	
	Takeover	Greenfield	Takeover	Greenfield
Employees	490	298	-	-
Total assets	311	187	634	628
Total sales	458	349	934	1170
Value of M&I	94	47	191	158
Investments in M&I	20	12	41	38
R&D expenditure	4	2	8	8
Wages&salaries	102	47	209	157
Profit before depr.	31	27	64	91
Profit after financial items	15	17	30	56

affiliates is located in industrialized countries. This reflects the overall trend in the location of all foreign direct investment from industrialized countries (UN [1992]). It is also interesting to note, although not shown in Table 3, that the share of takeovers increases over time throughout all regions. Changes in legislation may be expected to have played a role for this development in certain countries. On the whole, however, Swedish direct investment has targeted countries with fairly liberal rules for direct investment, and the limited size of most investment projects have meant few clashes with anti-trust clauses. Moreover, the fairly homogenous change in entry modes over time suggests that legislative changes in individual countries do not explain the major pattern. Our working assumption is that purely economic factors can explain the variation in entry mode across countries over time.

Industrial comparisons show that takeover is the most common way to establish an affiliate in most instances, except for textiles, mining and metals. It can be noted that metal goods, machinery, electronic equipment and chemistry industries account for 80 percent of all takeovers in the period 1986 to 1990. However, we can not observe the relative importance of organizational and technological skills on the industrial level. We have to analyze the development on the firm-specific level.

Table 3. ***Shares of all new establishments during the last three decades in different regions. Percent.***

Region	1960s	1970s	1980s
EC	60	59	56
EFTA	16	15	17
North America	6	12	20
Africa	1	1	1
Asia	2	3	2
Latin America	15	10	4
Total	100	100	100

4. Logit model and hypotheses for empirical testing

Takeover as a mode of entry for manufacturing affiliates is used as dependent variable in the tests below. This variable is dichotomous in nature, taking the value zero for greenfield investments, and otherwise one. A logit probability model is constructed to predict the variation in entry mode.

In the following, we only make a brief presentation of the logit model. For a more thorough discussion, see Amemiya [1981]. The logit model is based on the cumulative logistic probability function. The model can be written as:

$$Log\left(\frac{Prob(Y)_i}{1-Prob(Y)_i}\right) = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki}$$

Here, the X's correspond to either attributes of the host country in which the affiliate is started, or attributes of the investing firm. Prob(Y) represents the probability that an investing firm will take over a foreign competitor, given the values of the X's. The ß's can be interpreted as the impact of various firm and country attributes on the decision to perform a takeover. One may not treat these parameters as in usual regression models, however, because of the logarithmic transformation of the dependent variable.

Since our explanatory variables are continuous and every observation has a distinct probability associated with it, the logit model was estimated using a nonlinear maximum-likelihood estimation procedure. This estimation technique yields consistent parameter estimates and has a number of other desirable statistical properties. For large samples all parameter estimates are known to be efficient and normally distributed.

Concerning the explanatory variables, it is not possible to directly observe skills, particularly not organizational skill, but proxy variables must be used. As "skill" is a multi-dimensional concept, we can include several alternative proxies for organizational skill without running into problems with multicollinearity. Simultaneity problems might instead have been expected since entry in a foreign

market influences the organization of a multinational firm as a whole. It has been difficult to trace the connections between R&D and market structure in the form of monopoly or perfect competition, for example, since both are endogenous variables determined confounding variables. This is hopefully a minor problem in the present context, however, since most affiliates are established by large multinational firms, and exert only a marginal impact on the organization of these firms as a whole.

The definitions of our explanatory variables and descriptive statistics are found in Table 4. The rationale for their inclusion, and the expected impact, is as follows.

SIZE; The size of the acquiring company, measured as total turnover, is related to the accumulation of organizational skill. While this should account for a positive influence on the probability of takeovers, it is unclear how company size relates to technological skill, which makes the impact of the variable somewhat uncertain. In the earlier literature, size has, on the contrary, simply been associated with greater skill in general and, consequently, a greater propensity to undertake greenfield operations.

AFF; The previous number of manufacturing affiliates is a more comprehensive measurement of organizational relative to technological skill. We expect this variable to exert a positive effect on takeovers, which is in contrast with the previous literature.

RD; The R&D intensity in the investing company, defined as total R&D expenditure divided by total turnover, measures the need to develop specific technological skill. This should, in consequence with our earlier discussion, be negatively related to the probability of takeovers. To our knowledge, the role of this variable has not previously been investigated in this context, perhaps due to lack of data.

EXIST; The existence of previous affiliates in the host economy is measured as a

Table 4. ***Variable definitions and descriptive statistics.***

Variable	Definition	Mean	Median	Std.dev.	Expected sign
Y	Mode of entry	0.65	1	0.48	
SIZE	Company turnover - (MSEK)	2511	1237	3737	+
AFF	Number of affiliates	21.7	12.0	26.2	+
RD	R&D intensity	0.023	0.015	0.024	-
EXIST	Earlier establishment	0.37	0	0.48	+
GDPC	Income level - GDP/c (SEK)	14828	15113	7083	+
GDP	Size of foreign economy - GDP (SEK billions)	1085	394	1763	+/-
GROW	Growth rate of the host country - (GDP)	3.60	3.40	1.08	+/-
TIME	Time	17.5	18.0	8.1	+
D_1SIZE	Dummy variable for SIZE ($D_1=1$ for the period 1979-90).	3838	2203	4913	
D_2GROW	Dummy variable for GROW ($D_2=1$ for the period 1979-90)	3.50	3.00	0.99	

dummy variable, taking the value 1 if the investing firm had established at least one affiliate before already, and 0 otherwise. We expect that firms with already existing manufacturing affiliates aim for complementarity with old ones, and avoid raising the competitive pressure. Furthermore, if the firm already is established on a market, it will have better knowledge about local producers, which may be attractive for acquisition. This should favour takeovers, accounting for a positive influence on our dependent variable.

GDPC; The income level, which is estimated by GDP per capita, indicates the level of sophistication in the host economy, including the quality of possible objects for takeover. It will also be less troublesome and time-consuming to undertake an acquisition in a highly developed economy with a well-functioning stock market. This should exert a positive impact, which is consistent with the earlier literature.

GDP; The size of the foreign economy, measured as GDP, may exert an ambiguous

influence. Given that markets are segmented, it indicates greater scope for greenfield operations because a new firm adds relatively less new competition the larger the economy is. This should account for a negative effect. On the other hand, a greater economy may have more suitable objects for takeover, and offer an investor a better bargaining position. In case this effect dominates, we would instead expect a positive impact.

GROW; The growth rate of the host economy, measured by average annual growth of GDP for the whole period of study, is related to the need to act quickly in order not to forego potential gains. As a takeover creates access to already existing facilities, there should be a positive impact on the probability of takeover. On the other hand, a rapidly growing economy may have more scope for new firms, in analogy with a large economy. This would then favour a negative effect. Thus, the expected influence is ambiguous.

TIME; Time may be hypothesized to affect the entry mode since firms' international experience and organizational capabilities improve gradually. Of course, knowledge in specific technology improves over time as well, but this is matched by similar advancements in competing firms. This suggests that time exerts a positive influence on the probability of takeovers. This view contrasts with Zejan [1990], who suggested that takeovers become more common because of a growing instability and uncertainty.

As it would be preferable if the other explanatory variables were sufficient to explain the increase in takeover over time, tests will be performed without the time variable included. Moreover, we may expect the explanatory power of some of the other independent variables to change over time. For example, purely national determinants of supply and demand conditions may become less important with the continued internationalization of the financial markets. A few structural shifts in the influence of explanatory variables have been examined through dummy constructions, which are reported in connection to the results. We will also check if there are any firm-specific fixed effects, which may explain the variation between

firms. This is done by giving additive dummies for MNCs included more than ten times in the sample.[2]

5. Results of the estimation

The resulting estimates are given in Table 5. Three different models were run: (I) all hypothesized variables are included, (II) the time variable is excluded, (III) the same as (II), but with firm-specific effects included. Two different measures of the explanatory power of the logit model are given below the estimates in Table 5. Firstly, we examined the hypothesis that all parameters were equal to 0, using the likelihood ratio test which follows a chi-square distribution. Here, the results were highly favourable, and almost identical for all three models. Secondly, the number of wrong predictions was calculated for each model. This produced, again, highly satisfactory results, since more than 71 percent of the predictions were correct. The outcome was roughly the same for all three models in this case as well. However, when unique firm dummies were included, the influence of some of our main skill-variables were reduced. These dummies were mostly insignificant and are depicted in appendix Table 7.

There is no problem with multicollinearity in the model, which can be seen from the correlation matrix given in appendix Table 6. We also examined some attributes of the affiliates, for instance R&D intensity and turnover weighted by market size. However, such variables were excluded owing to two reasons. Firstly, they are likely to bias the model due to simultaneity problems, and secondly, they were all insignificant. Such affiliate-specific variables are endogenous in the model and in part determined, through one or more separate equations, by the dependent variable.

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[2] More than 60 percent of the MNCs in the sample only appear one or two times. If such MNCs are assigned a firm-specific dummy, there is little variation left between firms. By choosing ten as the critical number, we examine firm-specific dummies for the largest and most experienced MNCs, which cover more than 50 percent of the observations.

Table 5. ***Estimation results of the logit model.***

Dependent variable	Y = Mode of entry		
Independent variables	(I)	(II)	(III)
Intercept	-0.444 (0.453)	0.122 (0.430)	-0.0065 (0.441)
SIZE	1.755 E-4 ** (8.82 E-5)	2.354 E-4 *** (8.69 E-5)	3.093 E-4 ** (1.47 E-4)
D_1SIZE	-1.991 E-4 ** (8.61 E-5)	-2.616 E-4 *** (8.62 E-5)	-3.109 E-4 *** (1.12 E-4)
AFF	0.015 ** (0.0058)	0.015 *** (0.0056)	0.018 (0.0127)
RD	-6.696 ** (3.165)	-6.584 ** (3.130)	-6.8123 * (3.564)
EXIST	0.421 ** (0.199)	0.457 ** (0.198)	0.523 ** (0.211)
GDPC	1.760 E-5 (1.72 E-5)	4.251 E-5 *** (1.62 E-5)	4.275 E-5 ** (1.71 E-5)
GDP	-8.183 E-5 (5.43 E-5)	-9.609 E-5 * (5.40 E-5)	-9.814 E-5 * (5.51 E-5)
GROW	-0.205 *** (0.084)	-0.229 *** (0.084)	-0.228 *** (0.086)
D_2GROW	0.031 (0.081)	0.285 *** (0.084)	0.291 *** (0.060)
TIME	0.075 *** (0.017)	-- --	-- --
Chi-square value of the likelihood ratio test Prob > Chi-sq.	249.8 0.0001	230.8 0.0001	254.5 0.0001
No. of wrong predictions (percent)[a]	29.3	27.1	27.2

Note: Standard errors in parentheses. Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively. Size of sample equals 915. Firm-specific dummies for model (III) are shown in appendix Table 7.
[a] at critical probability of 0.5.

Turning to the statistical findings, we start by analyzing the variables primarily related to organizational skill. The coefficient of SIZE, the turnover of the company, has the expected positive sign and is clearly significant in all three models. Meanwhile, the interaction dummy variable D_1SIZE is also significant, but has the

opposite sign of SIZE. This indicates that the size of the company was positively related to the probability of takeovers before 1979, but that the impact disappeared in the period 1979-90. The other proxy variable for the relative amount of organizational skill in the parent company, AFF, clearly favours acquisitions in two of the models (I and II). The coefficient has the expected positive sign in all models, but is insignificant when firm-specific fixed effects are included.

The variable measuring technological skill, the R&D intensity of the parent company, RD, exerted a convincing effect. In all runs there were significant negative impacts, though only on the 10%-level in the last one, implying that firms' efforts to develop their own skills resulted in a preference for greenfield operations rather than takeovers. There is also another notable finding. While R&D intensity is as good a proxy for technological skill as we can get, it is entirely uncorrelated with the variables SIZE and AFF (see appendix), which are hypothesized to be connected to organizational skill. This supports our basic allegation that the concepts of organizational and technological skills can be separated.

An investor's earlier presence in the market, EXIST, exerted a clearly positive impact in all models. Thus, already established affiliates located in a country favour takeover when adding a new affiliate. This result is as expected with a desire to maintain, or reduce the competitive pressure on earlier establishment. Considering the host country variables, the income level, GDPC, has the expected positive sign in all runs, and is clearly significant when the time variable is excluded. Country size, GDP, exerts a significant negative impact on the probability of acquisitions in two of the models, but only on the 10 percent level. There is consequently no strong evidence that a larger host economy is conducive to greenfield operations. The growth rate of GDP, GROW, was significant across all runs. The negative sign supports the hypothesis that more greenfield operations are established in a rapidly growing economy. An interaction dummy, D_2GROW, included for the period 1979-90, turned out significant in model II and III. This indicates that the growth rate of the host economy did not exert any impact on the entry mode after 1978.

Finally, the time variable, TIME, was clearly positive and significant when it was included. The estimation was at least as good with the time variable

excluded, however, showing that our other explanatory variables did fine on their own. On the whole, they did well to determine the factors influencing the mode of entry.

6. Conclusions

Our findings support the perspective on organizational and technological skills presented in section 2. The variables associated primarily with organizational skill, i.e. company turnover and number of affiliates, both exerted a positive influence on takeovers when significant. R&D intensity, measuring technological skill, exerted a negative influence in all models. The presence of previous establishments in the host country increased the probability of takeovers, indicating that new establishments are complementary to earlier ones. Among the country variables, GDP per capita exerted a positive impact on takeovers when significant, while growth rate of GDP favoured greenfield operations, at least until 1978. The size of the host country had the expected negative sign, but had a weak performance. Finally, the time variable exerted a positive impact on takeovers, but the model explains the variation in entry modes just as well without time included. Tests of structural shifts suggest that the influence of company size and the growth rate of the host economy diminished over time.

Thus, the nature and composition of skills has been found to exert a major influence on the entry mode for direct investment. Relatively more organizational skill favours acquisitions, while relatively more technological skill favours greenfield operations. The quality of our data and the inclusion of particularly R&D intensity, lend support to our result and explain the differences compared to previous studies in the field. That company size and degree of internationalization have been found negatively related to takeovers in the past may well be due to the failure to include R&D intensity.

Even though the data covers only Swedish multinationals, there is no indication that the results would not be more generally applicable. For example, the Swedish multinationals have behaved the same as those based in other countries

with respect to increased emphasis on developed markets, and increased use of takeovers rather than greenfield operations. Of course, the Swedish multinationals may behave differently because of their long international experience or small home market. It would be interesting to see studies on the role of organizational vis-à-vis technological skills for the entry strategies of multinationals based in other industrialized countries as well. There is also a need of empirical work which examines the connection between entry modes, the undertaking of direct investment and the consequences for international interactions and social welfare. For example, acquisitions may revitalize ailing industries but also give rise to reverse technology transfers, or pave the way for foreign-owned monopolies. Greenfield operations, on the other hand, may add new competition to a higher extent, but may involve less linkages to domestic industry. More fundamentally, we need to further explore the interaction between what has here been broadly referred to as organizational and technological skills, and how they relate to the internalization of the world economy.

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Appendix

Table 6. ***Correlation Matrix.***

SIZE	0.175							
AFF	0.239	0.748						
RD	-0.051	0.145	0.033					
EXIST	0.222	0.404	0.578	0.104				
GDPC	0.203	0.131	0.115	-0.006	0.141			
GDP	0.057	0.048	0.045	0.107	0.147	0.541		
GROW	-0.125	-0.035	0.002	0.083	-0.083	-0.482	-0.249	
TIME	0.289	0.304	0.317	0.108	0.203	0.524	0.243	-0.075
	Y	SIZE	AFF	RD	EXIST	GDPC	GDP	GROW

Table 7. ***Firm-specific dummies for model (III).***

Variable	Parameter estimates	Standard errors
Z1	0.653	0.649
Z2	0.416	0.481
Z3	1.288 *	0.668
Z4	0.254	0.616
Z5	-0.096	0.520
Z6	-0.652	0.611
Z7	-0.109	0.838
Z8	-1.779	1.087
Z9	-1.011 *	0.571
Z10	0.503	0.584
Z11	-0.451	0.392
Z12	0.806	0.557
Z13	0.019	0.700
Z14	0.105	0.606
Z15	0.723	1.096

Note: Levels of significance are ***, ** and * significant at 1, 5 and 10 percent respectively.

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