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THE EC AND THE LOCATIONAL CHOICE OF SWEDISH MULTINATIONAL COMPANIES

by

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Revised

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ABSTRACT

In a world with multinational companies (MNC's) changes such as those implied by the realization of EC's internal market will affect the locational choice made by geographically mobile MNC's outside the EC. The reason is that any change which affects the competitive advantage of EC producers relative to non–EC producers will alter the choice between MNC exports to and local production in the EC. This paper presents an empirical analysis of this issue. It uses comprehensive micro data on Swedish MNC production and trade for the period 1965–86 to test hypotheses regarding the effects of European trade policy on the locational choice of Swedish MNC's in that period. The results show that being part of a trade liberalization area strongly stimulates exporting relative to producing abroad by MNC's. It is suggested that this should be relevant to an evaluation of the effects of the EC internal market on non–EC members like Sweden.

1. Introduction

The completion of the EC internal market by 1992 can be expected to affect not only EC members but non–EC members – like Sweden – as well. Some, like Krugman (1988), argue that other European countries will actually be made worse off as a result of the internal market. One reason is that the EC's reduction of trade barriers towards member countries will divert some of today's exports to the EC from non–member countries. Another reason is that in the presence of scale economies the location of production may shift towards the largest market to reduce trading costs.

This paper addresses the question of how changes such as those implied by the internal market will affect exports from Sweden and production abroad by Swedish multinational companies. The rationale behind this question is that any change that affects the cost of exporting relative to the cost of foreign production is likely to affect the locational choice of geographically mobile multinational companies (MNC's). If the internal market means that EC producers benefit at the expense of non–EC producers, then production by Swedish MNC's in the EC should increase at the expense of MNC exports from the home country. Hence, in a world with multinational companies part of the impact of trade policy on trade and production will be on the locational choice made by these companies.

Historical experience should offer some guidance as to what the effects of the internal market will be. Although the main thrust of 1992 is the removal of

non—tariff barriers to trade, the effects should, in many ways, be similar to those which resulted from the earlier removal of tariffs between the EC countries. This is, in any case, the presumption of this paper, which looks at the effects of changes in European trade policy in the 1960's and 1970's on Swedish MNC's to draw conclusions about some likely effects of 1992. The changes in trade policy that took place in this period included the creation of the EC and EFTA with the gradual elimination of tariffs within each bloc in the 1960's and the free trade agreement in 1973, which meant the removal of tariffs between the two blocs.[1]

The empirical analysis uses survey data on Swedish MNC production and trade for the period 1965–86 to test hypotheses regarding the effects of European trade policy on the locational choice of Swedish multinational companies in that period. The data, which have been collected at the Industrial Institute for Economic and Social Research (IUI) in Stockholm, are unique insofar that it is, to the best of my knowledge, the only panel micro data set (covering five years) on MNC production and trade for a country other than the U.S. It is, furthermore, the first time that the factors, including trade policy, determining MNC production and trade have been analyzed on the basis of such a comprehensive data set.[2]

Although it is outside the scope of this paper to attempt an evaluation of the effects of the internal market program on non—EC exports, a few words need be said on how the 1992 program may affect non—EC members. One important aim of the internal market is to eliminate remaining barriers to trade in goods and services between the EC countries. The program includes the elimination of border controls, of divergent technical standards for products, of discriminatory public procurement practices and regulations of different service sectors.

None of the proposed changes (necessarily) implies higher barriers to trade for non—members in absolute terms. Some even imply lower trade barriers for

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[1] Lundberg (1976) has shown that the creation of the EC and EFTA led to trade diversion of Swedish exports in the 1960's.

[2] Earlier studies in a similar vein include Swedenborg (1979, 1982) Lipsey and Weiss (1984).

non-members as well. But most imply larger reductions in trading costs for EC members than for non-members and therefore a competitive disadvantage in EC trade for non-members relative to member countries. This will cause trade diversion in that some of the increased trade within the EC will be at the expense of trade with outsiders. In addition, some measures will lead (directly or indirectly) to lower costs of production in the EC and improved competitiveness of EC producers, regardless of where the output is sold.

Not only do the different measures have different effects but both the direct and indirect effects are complex and difficult to evaluate. For example, the elimination of border controls between the EC countries will benefit EC trade but it will also benefit Swedish transit trade in the EC. Swedish exports will only have to pass through customs once, i.e., upon entry into the EC. On the other hand, the most important effect of the removal of border obstacles is not expected to be the direct resource saving (administrative handling, waiting time at the border, etc) but the increase in cross-border competition. The latter will not affect producers outside the EC market, who are shielded from such competition by border obstacles. (Commission of the European Communities, 1988)

Thus, there is a discriminatory element in the 1992 program for non-members which should affect both the cost of trade and the productive efficiency of EC producers relative to non-EC producers. In many ways this should be similar to the discriminatory effect on non-member countries of the creation of the EC. For Sweden, the polar case of hypothetical membership in the EC should be suggested by the removal of trade barriers within EFTA, of which Sweden is a member, in the 1960's and the free trade agreement with the EC in the 1970's.

The paper is organized as follows. Section 2 suggests how the effects of trade policy on the location of production can be analyzed in a partial equilibrium framework of a monopolistically competitive firm serving many national markets and able to produce in different countries. Section 3 presents some data on the size and growth of Swedish MNC's. Section 4 describes the regression equations and section 5 presents the empirical results. Section 6 contains the conclusions.

2. Integration and the location of production by multinational firms

The location of production and the pattern of trade between countries are determined simultaneously and by the same set of factors. According to the classical theory of comparative advantage both are determined by differences in relative factor prices, which, in turn, are determined by differences in relative factor endowments between countries. However, the theory of comparative advantage cannot explain why a considerable part of international trade occurs between countries with similar relative factor endowments and factor prices – like, for example, the European countries. Instead, empirical observation suggests that much trade between the industrial countries is not determined by comparative advantage but by product differentiation in combination with scale economies. Modern trade theory, therefore, stresses scale economies and, its corollary, imperfect competition as bases for trade.

Imperfect competition is also required to analyze another important empirical phenomenon, namely, the role of multinational companies (MNC's). Basically, the multinational growth of national firms can be explained by the existence of firm–specific assets, which are not freely transferable between firms but which are available within different parts of the same firm, regardless of location. This firm–specific asset can be in the form of headquarter services, e.g., R&D or management know–how, which can be produced in the home country and then be made available to production plants in different countries. (Hymer, 1960, Kindleberger, 1969, Caves, 1971, Krugman, 1983, Helpman, 1984, among others).

Firm–specific assets can create product differentiation and give rise to imperfect competition. They also give rise to economies of scale at the firm level insofar that investment in such assets entails a fixed cost. Actually, two kinds of scale economies are relevant to the theory of MNC's. Fixed costs in the production of headquarter services yield increasing returns to scale at the firm level. These affect the size of the firm but not the location of production. Plants can be established in different countries to take advantage of differences in production costs, to reduce transportation costs or avoid tariffs. The existence of such costs is compatible with multiplant production and with "footloose" MNC's producing in many countries.

Fixed costs in goods production yield increasing returns to scale at the plant level and affect location. They will lead to production being concentrated in one or a few large plants. These will tend to be located in the countries with the lowest costs or the largest home market, the latter because the firm can thereby avoid tariffs and other trading costs in its largest markets.

The growth of MNC's and foreign direct investment in the "new" theory of international trade does not primarily involve an international flow of capital but international trade in (firm–specific) information or knowledge, knowledge of how to produce a differentiated product. The presence of MNC's affects the international location of production in that the knowledge transfer makes it possible to produce a particular differentiated product in countries other than the home country. (Helpman and Krugman, 1985) The MNC thereby becomes a vehicle for overcoming barriers to trade between countries and MNC production abroad becomes a more ready substitute for production at home for exports.

What determines the firm's choice between exports from the home country and production abroad? This question can usefully be analyzed in a partial equilibrium framework of a firm serving many national markets and having the option of producing in different countries. (Horst, 1969, Swedenborg, 1979)

Consider the following simple model of a profit–maximizing, single–product firm in a two–country setting, which is illustrated graphically in in Figure 1. The firm faces a less than infinitely elastic demand in both markets, e.g., because of monopolistic competition. Marginal costs are increasing at both locations. Furthermore, domestic sales (S_H) are assumed to come from domestic production (Q_H), while foreign sales (S_A) can be supplied both through exports from the home country (S_X) and through production abroad (Q_A). The price at home is a function P_H of home sales $(Q_H - S_X)$ and the price abroad is a function P_A of foreign sales $(Q_A + S_X)$. Total costs at home (C_H) and abroad (C_A) are functions of the volume of home and foreign production respectively.

The firm's profit function, then, is

(1) $\pi = P_H(Q_H - S_X) \cdot (Q_H - S_X) + P_A(Q_A + S_X) \cdot (Q_A + S_X) -$
        $- C_H(Q_H) - C_A(Q_A)$

and profit maximization implies

(2) $\dfrac{\delta\pi}{\delta Q_H} = \dfrac{\delta P_H}{\delta Q_H}(Q_H - S_X) + P_H - \dfrac{\delta C_H}{\delta Q_H}(Q_H) = 0$

(3) $\dfrac{\delta\pi}{\delta Q_A} = \dfrac{\delta P_A}{\delta Q_A}(Q_A + S_X) + P_A - \dfrac{\delta C_A}{\delta Q_A}(Q_A) = 0$

(4) $\dfrac{\delta\pi}{\delta S_X} = -\dfrac{\delta P_H}{\delta S_X}(Q_H - S_X) - P_H + \dfrac{\delta P_A}{\delta S_X}(Q_A + S_X) + P_A = 0$

Profit maximization requires that marginal revenue at home equals marginal cost at home (equ. (2)), that marginal revenue abroad equals marginal cost abroad (equ. (3)) and that marginal revenue at home equals marginal revenue abroad (equ. (4)). These conditions determine the level of domestic production, Q_H, foreign production, Q_A, and exports, S_X, as well as the level of domestic sales $(S_H = Q_H - S_X)$ and foreign sales $(S_A = Q_A - S_X)$.

In Figure 1 we show the marginal revenue curves, MR_H and MR_A respectively. Supply in the home country is equal to the firm's marginal cost schedule for domestic production, MC_H. The export supply schedule, ES_X, corresponds to the horizontal distance between MC_H and MR_H. Therefore, marginal cost equals marginal revenue in the exporting country at all points along it and equ. (2) is satisfied. Total supply in the foreign market, $MC_A + ES_X$, is equal to the firm's export supply plus its foreign supply schedule, horizontally summed so that marginal cost abroad equals "marginal cost of exporting" $(MC_H = MR_H)$ at all points along it. At the intersection of the

total foreign supply schedule and the foreign marginal revenue schedule, MR_A, the firm's profits are maximized. At points A, B and C equ. (2) − (4) are satisfied. This gives the optimal volume of sales abroad, S_A. The quantity S_X is exported and Q_A is produced abroad. The equilibrium level of sales in the home country is S_H.

The assumptions of imperfect competition (negatively sloped demand) and increasing marginal costs are not idle in this context. The former must hold at least in the home market if the firm is to have determinate levels of sales in both countries. The latter must hold if the firm is to use both exports and foreign production to supply the foreign market. Since MNC's typically both export and produce abroad, production must be characterized by rising marginal cost in the relevant range of output. This applies to the single−product firm. For the multiproduct firm it is clearly possible that marginal cost for each product is constant or decreasing, in which case different products will be produced in the two countries.

The diagrammatic representation can be used to illustrate the effects of European trade policy on Swedish firms since the mid−1960's, as in Figures 2a − 2c. I assume that tariffs on home exports can be shown as an added cost of exporting. Figure 2a, then, illustrates the removal of tariffs. The initial situation is given by the foreign supply schedule $MC_X + MC_A$, assumed to include tariffs on exports, and the level of foreign sales S_A. The removal of tariffs leads to a downward shift in the export supply schedule to MC'_X, and in the total foreign supply schedule to $MC'_X + MC_A$. This leads to an increase in exports (to S'_X) and a decrease in foreign production (to Q'_A). Since exports and foreign production are alternative sources of supply for the firm, any

Figure 1   Determination of the firm's sales and output in two countries
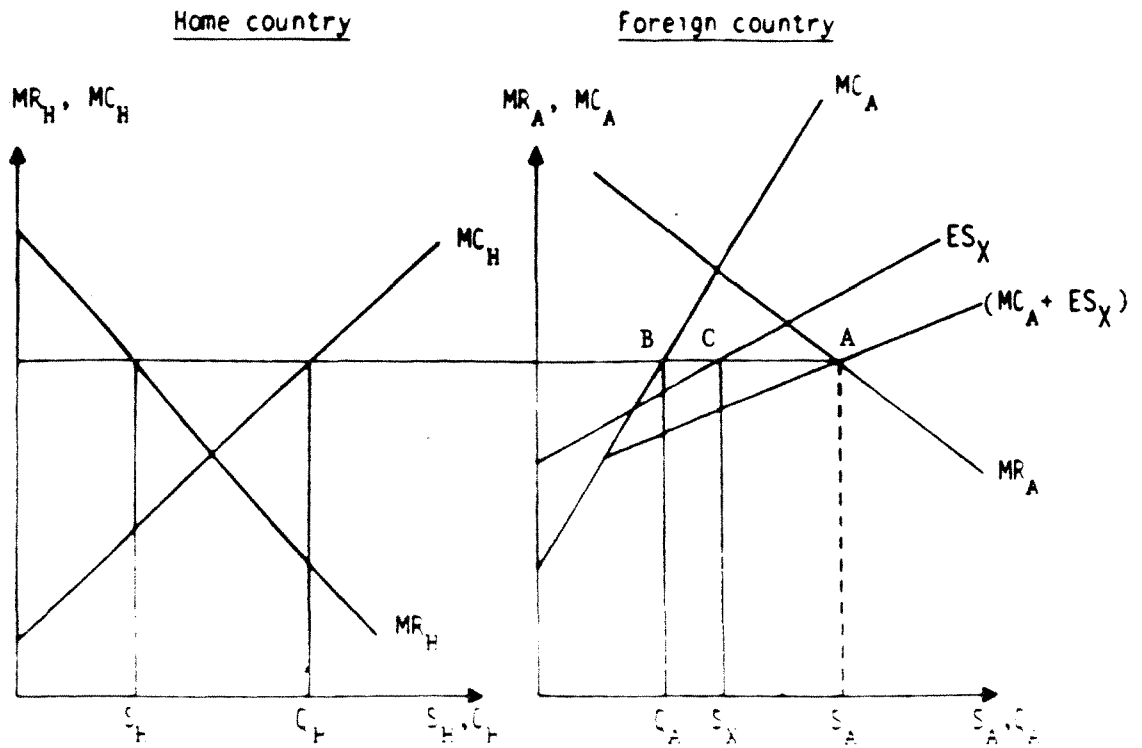
The conditions for profit maximization are

$$MC_H = MR_H$$

$$MC_A = MR_A$$

$$MR_H = MR_A$$

Figure 2a   The removal of tariffs against the home country: EFTA in the 1960's, EC in the 1970's
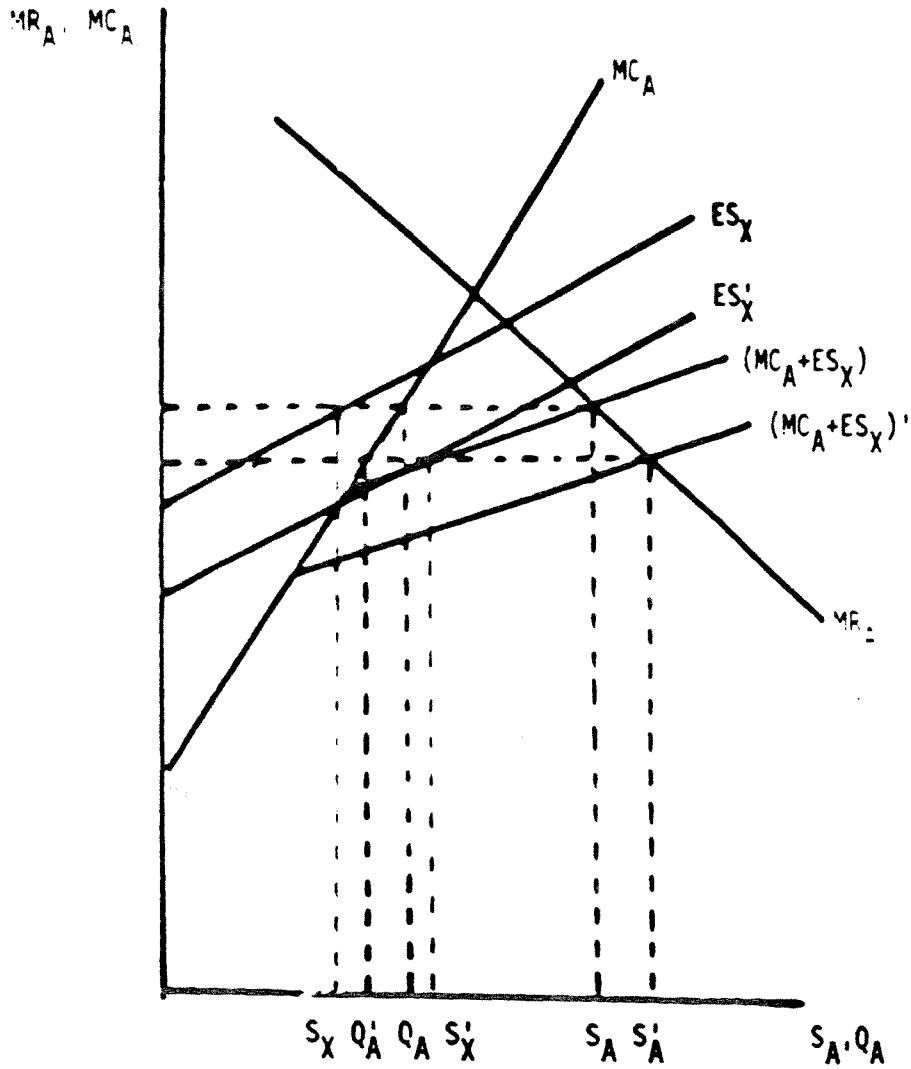
Figure 2b   The removal of tariffs against third countries: EC in the
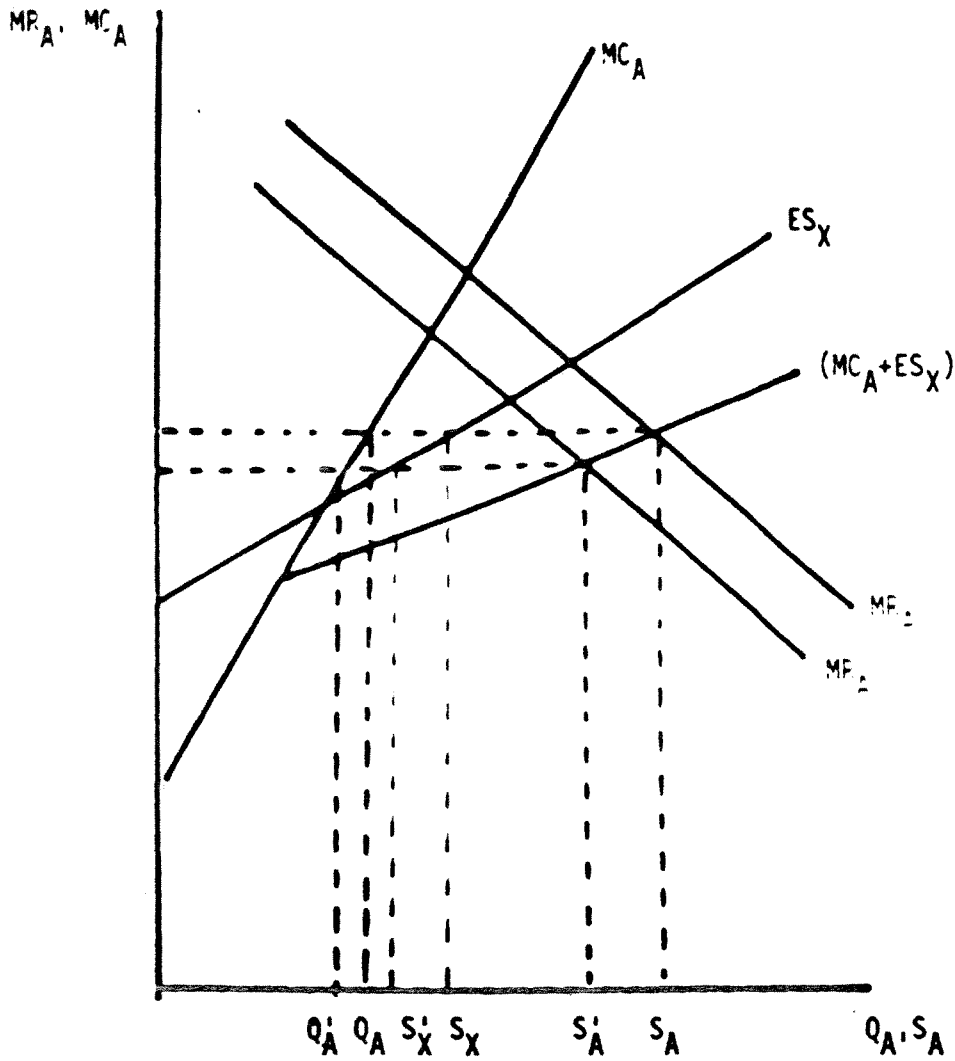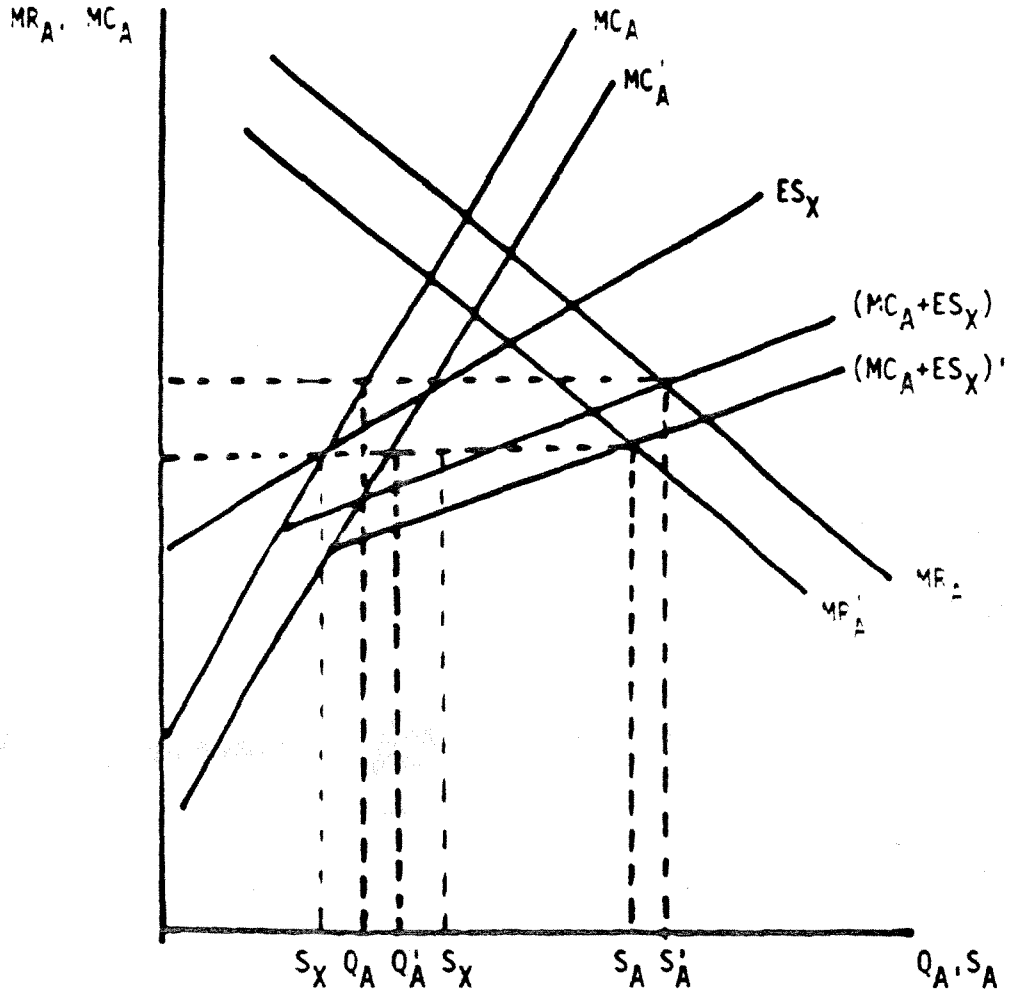1960's

Figure 2c   The removal of trade barriers against third countries and increased production efficiency in the foreign country: EC's internal market after 1992

exogenous change which affects their relative cost will lead to an increase in one and a decrease in the other. [3]

Figure 2a, then, summarily describes the effect on Swedish MNC's of the elimination of tariffs between the EFTA countries, including Sweden, in the 1960's. The effects of the discriminatory tariff reduction in the EC in the same period is illustrated in Figure 2b. Lower tariffs between EC members means lower prices of substitute products and translates into a downward shift in the MR_A schedule of Swedish firms (to $MR_A^{'}$). As seen in Figure 2b that means a fall in both exports and foreign production (to $S_X^{'}$ and $Q_A^{'}$ respectively). It does not affect the cost of exporting relative to producing abroad and the question of which of the two will be most adversely affected depends on their respective supply elasticities.

The absence of a differential impact on exports and foreign production in Figure 2b is, perhaps, counterintuitive. It depends on the restrictive assumption that foreign subsidiaries produce only for the local market. If that assumption is dropped and one allows for the possibility that they export to other EC countries, then Swedish—owned subsidiaries in one EC country would benefit just as other EC firms from lower tariffs on intra—EC exports. It would lower their export costs and lead to an increase in production in the EC country where they have production. This, undoubtedly, is a more realistic scenario, even though it requires going outside the simple framework of Figure 2b. (A similar modification would have to be made for EFTA subsidiaries exporting to other EFTA countries in Figure 2a.)

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[3] Note that this is a separate question from the much discussed issue of the "effect" of foreign production on exports, i.e., of whether exports are larger or smaller in a world with MNC's compared to hypothetical one where they are not allowed. Since exports and foreign production are both endogenous variables, the question makes sense only if foreign production can be treated as a policy variable, e.g., because of foreign investment controls. The answer to the question then depends on whether, in the case of multi—product firms, foreign production and exports are net complements, the increase in exports in Figure 2a will be smaller in a world where foreign production is allowed. For a fuller treatment, see Swedenborg (1979) but also Blomström et al. (1989).

The free trade agreement between the EC and EFTA in 1973 means that we are back in Figure 2a. Swedish exports benefit from the EC gradually eliminating its tariffs vis-à-vis EFTA. Foreign production declines.

The effects of the EC internal market are expected to be different from those that occurred in the EC in the 1960's, mainly because of the diversity of non-tariff barriers to be removed. Figure 2c only illustrates those changes which are expected to have a differential impact on EC and non-EC producers. On the one hand, the discriminatory reduction of some trade barriers between members should lead to a downward shift in the MR schedule, as in Figure 2b. On the other hand, lower costs for EC producers (due to, e.g., domestic deregulation) is expected to shift the MC of EC production down. (This would be reinforced by the above-mentioned positive effect on intra-EC exports.) As seen in Figure 2c the effect on exports of these changes are unambiguously negative. The net effect on foreign production, however, depends on the relative strength of two opposing influences. Still, the net effect of the internal market should be one of substitution of foreign production for exports.

3. Some empirical magnitudes

How potentially important are these effects? The first thing to note is that Sweden is a sizeable net foreign manufacturing investor. Swedish MNC's, defined as firms which have manufacturing affiliates abroad, make up a large part of Swedish industry. They account for some 50% of manufacturing employment in Sweden, almost 60% of Swedish exports, and around 90% of industrial R&D in Sweden. Furthermore, their total foreign employment (in both manufacturing and sales affiliates) correspond to half of Swedish manufacturing employment.

Second, Swedish MNC's are highly internationalized. In 1986, less than 1/4 of their total sales were sold in the home market. Of the 3/4 sold in foreign markets well over half was produced abroad.

Third, the EC is by far the single most important market for Swedish industry. It accounts for about half of both total Swedish exports and total

foreign production. For Swedish MNC's it is, in fact, much larger than the Swedish home market (38% compared to 24% of global MNC sales in 1986).

In general, both foreign production and total Swedish exports are highly concentrated to a few trading regions. Thus, the EC and EFTA countries along with the United States account for some 85% of both total MNC production abroad and total Swedish exports (Swedenborg et al., 1989).

One might argue, as does Lipsey (1990) in the case of U.S. MNC's, that Swedish MNC's are already well positioned within the EC with local production and can take advantage of many of the changes that will take place. That is true to a large extent. However, unlike U.S. firms, Swedish firms also have substantial exports to the EC from Sweden. Hence, a change in the cost of exports relative to EC production can cause these firms to supply an even larger share of their EC sales from local production. It can also cause new firms to enter the multinational arena with EC production.

Table 1 shows the ratio of foreign production to total Swedish sales abroad, i.e., total Swedish exports plus foreign production by Swedish MNC's, in different regions in the period 1965–86. Foreign production, here, measures total foreign production, and thus includes affiliate exports to other countries on the assumption that such exports to third countries are mainly intra–regional trade. There is reason to believe that this assumption is approximately valid. If so, differences in the ratio between regions, and changes over time, should be due to factors affecting locational choice.

It is worth noting that in 1965 the ratio of foreign production to total foreign sales was much higher in the original EC countries than in the original EFTA countries. Part of this difference is due to the fact that the neighboring Nordic countries (Denmark, Norway, Finland), with which Sweden traditionally has had extensive trade, were then part of EFTA. The fact that the ratio rose very rapidly in the EC in the period 1965–74, while it fell somewhat in the EFTA countries, could be due to changes in tariffs within the two trading blocs, however. After the 1973 free trade agreement between the blocs, the ratio rises more slowly in the EC, while there appears to be a "catching up" in the EFTA countries as well as the EC3 countries. The latter

group consists of Denmark and Great Britain, which left EFTA in 1973 to become members of an expanded EC, plus Ireland. Given the free trade agreement, EC3 did not raise trade barriers against their former EFTA partners, however.

Outside the European countries it is noteworthy that the ratio of foreign production to total sales in 1965 was also quite high in the U.S. and in Latin America. In the case of Latin America this was, and still is, due to nearly prohibitive trade barriers which have strongly favored foreign production relative to exports from Sweden. The high ratio in the U.S. in 1965 or the dramatic increase in 1978–86 cannot be explained similarly, however. In most regions, finally, the ratio of foreign production to total foreign sales has risen sharply after 1978.

The next section contains an analysis of some of the determinants of the observed differences between countries in the choice between exports and foreign production by Swedish MNC's with particular emphasis on the role of European trade policy.

Table 1   Foreign production relative to total sales abroad by Swedish firms 1965–86
                 Percent

	1965	1970	1974	1978	1986
EG 6	35	42	43	47	46
EG 3	14	15	14	22	24
EFTA	14	14	12	16	18
USA	47	36	37	46	58
Latin America	42	49	46	65	63
All countries	27	29	28	34	38

Source: Swedenborg et al., 1989

4. European trade policy and the locational choice of Swedish MNC's: an empirical analysis

We now turn to an empirical analysis of the role of European trade policy on exports and foreign production by Swedish MNC's. The data to be used are micro data on Swedish MNC's in the manufacturing sector collected at the Industrial Institute for Economic and Social Research (IUI) in Stockholm. They cover all MNC's in each of five years during a 20−year period (1965−86).[4]

In regression analyses across both firms and countries and over time I will seek to determine primarily whether the creation of the EC and EFTA, and the changes that took place after 1973, have had the expected effects on Swedish exports to and foreign production in these countries. In doing so it is necessary to hold constant other characteristics of both firms and countries which make for differences (and changes) in exports and foreign production. These characteristics, of course, are also of interest and have implications in the context of the EC internal market, but they are not the main focus of interest here.

In effect, the regression model that I will estimate will include as exogenous variables the characteristics which affect costs of exporting and foreign production respectively and the size of foreign demand (cf Figure 1 above). They include both characteristics of firms and of countries.

The firm characteristics that will be controlled for are measures of R&D intensity (RD), labor skill intensity (LS), capital intensity (KL), natural resource intensity (NR) and the age of the firm's foreign manufacturing in the particular country (YR). Of these, R&D intensity is expected to reflect a firm specific asset based on R&D and as such have a positive effect on both exports and foreign production. R&D intensity is, of course, a flow variable but it is expected to be related to the firm's stock of R&D knowledge. The age of foreign manufacturing could reflect a firm−specific asset based on learning (as a function of time), but it could also simply reflect the fact that

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[4] The data have been described in, inter al., Swedenborg (1979) and Swedenborg et al. (1988).

it takes time to grow large and that the current size of the firm depends on when it started growing. In either case, it captures the effect of dynamic-historical factors on current states. It is expected to have a positive effect on mainly foreign production. It may also have a positive effect on exports, since the length of time the firm has had production abroad is likely to be correlated with the length of time it has been an exporter.

Skill, physical capital and natural resource intensity are factor proportions variables and assumed related to Sweden's comparative advantage in production. As such, they are expected to favor exports from Sweden relative to production abroad.[5]

The country characteristics that will be taken account of are market size (GDP) and income per capita (GDPcap) to capture differences in demand between countries and a measure of relative wages (wage in country j relative to at home, w_j/w_H). A large market and high per capita income – assuming that Swedish products are adapted to high income markets – should have a positive effect on both exports and foreign production, though it is possible that market size could differentially favor foreign production in the presence of scale economies. The influence of the relative wage measure is ambiguous. It could reflect differences in labor costs between countries and, thereby, affect location. But it could also capture demand differences, since wage levels and per capita incomes are highly correlated.

The influence of trade policy will be proxied by dummy variables for the original EC countries (EC) and for the original EFTA countries (EFTA). The fact that England and Denmark left EFTA to join the EC in 1973 should not (and, in fact, does not) make a difference, since that did not entail a change in trade policy vis–à–vis the former EFTA partners. Ten other countries are included in the regressions without dummy variables, so the trade bloc dummies show the effect of European trade barriers relative to trade barriers of other countries.[6]

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[5] The revealed comparative advantage of Sweden has been analyzed in a number of studies, e.g., Carlsson and Ohlsson, 1976, Ohlsson, 1980, Flam, 1981, Gavelin, 1983, Lundberg, 1990.

[6] The other countries are Spain, the U.S., Canada, Brazil, Argentina, Mexico, South Africa, India, Australia, New Zeeland.

The trade bloc dummies are expected to have the effects discussed in connection with Figures 2a and 2b above. Since these dummies may capture other characteristics of these countries than trade policy, e.g., geographic and cultural proximity, we will pay less attention to the absolute size of their coefficients and more to their relative size and to shifts in these coefficients over time.

To make the most use of the data I will pool the cross–section and time–series observations and use dummy variables to hold, alternatively, unique time effects (D_t) and unique firm characteristics (Z_i) constant. The dummy variables affect the intercept, while the slope coefficients are constrained to be the same across years and across firms respectively.[7] The first model amounts to estimating the average cross–sectional relationship over time, while the second amounts to estimating the average time–series relationship across firms. Estimating the average effect of the independent variables in the 20–year period, as in the time dummy variable model, is justified if there is no a priori reason to expect that this relationship should have changed. In the case of the trade bloc dummies, we do expect them to change, however. Specifically, we expect the EC to have a different effect after the 1973 free trade agreement with the EFTA countries. We deal with this by using separate dummies for the 1965–74 period (since the tariff reductions did not come instantaneously) and the 1978–86 period respectively.

The equations that I will estimate using the time dummy variable model are

$$(5) \quad SX_{ijt} = a_0 + a_t D_t + b_1 RD_{it} + b_2 LS_{it} + b_3 KL_i + b_4 NR_i +$$
$$b_5 YR_{ijt} + b_6 \left(\frac{W_i}{W_H}\right)_{it} + b_7 GDP_{jt} + b_8 GDPcap_{jt} +$$
$$b_9 EC_{65\text{-}74j} + b_{10} EC_{78\text{-}86j} + b_{11} EFTA_j + \varepsilon_{ijt}$$

$$(6) \quad SQ_{ijt} = c_0 + c_t D_t + d_1 RD_{it} + d_2 LS_{it} + d_3 KL_{it} + d_4 NR_i +$$
$$d_5 YR_{ijt} + d_6 \left(\frac{W_i}{W_H}\right)_{it} + d_7 GDP_{jt} + d_8 GDPcap_{jt} +$$
$$d_9 EC_{65\text{-}74j} + d_{10} EC_{78\text{-}86j} + d_{11} EFTA_j + \mu_{ijt}$$

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[7] These are two versions of the least squares dummy variable model. See Kmenta, 1986.

In the firm dummy variable model Z_i replaces D_t. The regressions are in double logarithmic form.

<u>where</u>

$i = 1....n$ (firms)
$j = 1....m$ (countries)
$t = 1....5$ (1965, 1970, 1974, 1978, 1986)

D_t =   dummy variable for year 2...5.

Z_i =   dummy variable for firm 2...n.

SX_{ij} =   exports of firm i to country j for local sale (parent exports to j less exports to manufacturing affiliate weighted with affiliate export share, i.e., with $\left[\dfrac{\text{gross sales–net sales}}{\text{gross sales}}\right]$)

SQ_{ij} =   production by firm i in country j for sale in country j (affiliate local sales net of imports from the Swedish parent (net sales/gross sales), where the weighting is necessary to take account of the fact that imports from Swedish parent are also exported from j).

RD_i =   R&D intensity (the firm's total R&D expenditures relative to global sales)

LS_i =   skill intensity (average wage in the parent company)

KL_i =   physical capital intensity (book value of property, plant and equipment relative to employment in the parent company)

NR_i =   dummy variable for the steel industry and paper and pulp industry, i.e., industries intensive in Swedish natural resources

YR_{ij} =   age of the firm's oldest manufacturing affiliate in country j

$(\frac{W_i}{W_H})_i$ =   average wage in the firm's manufacturing affiliates relative to wage per employee in the parent company

GDP_j =   real GDP in country j

$GDPcap_j$ =   real GDP per capita in country j

EC_{65-74} =   dummy variable for original EC member countries (Italy, France, the Netherlands, Belgium–Luxemburg, West Germany) in 1965, 1970 and 1974

EC_{78-86} =   dummy varible for original EC member countries in 1978 and 1986

EFTA = dummy varible for EFTA countries (Denmark, Norway, Finland, England, Austria, Switzerland and Portugal)

All monetary firm variables are in constant prices (deflated with the Swedish export price index). All variables, except GDP and GDPcap., are from the IUI data base. GDP and GDPcap. are from Summers and Heston (1988).

Table 2 summarizes the expected influence of the independent variables on the dependent variables.

Table 2   The expected effect of the exogenous variables on the volume of exports (SX) and the volume of foreign production (SQ)

Dep var.	Firm characteristics (i)					Country characteristics (j)		
	RD	LS	KL	NR	YR_{ij}	GDP	GDPcap	$w_j w_h$
SX	+	+	+	+	(?)	+	+	(+)
SQ	+	−	−	−	+	+	+	(−)

	Country characteristics, cont.		
	EC_{65-74}	EC_{78-86}	EFTA
SX	−	+	+
SQ	−	−	−

5. Results

Table 3 shows the results of the pooled regressions when the effect of time on the intercept is held constant. Table 4 shows the results of the pooled "time–series" where unique firm characteristics are held constant with dummy variables for each firm. Here, I will mainly comment on the results obtained with the first model, since the model with dummy variables for each firm yields consistent results. It also yields higher $\bar{R}^2$ but the unique firm dummies (which are mostly significant) reduce the influence of common firm characteristics. Evidently, unique firm dummies contain these common characteristics but capture other characteristics as well.

In Table 3 we find that R&D intensity and natural resource intensity are the most important firm characteristics determining the volume of exports, while the age of foreign manufacturing (YR) is the most important determinant of the volume of foreign production.[8] Thus, a firm–specific asset based on R&D importantly affects the competitive advantage of Swedish MNC's.

Of the factor proportions variables, intensive use of domestic natural resources (NR) is the most significant and then only in the exports equation. Since the natural resource intensive industries also are characterized by substantial scale economies, the NR variable probably captures the combined effect of both of these on the location of production. Physical capital intensity (KL) has a positive effect on both exports and foreign production while skill intensity is insignificant. Neither, then, affects locational choice.

The age variable has a strong positive effect on especially foreign production, as expected. It underlines the importance of dynamic–historical factors. One interpretation, which is consistent with the "new" theory of international

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[8] It is worth noting, however, that in cross–sections across firms only (total exports and total foreign production) R&D intensity has an equally positive effect also in the foreign production equation. Cross–sectional analysis across firms only seems the more appropriate method of analyzing firm determinants of competitive advantage, since in the combined country and firm regressions firms which are represented with production in many countries are given a larger weight than those which may be equally large but produce in fewer countries. See Swedenborg (1989).

trade, is that the competitive positions of firms to a large extent depends on scale economies based on an arbitrary, historically determined specialization.

In sum, the results suggest that both the factor proportions theory and the "new" trade theory are relevant in explaining the competitive position of firms and the relative size of exports and foreign production.

Of the country characteristics, market size (GDP) has a positive effect on both exports and foreign production, while income per capita (GDP cap) has a positive effect only on exports. The relative wage variable was dropped because it was highly correlated with per capita income. Thus, market size has no differential impact on foreign production, while high per capita income (high relative wages) strongly favors exporting relative to foreign production. The differential impact is seen most clearly in the last column, where the dependent variable is exports relative to foreign production.

Looking, finally, at the trade bloc dummies we find that EFTA has a strong, positive effect on exports and a negative effect on foreign production, as expected. The EC, too, has a positive, though smaller, effect on exports in the period 1965–74. As noted earlier, the positive effect on, especially, exports of both EFTA and the EC probably reflects other characteristics of these country groups as well (geographic proximity, traditional commercial ties, etc). The EC differs from EFTA, however, in also having a positive effect on foreign production in this period and, hence, having less of an impact on locational choice. Again, this is seen most clearly when the dependent variable is the ratio of exports to foreign production.

Furthermore, in the period 1978–86, i.e., after the free trade agreement, there is the hypothesized shift in the EC coefficient in both the exports and foreign production equations. The positive effect on exports is much stronger and the positive effect on foreign production disappears. In the third column we note the strong differential effect on exports relative to foreign production. Table 4 broadly confirms these results.

In sum, although the sign of the EC coefficients in the 1965–74 period does not conform to the predictions of our simple analytical framework due to the crude measure of trade policy, the general results nevertheless do.

Table 3 Determinants of exports and foreign production in different countries 1965–1986: Pooled cross–section with time dummy (Log)

Indep. var.	Exports (SX)	Foreign prod. (SQ)	Exports/ for. prod. (SX/SQ)
Constant	−.83	4.32** (3.88)	−5.16** (−3.88)
RD	.47** (10.78)	.10** (2.92)	.37** (9.17)
LS	−.28 (−1.46)	−.22 (−1.51)	−.05
KL	.26** (3.17)	.23** (3.55)	.03
NR	2.20** (9.88)	.21 (1.21)	1.99** (9.63)
YR	.39** (8.51)	.64** (17.79)	−.25** (−5.73)
GDP	.30** (6.06)	.29** (7.34)	.01
GDP/cap.	.57** (5.13)	−.09 (−1.09)	.66** (6.44)
EFTA	.76** (4.85)	−.30** (−2.49)	1.06** (7.31)
EC₆₅₋₇₄	.41** (2.56)	.22* (1.75)	.19 (1.29)
EC₇₈₋₈₆	.63** (3.64)	−.02	.65** (4.04)
DT1	.07	.24* (1.70)	−.17
DT2	.53** (2.92)	.32** (2.26)	.21 (1.25)
DT3	.38* (1.73)	.60** (3.49)	−.22 (−1.06)
DT4	.65** (2.90)	.82** (4.72)	−0.17
N	1 464	1 464	1 464
DF	1 450	1 450	1 450
R̄²	.27	.29	.21
F	40.53	44.30	28.10

Variables are defined on p. 21.
Numbers in parentheses are t-statistics. t<1 not shown.
*, ** indicate significance at the .10 and .05 level respectively.
N = number of observations
DF = degrees of freedom

Table 4   Determinants of exports and foreign production: Pooled time series
with firm dummy (Log) a)

Indep. var.	Exports (SX)	Foreign prod. (SQ)	Exports/ for. prod. (SX/SQ)
Constant	10.91**	−4.24**	−6.67**
	(−8.64)	(−3.70)	(−4.82)
RD	.13*	−.05	.18**
	(1.80)		(2.26)
LS	.11	.07	.04
KL	.33**	.29**	.04
	(2.89)	(2.80)	
NR	.06	−.14	.20
YR	.09**	.53**	−.45**
	(2.09)	(14.00)	(−9.69)
GDP	.49**	.45**	.03
	(12.11)	(12.49)	
GDP/cap.	.86**	.03	.82**
	(10.63)		(9.31)
EFTA	1.61**	.05	1.56**
	(12.84)		(11.36)
EC$_{65-74}$	.56**	.12	.43**
	(4.82)	(1.18)	(3.42)
EC$_{78-86}$	1.02**	.09	.92**
	(7.67)		(6.32)
Z$_2$...Z$_n$ b)			
N	1 173	1 173	1 173
DF	1 105	1 105	1 105
R̄^{2}	.66	.53	.53
F	34.25	20.53	20.57

a) Only firms which are present in at least three of the five years
are included.

b) 59 firm dummies (excluding the intercept) are in the
regressions. 33 are significant in the SX regression, 54 in the SQ
regression and 30 in the (SX/SQ) regression.

Variables are defined on p. 21.
Numbers in parentheses are t-statistics. t<1 not shown.
*, ** indicate significance at the .10 and .05 level respectively.
N = number of observations
DF = degrees of freedom

Specifically, they suggest that free trade within EFTA has strongly favored exports relative to foreign production and that the free trade agreement with the EC had the same effect after 1974.

6. Conclusions

This paper has suggested a theoretical framework within which to analyze the determinants of exports and foreign production by multinational companies (MNC's) and the effects of trade policy on their choice of location. It has also tested the implications of such a model on the exports and foreign production by Swedish MNC's in the period 1965–86. Briefly, the empirical results show the following.

The characteristics that explain the size and growth of MNC exports and foreign production are largely the same as those that explain the Swedish trade structure. (Cf Lundberg, 1990) R&D intensity has a strong positive effect on MNC export performance and the intensive use of domestic natural resources strongly favors exporting from Sweden relative to producing abroad. In addition, dynamic—historical factors (viz., the age of foreign manufacturing) play an important role in explaining the current size of exports and foreign production by firms, as predicted by the "new" theory of international trade which stresses product differentiation and dynamic scale economies as bases for international specialization and trade.

The size of the foreign market has an equally positive effect on exports and foreign production and does not provide an extra incentive to produce locally, as would have been the case if the attainment of scale economies were constrained by the size of the foreign market. High foreign per capita income, however, has a positive effect on exports but not on foreign production, which might be due to the fact that it captures not only demand—side factors (income elasticity of demand for Swedish products) but also supply—side factors (wage level) in the foreign country.

The choice between exporting and foreign production by MNC's appears to have been affected, in predictable ways, by the European integration process

in the period. The elimination of tariffs within EFTA, of which Sweden is a member, has meant higher exports to EFTA countries and lower MNC production than to the EC. After the 1973 free trade agreement between the EC and EFTA there was a noticeable and significant reversal towards increased MNC exports to the EC and decreased production in the EC. These results suggest that being part of a trade liberalizing area strongly encourages exporting relative to producing locally by home country MNC's.

What conclusions, if any, can we draw from this about the likely effects of EC 1992? For non—members the EC internal market will mean some discriminatory reduction in trade barriers within the EC, as did EC trade policy in the 1960's. But it is, in addition, expected to lead to lower production costs for EC producers (whether due to increased competition or to deregulation of services). Both should lead to an increased propensity to locate production within the EC.

To the extent that the internal market leads to higher growth, as expected by the EC Commission (1988), this should have a positive effect on both Swedish MNC exports and foreign production in the EC. Higher GDP and higher per capita incomes should mitigate the negative effect on both exports and foreign production of the discriminatory reduction in trade barriers, making the net effect on absolute volumes uncertain.

Still, I venture the following predictions. Non—participation for Sweden in the EC internal market should lead to an increase in EC production relative to exports from Sweden by Swedish MNC's. On the other hand, participation in the EC — through membership or some other form of agreement — should strongly favor exporting relative to producing in the EC by Swedish MNC's.

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