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Determinants and Effects of Multinational Growth
The Swedish Case Revisited

Birgitta Swedenborg

4.1 Introduction

The enormous growth of international direct investment and multinational corporations (MNCs) in the postwar period has raised challenging issues for international trade theory and practical policy alike. Robert Lipsey has contributed more than anyone else to our empirical knowledge of many of these issues, particularly our understanding of the relationship between international production and trade. Therefore, it seems fitting to devote this paper in a volume honoring Robert Lipsey to the relationship between MNC growth and trade.[1]

A seemingly perennial question in the debate over MNCs has been whether international production by MNCs reduces trade. Certainly, investing countries have been concerned that foreign production by home-country firms replaces exports and thereby exports jobs.[2] Much of the theory on international investment, too, implies a negative relationship in that it focuses on the choice between exports and foreign production in serving foreign markets. The prevalent view, however, is both too partial and too

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1. It is also fitting because Robert Lipsey has been a constant source of support and inspiration in my own earlier work in this area.

2. Analysis of this question goes back at least to reports by Reddaway (in collaboration with Perkins, Potter, and Taylor, 1967, and with Potter and Taylor, 1968) for the United Kingdom, and to the studies by Hufbauer and Adler (1968) and Lipsey and Weiss (1969, 1972) for the United States, while recent examples include the OECD (1995), Barrell and Pain (1997), and Blomström, Fors, and Lipsey (1997).

static. Reduced exports of some products need not mean reduced exports overall. Multinational production may mainly be a way by which home-country firms can grow larger by specializing production in different countries in accordance with the competitive advantage of each. Therefore, a more relevant question is how international production affects the patterns of specialization and employment in different countries. A related question is what, in a world of internationally mobile firms, determines the competitive advantages of countries as production locations. Both questions are of considerable policy interest today in many countries that are dependent on increasingly footloose MNCs, and that worry about their ability to attract or retain production by these companies. Sweden is such a country.

The purpose of this paper is to explore these issues by analyzing the determinants and effects of foreign investment by Sweden. Over the last decades, foreign production by Swedish firms has grown dramatically. What lies behind this growth and how has it affected exports from and specialization patterns in Sweden? What can it tell us about the competitive advantage of firms and of Sweden as a production location?

Sweden is a small country on the periphery of Europe. Nevertheless, it offers an interesting and natural case study, both because it is, relative to the size of its economy, a very large foreign investor, and because it is the only country other than the United States for which there exist continuous and detailed (firm-level) data on the international operations of its MNCs in the manufacturing sector. The data now cover the thirty-year period from 1965 to 1994.[3]

There are two main motivations for the present study. The first is that no one has yet analyzed the entire thirty-year period for which there is now data.[4] Much has changed in this period and the factors that explained the pattern of foreign production and exports in the earlier part of the period may not be the same as those that explain it in the later part. More importantly, the added time dimension in the data set allows us to study the dynamics of change. Previous analyses have been mainly cross-sectional, and differences between firms (or industries) have been interpreted as indicating the nature of the relationship over time between, for example, exports and foreign production. Yet, the relevance of cross-sectional evidence for making inferences about relationships that are es-

3. The data have been collected by the Research Institute of Industrial Economics (IUI) in Stockholm. I was responsible for the design of these surveys and the collection of data in the first four censuses covering 1965, 1970, 1974, 1978, and 1986.

4. My earlier analyses of the same or related issues covered the period 1965–78 and, in less detail, through 1986 (Swedenborg 1979, 1982, 1985, 1991) and Swedenborg, Johansson-Grahn, and Kinnwall 1988). Newer data include 1990 and 1994. The fact that most of this earlier analysis is not available in English provides further motivation for the present study. Recent analyses (in English) of Swedish direct investment do not fully exploit the time dimension of the data set. See, e.g., the recent contributions in Andersson, Fredriksson, and Svensson (1996), Svensson (1996b), and Braunerhjelm and Ekholm (1998).

sentially dynamic in nature is highly uncertain. The observed relationship may mainly reflect inherent differences between firms rather than a relationship that applies to all firms over time. Using firm data over several years allows us to actually analyze changes over time. Specifically, in an analysis that combines cross-sectional and longitudinal data, firm-specific fixed effects can be held constant and the relationship between variables that change over time can be distinguished. Here, we will study changes over a thirty-year period, something that has not been done before.

The second motivation for the present study is that the important question of the "effect" of foreign production on home-country exports and, indirectly, the pattern of employment, remains controversial. Different studies on Swedish data have reached different results. Earlier studies have shown either no effect on exports or modest net complementarity between foreign production and exports, while more recent ones have found considerable net substitutability. Renewed analysis can clarify whether these differences are due to differences in model specification and methods or in the time periods analyzed.

The policy issues underlying an analysis of the effects of international investment are different today from what they were in the 1970s. In those days, the issue in many investing countries was whether they should try to restrict foreign investment by home-country firms—assuming that could be done. Sweden, for example, retained controls on foreign direct investment up until the mid-1980s, when the final vestiges of its foreign-exchange regulations from 1939 were dismantled. Today, such controls are no longer on the political agenda. Instead, the policy issue is related to the determinants of a country's competitive advantage as a production location and whether the home country can attract or retain the kind of production that it would like. If high-skill production, R&D, and, ultimately, corporate headquarters are moved out of the country, it may signal problems that the home country may want to address through policy.

This paper is organized as follows: Section 4.2 briefly describes the importance of Swedish MNCs in the Swedish economy. Section 4.3 goes on to analyze the determinants of foreign production by Swedish manufacturing firms and the effects on parent-company exports over the period from 1965 to 1994. Section 4.4 discusses the effects on the firm's overall competitiveness and implications for changes in the pattern of specialization in the home country. Section 4.5 contains concluding remarks.

4.2 The Role of Swedish MNCs in the Swedish Economy, 1965–94

Relative to its size, the Swedish manufacturing industry is among the most multinational in the world. The ratio of employment in foreign manufacturing affiliates to total employment in Swedish manufacturing was 44 percent in 1994. In 1960, the ratio was 12 percent. The corresponding

Table 4.1 The Role of Swedish MNCs in the Swedish Economy (percent)

	1965	1994
Employment relative to Swedish manufacturing		
Manufacturing affiliates abroad	16	44
Swedish parents	35	40
	1965–1994	
Employment change		
Total manufacturing in Sweden	−36	
Swedish parents	−25	
Manufacturing affiliates abroad	181	
All affiliates abroad (including sales affiliates)	210	

figure for U.S. firms was 25 percent at its peak in 1977, after which it declined slightly (Lipsey 1995).

A small number of Swedish companies accounts for the growing internationalization of Swedish manufacturing. Only some 130 corporations had manufacturing affiliates abroad in 1994. The number of companies has always been small, but the population of parent companies has, of course, changed through mergers, acquisitions, divestitures, and the disappearance of old and the entry of new MNCs. Nevertheless, Swedish MNCs have consistently made up a large part of Swedish manufacturing. In 1994 they accounted for some 40 percent of Swedish manufacturing employment, some 55 percent of total Swedish exports, and as much as 90 percent of industrial R&D. In other words, they are on average very large, very export oriented, and very R&D intensive.

Throughout the period 1965–94 MNCs as a group have shown higher employment growth in Sweden than has the rest of the Swedish manufacturing industry, which, in the period of stagnant or falling manufacturing employment since the mid-1970s, has meant that they have reduced their employment relatively less than other firms. Employment in their foreign manufacturing affiliates increased steadily up to 1990 but dropped off from 1990 to 1994, with the onset of the economic crisis in Sweden in the early 1990s and a downturn in major markets. For the whole thirty-year period an employment decline in the Swedish manufacturing industry by 36 percent and in Swedish parents by 25 percent contrasts with manufacturing-affiliate employment growth of 181 percent and total foreign-employment growth (including sales affiliates) of 210 percent. Table 4.1 summarizes these developments.

Figure 4.1 gives a snapshot of the relentless internationalization of the MNCs themselves. Foreign production has steadily grown as a share of their total sales, exporting from Sweden has roughly held its share, and sales in the home market have shrunk to just over 10 percent of total sales in 1994.

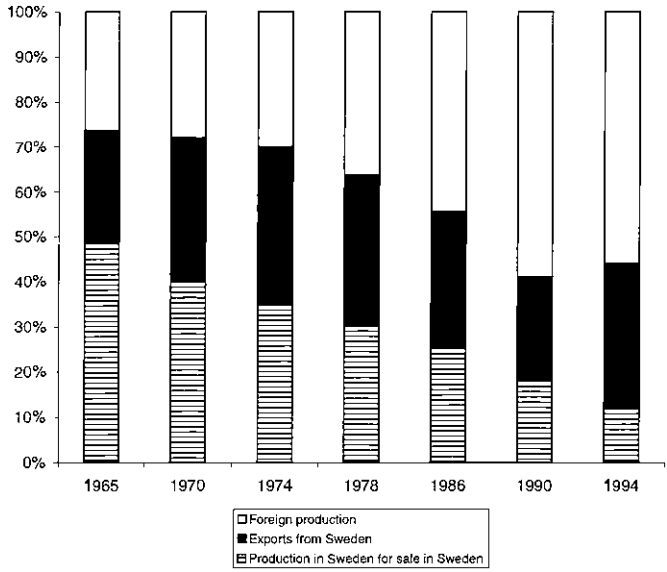

Fig. 4.1 The internationalization of Swedish MNCs 1965–94: total company sales divided into home production for home sale, exports, and foreign production (percent)

Note: Foreign production includes affiliate exports to Sweden. In order to get total sales in the home market, exports from affiliates back to Sweden must be added to "production in Sweden for sales in Sweden." Affiliate exports to Sweden was around 4 percent of total company sales in 1994.

4.3 Determinants and Effects of Foreign Production by Swedish MNCs

An important reason for Sweden's historical position as a large (net) foreign investor can be found in the small size of its home market and in the country's traditional dependence on being able to sell in foreign markets. For Swedish firms, foreign production has been an alternative to exports in serving foreign markets. Historically, only a negligible fraction of foreign output has been exported back to the home market. This is in contrast to foreign production by MNCs from countries such as the United States and Britain, for whom exports back to their large home markets have been more important. The close relationship between exports and foreign production for Swedish firms is also reflected in their geographical patterns. Foreign manufacturing is concentrated among the industrial countries (some 90 percent), and within these, in Western Europe, specifically the European Union (EU; more than 60 percent), which corresponds roughly to the geographical pattern of Swedish exports.

But what is the nature of the competitive advantage of Swedish MNCs in foreign markets, and what has determined whether they serve these markets through exports or foreign production?

Modern theory sees the competitive advantage of MNCs as based on a

firm-specific asset such as superior knowledge, which, once produced, can be used at little or no additional cost throughout the firm and regardless of location. (The original references are Hymer 1976; Kindleberger 1969; Johnson 1970; Caves 1971. See, e.g., Markusen 1995 for a recent statement.) Such an asset may be the result of investment in R&D or marketing, or it may be the result of learning by doing. It is specific to the firm but mobile within the firm and across national borders. It gives rise to economies of firm size or to multiplant economies of scale. It also implies imperfect competition. In this view, the size and growth of firms are determined to a large extent by their firm-specific knowledge advantage (Demsetz 1988).

The choice between exports and foreign production, on the other hand, depends on comparative production costs in different locations, trade barriers, and transportation costs. Comparative production costs may reflect differences in relative factor prices. Lower wages in a foreign country, for example, might induce firms to locate their more labor-intensive activities in that country. Comparative production costs may also depend on the ability to exploit economies of scale at the plant level when locating production in a particular country. When both scale economies and transportation costs are important, for example, the MNC will have fewer plants and will tend to locate them in large countries to minimize transportation costs. A country's competitive advantage as a production location, then, may depend on relative factor prices, the size of its market, and the distance to other markets. Tariff and nontariff barriers to trade tend, of course, to favor local production.

The previous explanation of a country's competitive advantage is an eclectic mixture drawn from different trade theories that actually give different predictions. According to the factor-proportions theory of trade, dissimilarity in relative factor prices and factor endowments determines specialization and trade. According to the imperfect-competition theory of trade, similarities in relative factor endowments encourage intraindustry trade in differentiated products. In the latter, the location of production is instead determined by the ability to exploit scale economies and by trading costs (Dunning 1977; Helpman and Krugman 1985). These theories are not mutually exclusive, however, since a country's output may consist of both homogeneous products, for which differences in factor proportions are important, and differentiated products, for which they are not. Each theory may, therefore, be relevant to explaining a part of a country's production and trade (Lancaster 1980; Dixit and Norman 1980; Brainard 1993).

Clearly, exports and foreign production are determined simultaneously, and largely by the same set of factors. Both are affected positively by the MNC's firm-specific competitive advantage, and both are affected in opposite directions by factors affecting locational choice. The latter explains the presumption in trade theory that the relationship between the two is

one of substitution. (Markusen [1998] describes a model in which they may be complements, however.) Yet, if exports and foreign production are determined simultaneously, how can one speak of the "effect" of foreign production on exports? What is generally intended here is the effect on exports compared to a situation in which an increase in foreign production is not allowed because of a policy restricting foreign investment. In this setting, foreign production becomes a policy variable. It is, of course, a hypothetical situation and defining the counterfactual is not easy. The latter has plagued most analyses of the effects of foreign production on exports (see Lipsey 1995 for an overview). In an econometric analysis the problem can be reduced by estimating the effect of foreign production by two-stage least squares regression analysis (2SLS), whereby foreign production becomes exogenous in the second stage of analysis (see Swedenborg 1979).

Although the basic relationship between foreign production and exports of a particular tradable good is generally one of substitution, the partial effect of foreign production on the firm's total exports is uncertain a priori and must be determined empirically. For a single-product firm the effect is negative or zero, depending on the extent to which exporting could have taken place in the alternative situation when foreign production is restricted. For example, if trade barriers are prohibitive, or if in the absence of foreign production by home-country firms production by other firms would have filled the void, the effect would be zero. For a multiproduct firm, which is either vertically or horizontally integrated, the effect depends on two opposite influences. One is the potentially negative effect on exports of substitute products. The other is the potentially positive effect on exports of complementary products, which may be either inputs in foreign production or products that are complementary in final use. Since most, if not all, MNCs are multiproduct firms, the net effect on exports depends on the strength of substitution relative to complementarity effects (for a formal model, see Swedenborg 1979).

On a priori grounds, a case could be made that foreign production by MNCs has allowed increased specialization between countries in accordance with the competitive advantage of each and thereby has contributed to increased output through a more efficient allocation of resources worldwide. Arguably, impediments to both international trade and to the firm managing operations in many different countries have declined due to a lowering of tariff levels and to lower costs of transportation and communication. This should have allowed MNCs to increasingly locate production so as to minimize production costs and/or trading costs. It should have allowed the MNC to bring its firm-specific asset (whether based on superior technological, marketing, or managerial know-how) to bear in countries that may lack such know-how but that have a competitive advantage as a production location.

What are the implications for the home country? The increased mobility

of international firms means that production abroad becomes a more ready substitute for home production by the firm. If the home country does not have a competitive advantage as a production location for part of the firm's output, or if exports are hindered by trade barriers, the firm can increase production by moving abroad. Total output of the firm's particular (differentiated) products is thereby greater than it otherwise would have been. The firm is larger than it otherwise would have been. The effect on home-country exports depends on whether this allows the firm (or other home-country firms) to specialize in accordance with home-country competitive advantage. A positive net effect on the investing firm's exports is one indication of increased specialization. Another may be increased investment in, for example, R&D in the home country, which is made possible by larger overall firm size. The effect, it must be emphasized, is always evaluated relative to the hypothetical situation in which foreign production is not allowed to increase.

4.3.1 Empirical Analysis: Total Foreign Production and Exports of MNCs

Let us now turn to an empirical analysis of the determinants and effects of foreign production by Swedish firms. We want to explain both total foreign production and exports, and foreign production in and exports to individual countries. We also want to estimate, by 2SLS, the partial effect of foreign production on exports from Sweden. In doing so, we distinguish between products that may be substitutes for and those that may be complements to foreign production. The relationships we want to estimate for the firm's overall foreign production and exports are

$$(1)\quad \ln(\mathrm{SQ})_{it} = a_0 + a_i Z_i + a_t \mathrm{DT}_t + b_1 \ln \mathrm{R\&D}_{it} + b_2 \ln \mathrm{LS}_{it} + b_3 \ln(K/L)_{it} + b_4 \mathrm{NR}_i + b_5 \ln \mathrm{YR}_{it} + e_{it},$$

$$(2)\quad \ln(\mathrm{SX})_{it} = a_0 + a_i Z_i + a_t \mathrm{DT}_t + b_1 \ln \mathrm{R\&D}_{it} + b_2 \ln \mathrm{LS}_{it} + b_3 \ln(K/L)_{it} + b_4 \mathrm{NR}_i + b_5 (\mathrm{pSQ})_{it} + e_{it},$$

$$(2a)\quad \ln(\mathrm{SXS})_{it} = a_0 + a_i Z_i + a_t \mathrm{DT}_t + b_1 \ln \mathrm{R\&D}_{it} + b_2 \ln \mathrm{LS}_{it} + b_3 \ln(K/L)_{it} + b_4 \mathrm{NR}_i + b_5 (\mathrm{pSQ})_{it} + e_{it},$$

$$(2b)\quad \ln(\mathrm{SXC})_{it} = a_0 + a_i Z_i + a_t \mathrm{DT}_t + b_1 \ln \mathrm{R\&D}_{it} + b_2 \ln \mathrm{LS}_{it} + b_3 \ln(K/L)_{it} + b_4 \mathrm{NR}_i + b_5 (\mathrm{pSQ})_{it} + e_{it}.$$

Subscript i refers to firm i, subscript t to year t. The dependent variables are the net (local) sales value of foreign production (SQ), defined as manufacturing-affiliate sales abroad less imports from parents, and of exports from Sweden (SX). Total exports are divided into exports to nonaffiliates

(SXS), which we expect may be noncomplementary to (or substitutes for) foreign production, and exports to affiliates (SXC), which we expect may be complementary to foreign production. These expectations can, of course, be questioned. Exports to manufacturing affiliates include both products that are used as inputs by the affiliates and products that are merely resold. While the former should be complementary to foreign output, the latter need not be. Similarly, exports to nonaffiliates may contain a mixture. The empirical analysis will reveal whether these definitions correspond to the theoretical concepts. Definitions of all variables are given in the appendix.

The firm's overall exports and foreign production are expected to depend on specific characteristics both of the firm and of the industry in which it operates. Research and development expenditures (R&D) measure the firm's firm-specific asset. Physical-capital intensity (K/L) and the skill level of labor (LS) in the firm's domestic production are industry characteristics that may affect the cost of home (relative to foreign) production and reveal whether factor proportions affect the location of production. A dummy variable (NR) for two natural-resource-based industries (metals and forest products), in which Sweden has a comparative advantage, is also included. These industries have historically been located near the natural resource and are, moreover, characterized by scale economies. For both these reasons, NR is expected to bias the firm toward exporting. So far, the explanatory variables are the conventional ones in this kind of analysis. A less conventional one is the age of the firm's oldest foreign manufacturing affiliate (YR). This firm-specific variable is included to take into account dynamic-historical factors, specifically that it takes time to grow large abroad. It may also reflect the effect of accumulated knowledge in the affiliate based on learning by doing, which, too, is an effect of time. Since this variable should have a direct effect on foreign production only—not on exports—it is used as an instrumental variable to allow 2SLS estimation of the effect of foreign production. The predicted value of SQ (pSQ) is obtained from the first stage and inserted as an explanatory variable in the exports regressions in the second stage.

We introduce a dummy variable for each firm (Z) in order to control for the effect of inherent characteristics of firms that stay constant over time, and a dummy variable for time (DT) to control similarly for the effect of time—for example, specific occurrences at time t or a general time trend that affects all firms the same way. The firm dummy allows us to hold each firm constant and analyze the relationship between the independent and dependent variables over time. For this to be meaningful we impose the condition that the firm is represented in the data in at least three of the six years for which we have data. That reduces the data set, since it eliminates firms that have dropped out as MNCs after a relatively short period or that are relatively recent entrants.

In order to make a comparison between the results of cross-sectional

analysis and analysis of panel data we present regressions first without controlling for firm fixed effects (Z), and then with such a control. The former pools all cross-sectional observations; the latter pools only those that have manufacturing affiliates abroad in at least three of the census years.

Table 4.2 reports the results. Panel A shows the results when firm-specific fixed effects are not controlled for, and panel B, when they are.[5] First, we note—in panel A—that R&D expenditures have the expected positive effect on both foreign production and exports. The age of foreign operations has the expected positive effect on foreign production, which underlines the importance of taking into account dynamic-historical factors in cross-sectional analysis. Natural-resource intensity (NR) has a strong positive effect on total exports, while the other factor-proportion variables (K/L, LS) have no effect on either exports or foreign production. The lack of significance for physical-capital intensity is consistent with other studies that show that Sweden has lost its earlier comparative advantage in capital-intensive production (Lundberg 1992; Leamer and Lundborg 1997). What remains may be captured by the NR variable, since these resource-based industries are also very capital intensive. The insignificance of the skilled-labor measure is perhaps more surprising, since Sweden has been shown to have a comparative advantage in skill-intensive production at least through the early 1980s (Lundberg 1992). According to Leamer and Lundborg (1997), however, such an advantage was substantially eroded by the late 1980s.

The effect of foreign production on exports is seen to be weak and insignificant in the substitute-exports equation and strongly positive in the complementary-exports equation. The net effect is a surprisingly strong positive effect on total exports. It is surprising because exports to non-affiliates are so much larger than exports to manufacturing affiliates, and the effect on the former could therefore have been expected to carry through more strongly. (The mean value of the former is almost five times the size of that of the latter.)

Panel B in table 4.2 shows what happens when we hold each firm constant and examine the relationship between the variables over time. First of all we note that the same firm and industry characteristics remain significant determinants of foreign production and exports; but both the size of the coefficients and their significance are much reduced when firm fixed effects are controlled for. Thus, the role of these characteristics in cross-sectional analysis is, to a large extent, to differentiate between firms with inherent differences rather than to reflect their impact over time. This is

5. In earlier analysis (Swedenborg 1979, 1982) the dependent variables were in ratio form and controlled for the firm's size in the home market. Use of the absolute value of the dependent variables, as in table 4.1, corresponds more closely to theoretical relationships and is easier to interpret. The use of a dummy variable for each firm makes it less necessary to normalize for firm size. The results, in any case, turn out to be quite similar.

Table 4.2 **Determinants and Effects of Total Foreign Production and Exports by Swedish MNCs 1965–94 (OLS and 2SLS; log form)**

Independent Variables	Dependent Variables			
	SQ_i	SX_i	SXS_i	SXC_i
	A. Pooled Cross-Sections			
Constant	3.85***	4.46***	4.80***	−0.32
	(5.80)	(7.00)	(6.81)	(−0.34)
$R\&D_i$	0.56***	0.47***	0.55***	0.09
	(22.21)	(8.96)	(9.60)	(1.18)
LS_i	−0.02	0.06	0.02	0.08
	(−0.10)	(0.32)	(0.10)	(0.31)
K/L_i	0.13*	0.08	0.09	−0.08
	(1.83)	(1.25)	(1.34)	(−0.96)
NR_i	0.38	1.92***	2.01***	1.22***
	(1.55)	(9.08)	(8.61)	(3.94)
YR_i	0.67***			
	(12.18)			
DT[a]				
pSQ_i		0.21***	0.10	0.76***
		(3.03)	(1.29)	(7.60)
N	672	587	587	587
R^2	0.67	0.74	0.70	0.57
F	128.24***	151.30***	127.19***	71.35***
	B. Panel Data with Firm Fixed Effects			
Constant	4.72***	7.28***	7.95***	0.49
	(6.65)	(10.81)	(9.73)	(0.34)
$R\&D_i$	0.21***	0.13***	0.13***	0.05
	(3.97)	(3.32)	(2.76)	(0.65)
LS_i	−0.07	0.06	−0.02	0.22
	(−0.36)	(0.48)	(−0.11)	(0.79)
K/L_i	0.06	0.10	0.10	0.21
	(0.48)	(1.35)	(1.11)	(1.26)
NR_i	0.40	0.83***	0.88**	0.58
	(0.83)	(2.58)	(2.26)	(0.85)
YR_i	0.61***			
	(7.21)			
DT_t[a]				
Z_i[a]				
pSQ_i		−0.03	−0.16	0.75***
		(−0.39)	(−1.44)	(3.94)
N	404	370	370	370
R^2	0.88	0.94	0.92	0.82
F	29.38***	57.38***	40.88***	15.75***

Note: Summary of appendix tables 4A.1 and 4A.2. All variables are natural logarithms. R^2 is corrected for degrees of freedom. Numbers in parentheses are *t*-values. Only firms for which there are data in at least three years are included in the regressions in panel B. (Variables are defined in the appendix.)

[a]Time dummies included in both panels, firm dummies only in panel B, but not shown here. The time dummies are significantly positive and increasing in the SQ and SX equations in panel B. The firm dummies are overwhelmingly significant.

*Denotes significant at the 10 percent level.

**Denotes significant at the 5 percent level.

***Denotes significant at the 1 percent level.

not unexpected, but it does caution against interpreting coefficients estimated on cross-sectional data as indicating the effect of changes over time.

The dummy variables (not shown) contribute to the high explanatory values of the equations, but they also reveal our ignorance. The time dummies are quite significant and their coefficients are positive and increasing over time. All firms' foreign production and exports (but not complementary exports) increase over time in a way that cannot be explained by the other variables.[6] The firm dummies (overwhelmingly significant) reveal that firm-specific attributes that have not been measured play a significant role. This is hardly surprising, since R&D spending is only one possible source of a firm-specific asset. Managerial, production, and marketing know-how, brand names, and so forth, are not necessarily related to R&D.

The partial effect of foreign production on total exports is now insignificant. The coefficient for substitute exports is negative but insignificant, while the coefficient for complementary exports is strongly positive and significant. The results are consistent with our expectations regarding exports to both nonaffiliates and affiliates and lend some credence to the terminology adopted. Since the estimated coefficients are elasticities, the coefficient on complementary exports shows that a 1 percent increase in foreign production is associated with a 0.75 percent increase in complementary exports. Because complementary exports is such a small part of total parent exports, this effect is drowned in the total.

When it comes to the effect of foreign production on exports we are, of course, interested only in the dynamics of change. We want to know how exports change over time as a result of an increase in foreign production. Here, cross-sectional analysis yields ambiguous results, while analysis of panel data where interfirm differences are held constant—as in panel B of table 4.2—allows us to distinguish the effect we are interested in. This is worth emphasizing, since most previous analyses of this relationship have not made this use of the longitudinal dimension of the data. (The exceptions are Swedenborg 1982, 1991, for a shorter time span.)[7]

The high explanatory value of the regressions and the significance of the instrumental variable YR in the foreign-production equation should improve the precision with which the effect of foreign production is esti-

6. When the firm dummies were not included (table 4.2, panel A) the time dummies were significant only in the SX equation and only for two extreme years. One was an export boom (1974), the other an economic crisis (1990).

7. Blonigen (2000) uses product-level time-series data on Japanese production in and exports to the United States. His motive is to try to ascertain the substitution relationship that most theory predicts should exist between production abroad and exports of a given product, but that more-aggregated analyses fail to find. He succeeds in this. However, he does not seem to be interested in the effects of foreign production on exports in the sense that we are here, since he does not control for other variables that may simultaneously affect these variables. Nor does he take into account the firm's exports of other products, except those that are inputs in foreign production, to obtain a net effect comparable to that which has been estimated in more aggregated studies.

mated in the export equation by 2SLS. This should reduce the concern expressed by Blomström, Lipsey, and Kulchycky (1988) that the results from using 2SLS are uncertain because a low explanatory power means that much of the relevant variation in the affiliates' production is neglected in the second-stage estimation. Although 2SLS is the theoretically correct method for estimating this simultaneous relationship, these authors' reservation makes them prefer estimation by ordinary least squares (OLS).

In order to check what difference the choice of estimation method makes, the same regressions as in table 4.2, panel B, were estimated by OLS. The results suggest that OLS estimation tends to overestimate the positive effect of foreign production on exports compared to 2SLS estimation.[8]

The estimated effect of foreign production on overall exports is remarkably consistent with results obtained for earlier years (Swedenborg 1982, 1991). Previous analysis (when based on pooled cross-sectional data) has also shown a strong positive effect on complementary exports, a weak negative effect on substitute exports, and an insignificant net effect. Even the sizes of the coefficients are very similar in similar specifications of the regression equations. For example, the coefficient for the effect of foreign production on complementary exports obtained on panel data through 1986 (and with 30 percent fewer parent companies than in table 4.2, panel B) was 0.70 compared to 0.75 in table 4.2.

In general, one would expect to find an increasingly negative relationship between foreign production and exports over time. The growth and maturing of foreign affiliates could be expected to lead to a diminished dependence on imports from parents. Furthermore, the fact that growth in foreign production to such a large extent has been through acquisitions of existing firms, which have a lower propensity to import from the Swedish company, would tend in the same direction (Swedenborg, Johansson-Grahn, and Kinnwall 1988; Andersson, Fredriksson, and Svensson 1996). A tendency toward a more negative effect on exports over time may account for the negative time trend in the complementary-exports estimation, which shows that such exports do not grow over time in the same way as other exports. This trend is not statistically significant, however.

Before drawing any definite conclusions regarding the effects of foreign production on parent exports we should analyze the same relationship for individual countries. Presumably, it is in individual countries of production where the main effect occurs—provided, of course, that affiliate exports to

8. OLS estimation yields the following coefficients (*t*-values in parentheses): for SX 0.06 (1.82), for SXS 0.00 (0.08), and for SXC 0.51 (7.54). Assuming that SQ is indeed endogenous, the 2SLS estimator should be consistent while the OLS estimator should not.

Ideally, one would like to test whether YR is a valid instrument, i.e., whether YR is exogenous. This is not possible, however, since equation (2) is exactly identified. In order to test for exogeneity the equation would have to be overidentified.

third countries are not a major influence. An analysis across countries can also reveal what country characteristics determine the volume of exports and foreign production, and possibly the choice between these methods of serving foreign markets as well.

4.3.2 Foreign Production in and Exports to Individual Countries

For an analysis across countries we add country characteristics as explanatory variables. The country's gross domestic product (GDP) is a measure of market size. It is a demand characteristic and as such should positively affect total sales in a foreign market. It could also have a positive effect on foreign production when scale economies at the plant level are important, and when trading costs—both trade barriers and possibly information and transaction costs generally—make it advantageous to produce near the final market. A large market allows the firm to take advantage of economies of scale and, given trading costs, means that production may be located in the large market even though this country may not be the lowest cost producer.

Per capita income (GDPcap) is also a demand characteristic (reflecting income elasticity) but it may also be a cost variable (reflecting the skill level in the country). Its influence is therefore ambiguous. In practice, it is highly correlated with a third variable, w_{ij}/w_{is} which is a measure of the wage in the foreign country relative to that of Sweden. The age variable (YR) now refers to the age of the oldest manufacturing affiliate in a country.

The equations to be estimated are now

$$\begin{aligned}(3)\quad \ln(\mathrm{SQ})_{ijt} &= a_0 + a_i Z_i + a_j \mathrm{DC}_j + a_t \mathrm{DT}_t + b_1 \ln \mathrm{R\&D}_{it} + b_2 \ln \mathrm{LS}_{it} \\ &\quad + b_3 \ln(K/L)_{it} + b_4 \ln \mathrm{NR}_i + b_5 \ln \mathrm{YR}_{ijt} + b_6 \ln \mathrm{GDP}_{jt} \\ &\quad + b_7 \ln \mathrm{GDPcap}_{jt} + b_8 \ln(w_{ij}/w_{is})_t + e_{ijt},\end{aligned}$$

$$\begin{aligned}(4)\quad \ln(\mathrm{SX})_{ijt} &= a_0 + a_i Z_i + a_j \mathrm{DC}_j + a_t \mathrm{DT}_t + b_1 \ln \mathrm{R\&D}_{it} + b_2 \ln \mathrm{LS}_{it} \\ &\quad + b_3 \ln(K/L)_{it} + b_4 \ln \mathrm{NR}_i + b_5 \ln \mathrm{YR}_{ijt} + b_6 \ln \mathrm{GDP}_{jt} \\ &\quad + b_7 \ln \mathrm{GDPcap}_{jt} + b_8 \ln(w_{ij}/w_{is})_t + b_9 \ln(\mathrm{pSQ})_{ijt} \\ &\quad + e_{ijt},\end{aligned}$$

$$\begin{aligned}(4a)\quad \ln(\mathrm{SXS})_{ijt} &= a_0 + a_i Z_i + a_j \mathrm{DC}_j + a_t \mathrm{DT}_t + b_1 \ln \mathrm{R\&D}_{it} \\ &\quad + b_2 \ln \mathrm{LS}_{it} + b_3 \ln(K/L)_{it} + b_4 \ln \mathrm{NR}_i + b_5 \ln \mathrm{YR}_{ijt} \\ &\quad + b_6 \ln \mathrm{GDP}_{jt} + b_7 \ln \mathrm{GDPcap}_{jt} + b_8 \ln(w_{ij}/w_{is})_t \\ &\quad + b_9 \ln(\mathrm{pSQ})_{ijt} + e_{ijt},\end{aligned}$$

$$\begin{aligned}(4b)\quad \ln(\mathrm{SXC})_{ijt} &= a_0 + a_i Z_i + a_j \mathrm{DC}_j + a_t \mathrm{DT}_t + b_1 \ln \mathrm{R\&D}_{it} \\ &+ b_2 \ln \mathrm{LS}_{it} + b_3 \ln(K/L)_{it} + b_4 \ln \mathrm{NR}_i + b_5 \ln \mathrm{YR}_{ijt} \\ &+ b_6 \ln \mathrm{GDP}_{jt} + b_7 \ln \mathrm{GDPcap}_{jt} + b_8 \ln(w_{ij}/w_{is})_t \\ &+ b_9 \ln(\mathrm{pSQ})_{ijt} + e_{ijt},\end{aligned}$$

where subscript *j* refers to country *j*. Important omitted variables are those that would unambiguously affect foreign production and exports in opposite directions, such as transportation costs and a country's trade policy. High barriers to trade would reduce exports and encourage foreign production. Their omission might mean that we tend to overestimate the negative relationship between exports and foreign production. A country dummy (DC) is introduced to control for the effect of omitted country characteristics.

Table 4.3 reports the influence of country characteristics on production for local sales in and exports to individual countries when firm-specific fixed effects at the parent-company level are controlled for. Panel A shows the results when country-specific fixed effects are not controlled for, and panel B, when they are. The influence of parent characteristics is not shown, since these are of less interest in an analysis across countries, which tends to give more weight to firms that produce in many countries than to firms that may be larger but produce in only a few.

First, we note—in panel A—that the length of time that the firm has produced in a country (YR) has a strong positive effect on the size of foreign production, confirming the earlier finding. Second, market size has a strong positive effect on foreign production and a much weaker positive effect on substitute exports. It also has a strong negative effect on complementary exports. The latter is of less interest since the demand for complementary exports is a derived demand. It should perhaps be pointed out that the inclusion of the estimated value of foreign production (pSQ) in the exports equations does not account for these results, since its inclusion does not alter the influence of any of the other independent variables.

The fact that market size has a stronger positive effect on foreign production than on exports suggests that trading costs and market considerations are important and that they affect the location of production. If trading costs were low, firms would produce in the country with the lowest production costs and export to all other markets. Market size would not affect how the firm chooses to serve a foreign market. A large market also allows firms to take advantage of scale economies in production. These interpretations are consistent with the proximity-concentration hypothesis, which postulates that there is a trade-off between achieving proximity to customers and concentrating production to achieve scale economies. Thus, both Brainard (1997) and Ekholm (1998) find that scale economies

Table 4.3 **Determinants and Effects of Swedish MNC Foreign Production in and Exports to Different Countries 1965–94 (OLS and 2SLS; log form)**

Independent Variables	Dependent Variables			
	SQ_{ij}	SX_{ij}	SXS_{ij}	SXC_{ij}
	A. Panel Data with Firm Fixed Effects			
Constant	−6.30***	−21.01***	−34.94***	3.17
	(5.40)	(−8.32)	(−11.13)	(1.25)
YR_{ij}	0.45***			
	(11.68)			
GDP_j	0.52***	0.03	0.32***	−0.82***
	(17.70)	(0.27)	(2.43)	(−7.57)
$GDPcap_j$	0.12	2.09***	2.60***	0.30*
	(1.51)	(12.91)	(12.93)	(1.78)
w_{ij}/w_{is}	0.19*	0.60***	0.57**	0.69***
	(1.90)	(2.92)	(2.23)	(3.35)
DT[a]				
Z_i[a]				
pSQ_{ij}		0.47***	−0.24	1.83***
		(2.76)	(−1.15)	(10.73)
N	1,644	1,652	1,652	1,652
R^2	0.58	0.45	0.43	0.37
F	24.34***	15.35***	14.01***	11.24***
	B. Panel Data with Firm and Country Fixed Effects			
Constant	1.64	33.04***	17.95	−2.08
	(0.24)	(2.69)	(1.09)	(−0.15)
YR_i	0.40***			
	(10.81)			
GDP_j	−0.79	−4.82***	−4.53***	0.83
	(−1.46)	(−4.98)	(−3.48)	(0.74)
$GDPcap_j$	2.03***	6.27***	7.04***	−2.78**
	(3.31)	(5.60)	(4.67)	(−2.15)
w_{ij}/w_{is}	−0.03	0.29	0.06	1.03***
	(−0.28)	(1.59)	(0.26)	(4.91)
DT[a]				
Z_i[a]				
DC_j[a]				
pSQ_{ij}		0.07	−0.66***	2.02***
		(0.45)	(−2.98)	(10.60)
N	1,644	1,652	1,652	1,652
R^2	0.62	0.61	0.52	0.41
F	22.01***	21.09***	15.04***	9.79***

Note: Summary of appendix tables 4A.3 and 4A.4. All variables are natural logarithms. R^2 is corrected for degrees of freedom. Numbers in parentheses are t-values; t-values < 1 are not shown. Only firms for which there are data in at least three years are included in the regressions. (Variables are defined in the appendix.)

[a]Firm characteristics and dummy variables not shown here. Time and firm dummies included in both tables, country dummies included only in panel B. Time dummies are significantly negative in panel A and mostly insignificant in panel B. Firm and country dummies are quite significant.

*Denotes significant at the 10 percent level.

**Denotes significant at the 5 percent level.

***Denotes significant at the 1 percent level.

negatively affect the firm's propensity to supply a particular market through local production, which confirms an earlier finding for Swedish firms (Swedenborg 1982), while trade barriers and market size have the opposite effect.

By contrast, per capita income in a country has a strong positive effect on exports but not on foreign production. A higher relative wage in a country, which is highly correlated with per capita income, does have a positive effect on foreign production, but it is a weaker effect than that on exports. High-income countries thus seem to be important markets in general for Swedish firms. We can also conclude that lower wages for unskilled workers is not a motive for foreign production by Swedish firms.[9]

The estimated net effect on exports of foreign production in individual countries is surprisingly positive. The coefficient for total exports indicates that a 1 percent increase in foreign production in a country leads to a 0.47 percent increase in exports to the same country! This seems too good to be true. Behind this effect is a weak negative effect on substitute exports and a very strong positive effect on complementary exports. Since substitute exports to countries where firms have manufacturing affiliates is only 70 percent larger than complementary exports on average (compared to almost five times larger in overall exports), the effect on complementary exports carries through strongly.[10]

In order to isolate the effect of variables that change over time, a country fixed effect is introduced in the regressions summarized in table 4.3, panel B. A country dummy controls for country characteristics that affect all firms in a country but stay constant over time. It also captures the effect of omitted variables. Transportation costs (distance), traditional commercial ties, and possibly the country's trade policy are examples.

The inclusion of country dummies does not improve the overall efficiency of the estimate of foreign production and complementary exports according to the *F*-test. It does, however, raise the *F*-value in the other exports equations. It also changes some results. The country dummies take over the role of market size in the foreign-production equation and make the influence of market size on exports significantly negative. Why market growth should have a negative effect on exports is hard to see, however.

9. This appears to contradict Brainard's (1997) finding that the higher GDP per worker is in the United States relative to abroad, the higher the propensity to supply the foreign market through exports rather than through local production. Brainard's result suggests that factor-proportion differences stimulate exports relative to affiliate production, while the results here point in the opposite direction. However, it is not clear what we should make of that. As Brainard herself notes, her results do not allow her to reject a model with only country and industry fixed effects.

10. Sometimes total exports or, more frequently, exports to affiliates (SXC) in a particular country are zero. Since the log of zero is not defined, zero values have been set equal to one. This method does give a heavy weight to these observations. However, it seemed preferable to excluding the observations altogether.

Since the country dummies also make the growth of per capita income more significantly positive, one possible explanation is that, holding unique country characteristics constant, the growth of GDP and of GDPcap are correlated. Still, we can conclude that income growth in foreign markets is an important explanation of the growth of both foreign production and exports.

The most important change is that the effect of foreign production on substitute exports is now significantly negative, yielding a zero effect on total exports. The reason for this change is puzzling. The omission of country characteristics such as trade barriers should have implied a tendency to overestimate the negative relationship between exports and foreign production—not to underestimate it. Here, the dummy variables are truly measures of our ignorance. They apparently capture several unique characteristics of each country, including the importance of each market to Swedish firms.

The continued strong, positive effect on complementary exports also seems excessive. How can we explain a coefficient that says that a 1 percent increase in foreign production leads to an increase in complementary exports of almost 2 percent? One possible explanation is the definition of "complementary exports." As mentioned earlier, these are defined as parent exports to manufacturing affiliates of intermediate products used both as inputs and as final products for resale by the affiliate. The affiliate's import of inputs cannot increase more than in proportion to output growth; imports of final products can.

One possibility, then, is that the parent's exports of final products are greatly stimulated by the local production of a manufacturing affiliate. Alternatively, a larger share of parent exports is channelled through the manufacturing affiliate, which also serves as a sales company. It is hard to believe the latter to be an important factor generally. For one thing, imports of intermediate products make up some 60 percent of total affiliate imports from parents, and this share has increased over the period. For another, Swedish MNCs have a very large network of foreign sales affiliates and more often than not in countries where they also have manufacturing. Employment in pure sales affiliates abroad amounts to as much as a third of employment in manufacturing affiliates, and the country distribution of that employment corresponds to that of manufacturing affiliates. Nevertheless, it seems likely that such a rechanneling of complementary final products to manufacturing affiliates for resale is part of the explanation.[11]

11. It is not due to exports to third markets. Otherwise, a third possibility might have been that part of the affiliates' imports from parents are reexported as final goods to third markets. However, this has been allowed for in the definition of complementary exports for sale in country *j*, where affiliate imports from the parent is multiplied by the ratio of net local sales to net total sales by manufacturing affiliates. This is a somewhat excessive correction, since

As before, controlling for fixed effects should yield the most reliable estimate of the partial effect of foreign production on exports over time. Therefore, we are again led to conclude that the net effect of foreign production is probably close to zero. Behind this net effect is a changed composition of parent exports, away from the kind of products that are produced abroad and toward products that are complementary to foreign production.[12]

These results are broadly consistent with previous findings in similar studies, both for Sweden and for the United States. Most econometric evidence points to either no effect or a positive effect of foreign production on total parent exports (Lipsey and Weiss 1981, 1984; Blomström, Lipsey, and Kulchycky 1988). Lipsey (1995) surveys the long line of empirical studies of the effect of foreign production on exports. Blomström and Kokko (1994) survey the evidence for Sweden in more detail.

The notable exceptions to this general agreement are Svensson's studies (1993, 1996a, 1996b), using the same data on Swedish MNCs as in the present analysis but limited to the period 1974–90. The extent and significance of his divergent results have been exaggerated, however, since in part his results are consistent with the ones reported here. Using different definitions of "substitute" and "complementary" exports, he also finds that affiliate production for local sales has a negative effect on parent exports of final goods and a positive effect on exports of intermediate products to the country of production, and that the net effect, though negative, is insignificant. The difference is that, in addition, he finds that affiliate exports to third countries has a highly significant and much larger negative effect on parent exports to those countries. His analysis differs from the one here in that he includes countries where foreign production is zero, which in itself may be motivated. Unfortunately, this forces him to omit all MNCs with affiliates in fewer than six countries; that means that all small and medium-sized MNCs are omitted, because data on exports to countries where these firms do not have manufacturing affiliates are unavailable before 1990. Thus, the gain in being able to include countries where firms have no manufacturing has to be weighed against the loss from excluding a substantial proportion of Swedish MNCs from the analysis. That may explain some of Svensson's divergent results.[13] The main

it assumes that imports from parents of final products for resale also are exported. Still, the estimated effect of foreign production on complementary exports is hardly affected by whether this correction is made.

12. Again, we might compare with OLS estimation. This yields the following coefficients (with *t*-values in parentheses) for SQ: on SX 0.14 (3.18), on SXS −0.11 (−1.85), and on SXC 0.89 (18.62). Although they are in no way unreasonable, the net effect on total exports is again more positive than in 2SLS estimation.

13. A further reason for his divergent results, as Lipsey (1995) points out, is probably his formulation of the equations. Exports and foreign production are normalized for the global sales of the firm, which virtually guarantees a negative effect on exports. If increased foreign

reason for the large negative effect on parent exports to third countries, however, is probably the measure he uses for affiliate exports to third countries. Since information on affiliate exports to individual countries is lacking in the data, the analysis is confined to the EU and the country distribution of these exports within the EU is simply assumed (Svensson 1996a, 82–83). That is not a particularly reliable basis for an analysis of this relationship. In any case, the results reported previously in table 4.2 refer to the effects on the overall exports from parent companies and therefore incorporate possible displacement of parent exports to third countries.

The broad consistency of results, while reassuring, is remarkable for several reasons. Different studies have tested different formulations of the problem, used different methods and data, and looked at different time periods. However, the consistency achieved in the present analysis of a much longer time period comes only through using a more discerning specification of the model. The cross-sectional model—in tables 4.2, panel A, and 4.3, panel A—shows a much more positive relationship between foreign production and exports than has been found in earlier analyses. It is only after controlling for interfirm differences to look at changes over time—in tables 4.2, panel B, and 4.3, panel B—that we again find a negligible effect on overall exports.

To conclude, using panel data and separating out the partial relationship between variables over time, the analysis here has reaffirmed earlier results that have shown that there is no net substitution between foreign production and exports. Thus, empirical analysis again contradicts the common theoretical presumption of a negative relationship between foreign production and exports. The reason, we have argued, is that this presumption is not necessarily valid when firms produce many products and are able to adapt their output mix to changing conditions in different countries and over time. We also find evidence of such adaptation. Foreign production leads to a significant shift in the pattern of specialization in the home country, away from the kinds of products that are produced abroad and toward products that are complementary to foreign production. These changes are offsetting so that the net effect on total exports is zero.

Furthermore, the analysis has confirmed that a firm-specific asset such

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production leads to an increase in global sales with little effect on parent exports, as most analyses suggest, the ratio of exports to global sales will necessarily fall as the ratio of foreign production to global sales increases.

As mentioned in an earlier footnote, the relationships analyzed in the present study have also been estimated in ratio form, where the dependent variable is normalized for the firm's size in the home market. This normalization is not subject to the same criticism. Also, the results with respect to the effects of foreign production on exports are consistent with the ones obtained for the variables in absolute form. The ratio form yields the following coefficients for the effect of the propensity to produce abroad (t-values in parentheses) for the model in table 4.1, panel B: on "substitute" exports −0.5 (0.62), on "complementary" exports 0.56 (3.58), and on total exports 0.01 (0.17). Adjusted R^2 is 0.69 in the foreign production equation and 0.78 in the exports equation.

as that based on R&D spending is an important source of firm-specific competitive advantage, but that other firm-specific attributes that we cannot measure also play a significant role. It has also reaffirmed the importance of taking history into account in cross-sectional analysis, in that it matters how long the firm has been producing abroad.

When it comes to identifying the determinants of the competitive advantages of countries as production locations, the results show that the size of a country's market affects the volume of local production. This suggests that trading or transaction costs in combination with scale economies at the plant level play an important role in determining how a foreign market is served, which is consistent with earlier analyses based on the proximity-concentration hypothesis. The results also show, however, that unique country characteristics that we have not measured play an even more important role. A high and growing per capita income greatly stimulates exports to a country as well as local production. Swedish firms both export to and produce in high-income (and high-wage) countries—that is, countries that are very similar to Sweden. This, in turn, can explain why relative factor proportions in production, such as physical-capital intensity and human-capital intensity, do not affect either exports or foreign production. Together these findings suggest that the new, imperfect-competition theory of international trade and production is more relevant in explaining the pattern of production and trade by Swedish MNCs than is the factor-proportions theory of trade.

4.4 Effects of Increased Firm Size

The absence of net substitution between foreign production and exports means that foreign production is a net addition to the overall sales of the MNCs. By producing abroad, MNCs increase their foreign market shares. They also grow much larger than they otherwise could have. This has, of course, been a motive for foreign expansion, but it also has important implications for the competitive position of MNCs and also for the home country.

Increased firm size allows firms to take advantage of economies of firm size. They can invest more in activities that increase the firm's overall competitiveness, since the cost of such investment can be spread over much larger sales. Examples of such fixed costs are R&D, advertising, a widespread and specialized distribution and service network through sales affiliates in other countries, and more specialized headquarter services. The investments benefit the entire company, regardless of where production is located. Some of it, like knowledge, has the characteristic of a public good within the firm.

How important are such effects? Foreign production by Swedish MNCs constituted almost 60 percent of total corporate sales (cf. fig. 4.1). If all of

Table 4.4 **R&D Intensity According to Different Measures 1965–94 for Swedish MNCs (percent)**

	1965	1974	1986	1994
Total R&D/total MNC sales	2.08	2.08	3.83	4.65
Total R&D/Swedish parent sales	2.59	2.93	6.71	9.72
Swedish R&D/Swedish parent sales	2.37	2.51	5.83	7.32

Note: Figures refer to all MNCs in each year. The corresponding figures for continuing firms, i.e., firms that are represented in the data in the whole period, are much higher. For them, the first measure of R&D intensity was 6.69 percent in 1994; the second measure was 13.04 percent.

this is a net addition to MNC output, Swedish MNCs are two and a half times bigger than they would have been in the absence of foreign production; but the effects may be much larger than that. The regression estimates apply to marginal changes in foreign production, not to an all-or-nothing change. It is impossible to know what these companies would have been today if they had not become multinational.

Investment in R&D can illustrate the point. The Swedish manufacturing industry ranks among the most R&D-intensive in the world (OECD 1995). Most of that is accounted for by Swedish MNCs (more than 90 percent). This is a reflection of the fact that most corporate R&D is still located in Sweden (75 percent in 1994, higher in earlier years), while much of the production that finances it is located abroad.

Table 4.4 shows the R&D intensity in Swedish MNCs measured in three different ways. The first measures total R&D relative to total sales; the second shows total R&D relative to Swedish parent sales; and the third shows Swedish R&D relative to Swedish parent sales. Regardless of how it is measured, R&D intensity has grown over the period shown. The overall R&D intensity—the first measure—shows what the company's total operations can support. But the results of that R&D are available in full to the Swedish part of the company. Therefore, it is the second measure that should be the basis for the competitiveness of the Swedish operations. That, clearly, is much higher than it could have been without foreign operations. Higher R&D, in turn, has a positive effect on Swedish exports (table 4.2).

The conclusion we can draw is this. Multinational production by home-country firms does affect the pattern of specialization in the home country and in the following way. It leads to increased specialization in (exports of) R&D-intensive products. This is true regardless of where R&D activities are located. Since most R&D is located in the home country, it probably also leads to increased specialization in R&D itself. The location of R&D in the home country is due to the fact that R&D was historically performed near the main production facility. In order to retain R&D ac-

tivities in the home country as the production base increasingly shifts to other countries, however, the home country has to prove that it has a competitive advantage in R&D. Its supply of scientists and engineers, the quality of its educational institutions, and its ability to attract foreign specialists are all part of what constitutes such an advantage.[14] In Sweden today, leading MNCs are questioning whether Sweden can live up to these competitive attributes.

4.5 Summary and Conclusions

The growth of MNCs has made it necessary to distinguish between the competitive advantage of firms and the competitive advantage of countries. Since the late 1960s, Swedish exports have failed to keep up with the growth of world exports and the Swedish share of OECD value added has been lagging (Blomström and Lipsey 1989; Andersson, Fredriksson, and Svensson 1996; Leamer and Lundborg 1997). However, the deteriorating competitive position of Sweden in export markets does not have a counterpart in a deteriorating competitive position of Swedish firms. They have, in fact, increased their foreign market shares and they have done so by expanding production abroad. The sheer size of that expansion makes it clear that domestic production could never have been an alternative way to realize such growth.

Increased foreign market shares through multinational production have not come at the expense of production at home. The analysis reported here has found that the enormous growth of foreign production by Swedish firms in the thirty-year period 1965–94 has not, in itself, had a negative effect on parent-company exports. A weak negative effect on exports to nonaffiliates—"substitute exports"—has been offset by a strong positive effect on exports to manufacturing affiliates—"complementary exports." These effects, as emphasized throughout, are defined relative to a hypothetical alternative situation in which foreign production had been restricted by policy.

Our results broadly confirm previous findings in similar analyses, both for Sweden and the United States; but there is a difference. In earlier studies this dynamic relationship between exports and foreign production has been inferred from cross-sectional analysis. Here, the longitudinal dimension of cross-sectional data for individual firms has been used to analyze the partial effect of foreign production on exports for all firms over time.

14. Fors (1998) analyzes the reasons Swedish MNCs locate R&D activities abroad. He concludes that the main reason is the need to adapt products and processes to conditions in the foreign market. However, he finds that an additional motive seems to be to carry out R&D in countries that are specialized technologically in the industry in which the firm operates, presumably to benefit from technological spillovers in that environment.

This allows us to draw the conclusion with much greater confidence. We can also note that coefficients estimated on cross-sectional data, in general, tend to overestimate the relationship between variables over time.

Our analysis also allows us to reject Svensson's (1996a) partly contrary findings for Sweden. Svensson claims that the reason he is able to find substitution is his taking into account affiliate exports to third countries, and exports to countries in which firms do not have manufacturing affiliates. We can reject that explanation, since we find no net substitution for the firm's overall exports, which, of course, include effects in all countries. Instead, we suspect that the reasons for his divergent findings are certain methodological weaknesses.

What are the implications of MNC growth for the home country—for Sweden? The most important effect comes from the effect of larger firm size on the ability of MNCs to invest more in R&D, in specialized headquarter services, and in a more widespread distribution network abroad—all of which benefit the Swedish part of the MNCs. This means increased specialization in R&D-intensive output in Sweden and, as long as R&D is located mainly at home, in R&D production itself. Although hard to measure, it seems likely that the location of both R&D and headquarter services can result in valuable spillover effects for the home country as well.

Thus, Sweden has benefited and still benefits from being home to large MNCs. The pattern of specialization in Sweden, however, is also determined by Sweden's comparative advantage as a production location. Sweden is at a disadvantage in having a small home market, since trading costs and market factors make firms prefer production near the final market. Important markets and countries of production for Swedish firms, our results show, are high-income countries with similar or higher skill levels than Sweden's.

The growth of foreign production may, of course, in itself signal that Sweden is becoming a less attractive location of production for its increasingly global firms. Is there any indication that this might be the case? One such indication is that Sweden seems to be losing its competitive advantage in skill-intensive and technologically advanced production. Sweden has lagged behind other OECD countries in real income and productivity growth over this period. In 1970 Sweden ranked third in real income per capita among the OECD countries; after a gradual decline over most of the period, followed by a sharp drop in the early 1990s, Sweden ranked sixteenth in 1994. Leamer and Lundborg (1997) argue that part of the reason is that Sweden has not kept up with other countries in the accumulation of physical and human capital, which in turn may be due to the low after-tax return on such investment in the egalitarian Swedish welfare state.

Another, more recent, indication is the exodus of corporate headquarters from Sweden in the late 1990s. International mergers involving large

Swedish MNCs *as equals* have consistently meant locating corporate headquarters outside Sweden, mainly, it seems, for tax reasons.[15]

If Sweden's productivity continues to lag behind, as many analyses predict it will in the absence of structural reforms of its welfare state (Lindbeck et al. 1994; Freeman, Topel, and Swedenborg 1997), it bodes ill for Sweden's ability to remain a home base for its global companies. Swedish MNCs have adapted to rising productivity in other countries by raising the capital and skill intensity in their foreign affiliates relative to that at home (Swedenborg 1991). If this continues, there is a serious risk that production by Swedish MNCs in Sweden will become specialized in less skill-intensive and technologically advanced production than in some of their foreign affiliates. If, in addition, R&D and headquarter services move abroad, the current benefits of being home to successful Swedish MNCs will disappear. Negative effects of an eroding competitive advantage in such production would have occurred in the absence of MNCs. However, the adjustment to such a change may occur more rapidly and more completely through the internal adaptation of MNCs. Also, the benefits lost are much greater for a country that has been home for large MNCs. Therefore, the policy issue Sweden confronts in the years ahead is what, if anything, it should do to remain an attractive base for its global companies.

Appendix

List of Variables

Dependent Variables

SQ_i Foreign manufacturing affiliates' net sales abroad; i.e., affiliate sales minus imports from Swedish parent *i*

SX_i Parent *i*'s exports from Sweden

SXS_i "Substitute" or "noncomplementary exports"; i.e., SX − SXC

SXC_i "Complementary" exports, measured as parent exports to manufacturing affiliates

SQ_{ij} Affiliate net local sales in country *j*; i.e., affiliate sales minus imports from Swedish parents by affiliate weighted by (net sales/gross sales), where the weight is necessary to account for the fact that imports from Swedish parent are also exported from country *j*

15. It started with ASEA-BrownBovery's locating in 1986 in Zürich. In the late 1990s it seems to have become endemic. Pharmacia-Upjohn in 1995 located in London (and subsequently moved to the United States); MeritaNordbanken and Stora-Enso in 1998 both located in Helsinki; Astra-Zeneca in late 1998 will locate in London; and Ericsson, in 1998, without a merger, decided to move part of its corporate headquarters to London. Other companies are expected to follow.

SX_{ij} Parent *i*'s exports to country *j*
SXC_{ij} "Complementary" exports to country *j*; i.e., parent exports to manufacturing affiliates (net sales/gross sales)
pSQ Predicted value of SQ

Independent Variables

$R\&D_i$ Total company-sponsored expenditures for research and development
LS_i Labor skill measure (wages and salaries per employee in Sweden)
K/L_i Capital intensity (book value of property, plant, and equipment per employee in Swedish parent)
NR Natural-resource intensity (dummy variable for the paper and pulp industry and the iron and steel industry)
YR_i Age of the oldest manufacturing affiliate by decade; i.e., *t* minus year of establishment, using only the first three digits
YR_{ij} Age of the oldest manufacturing affiliate in country *j*
w_{ij}/w_{is} Average wage in affiliate in country *j* relative to average wage in Swedish parent
GDP_j Real gross domestic product expressed in purchasing-power-parity-adjusted U.S. dollars from Penn World Tables
$GDPcap_j$ Real GDP per capita from Penn World Tables

Other Dummy Variables

DT_t Dummy variable for time *t*
Z_i Dummy variable for firm *i*
DC_j Dummy variable for country *j*

$t = 1, \ldots, 7$ (1965, 1970, 1974, 1978, 1986, 1990, 1994)
$i = 1, \ldots, n$
$j = 1, \ldots, m$ (excl. Sweden); S = Sweden

Data Sources

All variables are from the IUI data base on Swedish MNCs except GDP and GDP per capita, which are from Penn World Tables.

Table 4A.1 **Company Regressions with Cross-Sections Pooled over the Period 1965–94 (OLS and 2SLS)**

Independent Variables	Dependent Variables			
	SQ_i	SX_i	SXS_i	SXC_i
Constant	3.85***	4.46***	4.80***	−0.32
	(5.80)	(7.00)	(6.81)	(−0.34)
$R\&D_i$	0.56***	0.47***	0.55***	0.09
	(22.21)	(8.96)	(9.60)	(1.18)
LS_i	−0.02	0.06	0.02	0.08
	(−0.10)	(0.32)	(0.10)	(0.31)
K/L_i	0.13*	0.08	0.09	−0.08
	(1.83)	(1.25)	(1.34)	(−0.96)
NR_i	0.38	1.92***	2.01***	1.22***
	(1.55)	(9.08)	(8.61)	(3.94)
YR_i	0.67***			
	(12.18)			
DT70	−0.23	0.15	0.07	0.23
	(−1.02)	(0.80)	(0.35)	(0.85)
DT74	0.19	0.40**	0.42**	0.22
	(0.85)	(2.17)	(2.05)	(0.83)
DT78	0.06	−0.06	−0.09	0.03
	(0.26)	(−0.31)	(−0.40)	(0.10)
DT86	0.04	0.05	0.06	0.05
	(0.17)	(0.26)	(0.27)	(0.17)
DT90	0.18	−0.44**	−0.49**	0.03
	(0.70)	(−2.06)	(−2.11)	(0.08)
DT94	0.19	−0.28	−0.33	0.02
	(0.71)	(−1.25)	(−1.33)	(0.05)
pSQ_i		0.21***	0.10	0.76***
		(3.03)	(1.29)	(7.60)
N	672	587	587	587
R^2	0.67	0.74	0.70	0.57
F	128.24***	151.30***	127.19***	71.35***

Note: R^2 is corrected for degrees of freedom. Numbers in parentheses are *t*-values.

*Denotes significance at the 10 percent level.

**Denotes significance at the 5 percent level.

***Denotes significance at the 1 percent level.

Table 4A.2 **Company Regressions: Panel Data with Firm Fixed Effects, 1965–94 (OLS and 2SLS)**

Independent Variables	Dependent Variables			
	SQ_i	SX_i	SXS_i	SXC_i
Constant	4.72***	7.28***	7.95***	0.49
	(6.65)	(10.81)	(9.73)	(0.34)
$R\&D_i$	0.21***	0.13***	0.13***	0.05
	(3.97)	(3.32)	(2.76)	(0.65)
LS_i	−0.07	0.06	−0.02	0.22
	(−0.36)	(0.48)	(−0.11)	(0.79)
K/L_i	0.06	0.10	0.10	0.21
	(0.48)	(1.35)	(1.11)	(1.26)
NR_i	0.40	0.83***	0.88**	0.58
	(0.83)	(2.58)	(2.26)	(0.85)
YR_i	0.61***			
	(7.21)			
DT70	0.30*	0.48***	0.49***	0.18
	(1.75)	(4.17)	(3.48)	(0.72)
DT74	0.56***	0.75***	0.86***	0.09
	(3.33)	(5.78)	(5.49)	(0.34)
DT78	0.86***	0.75***	0.98***	−0.33
	(4.11)	(4.35)	(4.65)	(−0.89)
DT86	1.07***	0.93***	1.24***	−0.65
	(4.56)	(4.51)	(4.93)	(−1.47)
DT90	1.53***	0.96***	1.34***	−0.79
	(5.49)	(3.70)	(4.27)	(−1.43)
DT94	1.78***	1.26***	1.64***	−0.78
	(5.69)	(4.24)	(4.55)	(−1.24)
Z_i [a]				
pSQ_i		−0.03	−0.16	0.75***
		(−0.39)	(−1.44)	(3.94)
N	404	370	370	370
R^2	0.88	0.94	0.92	0.81
F	29.38***	57.38***	40.88***	15.75***

Note: Only firms that are present in at least three years are included. A total of 98 companies meet this criterion. R^2 is corrected for degrees of freedom. Numbers in parentheses are *t*-values.

[a] Firm dummies are overwhelmingly significant.

*Denotes significance at the 10 percent level.

**Denotes significance at the 5 percent level.

***Denotes significance at the 1 percent level.

Table 4A.3 **Country Regressions: Panel Data with Firm Fixed Effects, 1965–94 (OLS and 2SLS)**

Independent Variables	Dependent Variables			
	SQ_{ij}	SX_{ij}	SXS_{ij}	SXC_{ij}
Constant	−6.30***	−21.01***	−34.94***	3.17
	(5.40)	(−8.32)	(−11.13)	(1.25)
$R\&D_i$	−0.08	−0.01	−0.16	−0.01
	(−1.24)	(−0.08)	(−1.01)	(−0.06)
LS_i	0.06	2.02***	2.20***	1.52***
	(0.27)	(4.90)	(4.28)	(3.68)
K/L_i	0.02	−0.11	−0.18*	−0.10
	(0.51)	(−1.38)	(−1.79)	(−1.20)
NR_i	0.19	1.46*	−1.82*	−0.26
	(0.49)	(1.91)	(−1.91)	(−0.34)
YR_{ij}	0.45***			
	(11.68)			
GDP_j	0.52***	0.03	0.32***	−0.82***
	(17.70)	(0.27)	(2.43)	(−7.57)
$GDPcap_j$	0.12	2.09***	2.60***	0.30*
	(1.51)	(12.91)	(12.93)	(1.88)
w_{ij}/w_{is}	0.19*	0.60***	0.57**	0.69***
	(1.90)	(2.92)	(2.23)	(3.35)
DT70	0.17	−0.74***	−0.97***	−0.44
	(1.14)	(−2.47)	(−2.61)	(−1.47)
DT74	−0.10	−1.11***	−0.87**	−0.71**
	(−0.67)	(−3.59)	(−2.27)	(−2.29)
DT78	−0.04	−1.89***	−1.16***	−1.21***
	(−0.22)	(−5.17)	(−2.55)	(−3.32)
DT86	0.33*	−2.79***	−1.73***	−2.48***
	(1.78)	(−7.31)	(−3.65)	(−6.49)
DT90	0.66***	−4.63***	−3.12***	−3.41***
	(3.05)	(−10.40)	(−5.64)	(−7.64)
DT94	0.61**	−5.16***	−3.44***	−3.41***
	(2.41)	(−9.90)	(−5.30)	(−6.51)
Z_i[a]				
pSQ_{ij}		0.47***	−0.24	1.83***
		(2.76)	(−1.15)	(10.73)
N	1,644	1,652	1,652	1,652
R^2	0.58	0.45	0.43	0.37
F	24.34***	15.35***	14.01***	11.24***

Note: Only firms that are present in at least three years are included. A total of 98 parent companies meet this criterion. R^2 is corrected for degrees of freedom. Numbers in parentheses are *t*-values.

[a] Firm dummies are overwhelmingly significant.

*Denotes significance at the 10 percent level.

**Denotes significance at the 5 percent level.

***Denotes significance at the 1 percent level.

Table 4A.4 **Country Regressions with Fixed Effects for Firms, Time, and Countries, 1965–94 (OLS and 2SLS)**

Independent Variables	Dependent Variables			
	SQ_{ij}	SX_{ij}	SXS_{ij}	SXC_{ij}
Constant	1.64	33.04***	17.95	−2.08
	(0.24)	(2.69)	(1.09)	(−0.15)
$R\&D_i$	−0.07	0.03	−0.11	0.00
	(−1.18)	(0.25)	(−0.74)	(0.03)
LS_i	−0.18	1.48***	1.52***	1.94***
	(0.92)	(4.13)	(3.14)	(4.68)
K/L_i	0.02	−0.09	−0.13	−0.06
	(0.60)	(−1.29)	(−1.31)	(−0.76)
NR	0.06	0.84	−2.68***	−0.40
	(0.16)	(1.28)	(−3.05)	(−0.53)
YR_i	0.40***			
	(10.81)			
GDP_j	−0.79	−4.82***	−4.53***	0.83
	(−1.46)	(−4.98)	(−3.48)	(0.74)
$GDPcap_j$	2.03***	6.27***	7.04***	−2.78**
	(3.31)	(5.60)	(4.67)	(−2.15)
w_{ij}/w_{is}	−0.03	0.29	0.06	1.03***
	(−0.28)	(1.59)	(0.26)	(4.91)
DT70	0.25	0.16	−0.08	−0.44
	(1.48)	(0.52)	(−0.21)	(−1.25)
DT74	−0.02	0.08	0.30	−0.59
	(−0.08)	(0.20)	(0.58)	(−1.32)
DT78	0.18	−0.16	0.61	−1.31**
	(0.67)	(−0.34)	(0.94)	(−2.37)
DT86	0.61*	−0.35	0.72	−2.66***
	(1.90)	(−0.61)	(0.91)	(−3.93)
DT90	1.00***	−1.51**	−0.04	−3.73***
	(2.69)	(−2.20)	(−0.05)	(−4.70)
DT94	1.00**	−2.10***	−0.34	−3.95***
	(2.48)	(−2.82)	(−0.34)	(−4.59)
Z_i[a]				
DC_j[a]				
pSQ_{ij}		0.07	−0.66***	2.02***
		(0.45)	(−2.98)	(10.60)
N	1,644	1,652	1,652	1,652
R^2	0.62	0.61	0.52	0.41
F	22.01***	21.09***	15.04***	9.79***

Note: Only firms that are present in at least three years are included. A total of 98 companies meet this criterion. R^2 is corrected for degrees of freedom. Numbers in parentheses are *t*-values.

[a]Dummy variables are overwhelmingly significant.

*Denotes significance at the 10 percent level.

**Denotes significance at the 5 percent level.

***Denotes significance at the 1 percent level.

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Comment

Bruce A. Blonigen

This paper is a fitting tribute to Robert Lipsey's substantial contributions on foreign direct investment (FDI) and multinational corporations (MNCs). The literature on FDI and MNCs owes a large debt to Lipsey's pioneering work in this area. Furthermore, it is an honor to provide comments on a paper written by Birgitta Swedenborg, who has been so instrumental in developing and analyzing the rich data we now have on Swedish multinational firms.

One of the important issues concerning MNCs that Robert Lipsey has addressed (in numerous articles with various coauthors) is the effect of FDI by MNCs on the parent (or home) country. As Swedenborg points out, this has been a particularly important policy concern in Sweden's history, and, of course, this is an important policy issue for many countries as we witness the increasing globalization of the world economy. These policy issues have led to important work estimating the net effect of MNCs locating production abroad on exports from the home country.

This is not a straightforward exercise for a variety of reasons. The primary difficulty is endogeneity concerns. The MNC's decision to service a foreign market through exports or foreign production is obviously simultaneous, with a variety of observed and unobserved "other" factors determining how much the MNC exports and how much it produces in the foreign market. This makes it difficult to identify the independent effect of foreign production (or affiliate net sales) on exports. Furthermore, the literature is not in agreement about how to properly specify an export equation, much less an equation explaining foreign-affiliate net sales. Finally, there are the typical data measurement issues to contend with.

Swedenborg's paper confronts these estimation issues in a reasonable way and gives us new estimates of the relationship between foreign production and exports using data on Swedish MNCs from 1965 to 1994. There are three significant contributions of Swedenborg's analysis. First, she controls for endogeneity by estimating the export equations with two-stage least squares (2SLS). Second, the panel nature of the data allows her to

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control for firm fixed effects, destination-country fixed effects, and time fixed effects. Finally, she separately estimates the effect of foreign net sales on exports by MNCs to their affiliates versus its effect on exports to non-affiliates, yielding more information about what is driving the overall net effect. The overall conclusion one draws is the following: While there is a strong complementarity relationship between exports of MNCs to their affiliates and MNC net sales abroad (presumably through exports of inputs from the parent to the affiliates), the overall net effect is zero when one properly controls for these statistical concerns. This finding contrasts with many previous studies of cross-sectional data that find overall net complementarity using OLS.

Swedenborg's analysis also points to future refinements and extensions. First, her work gives us evidence that endogeneity bias is quite important for these data, and strongly suggests that this issue should be examined further in future work. Swedenborg uses YR (the age of the firm's oldest manufacturing affiliate) as an instrument to identify the effect of foreign net sales on exports. The YR variable is a significant explanatory variable for foreign net sales and, as Swedenborg reports in footnote 7, the 2SLS estimates suggest the OLS estimates are biased upward. While this is an indication that YR is potentially an appropriate instrument, it is neither certain that this is the case, nor that we know how well this instrument controls for endogeneity compared to some alternative set of instruments that could be employed.

Swedenborg's YR variable is a creative instrument choice because it is likely to proxy well for an MNC's FDI experience in the foreign market. This FDI experience arguably decreases a firm's cost of operating in the foreign market and should correlate with more affiliate sales, which Swedenborg finds it does. However, an appropriate instrument needs to be uncorrelated with the error term in the export equations, and it is not clear that YR would satisfy this requirement. In particular, FDI experience in a foreign market may also mean the firm is more familiar with local input sources, which would affect the export equations if greater experience means affiliates substitute more local inputs for imported home-country inputs. This would likely affect the SXC (parent exports to foreign affiliates) equation the most, and this is precisely where Swedenborg finds large complementarity effects—in fact, implausibly large complementarity effects when she examines data at the destination-country level in table 4.3. Remaining endogeneity bias in the SXC equation is obviously important, since the implausibly high complementarity effect for the SXC equation seems to be responsible for netting out the substitution effect of the SXS equation in table 4.3, panel B. In other words, it is plausible that YR is not an appropriately exogenous instrument, particularly for the SXC equation, and that this is masking the true net relationship between foreign sales and exports, which may be one of net substitution.

While it is easy to call for better instruments, it can be difficult to devise more appropriate ones. However, it should be noted that Grubert and Mutti (1991) used tax-policy changes across countries to instrument for foreign-affiliate production in MNC export equations estimated from a panel of U.S. MNCs. As with this paper, they find that 2SLS estimation reduces the net effect of foreign production on exports from being one of complementarity to a statistically insignificant one. Swedenborg also notes that Sweden maintained controls on foreign direct investment until the 1980s. This type of country policy may be observable and quantifiable in some manner, and thus useful as an instrument. The point is that there are likely a number of alternative instrument sets that could be constructed and an examination of this would likely be a fruitful avenue for research, given the results to date of both this paper and that of Grubert and Mutti (1991).

Swedenborg is to be commended for exploiting the panel nature of the data to control for a variety of time-invariant "fixed" effects. A priori one would expect there to be significant firm-specific and destination-country-specific unobserved factors that affect exports, and particularly, foreign production. For example, theory suggests that firm-specific assets (often ones difficult to observe) are the main reason we observe MNCs. Controlling for these effects is quite important, as we can see from the differences between estimates in table 4.2 panels A and B, and between table 4.3 panels A and B. In fact, as with the endogeneity issues, her estimates show there is a substantial bias from pooled (or cross-section) OLS toward finding net complementarity, when one does not control for these fixed cross-sectional effects.

As Swedenborg notes, the data in this paper represent the longest time series to date of Swedish MNCs and the dynamic aspects of the data are quite interesting and worthy of future work. The extent to which Swedenborg exploits the time-series dimension of the data is to control for cross-sectional fixed effects, which yields estimates that are identified from the within-firm time-series dimension of the data. However, figure 4.1 suggests there may be more substantial dynamic considerations connected with the relationship between foreign production and exports than can be obtained from a point estimate derived from the entire period of the data. In particular, figure 4.1 portrays a very interesting look at overall Swedish MNC activity from 1965 through 1994. From 1965 to 1974 there were modest increases in both the share of exports and the share of foreign production in MNC sales. From 1978 to 1990, the share of foreign production almost doubles, while the share of exports falls by almost a third. Finally, from 1990 to 1994 foreign production falls off some, as the share of exports increases back to historical levels.

While information on all years from 1965 through 1994 would presumably be more revealing, this information suggests that the relationship be-

tween foreign production and exports changes and evolves over time. That is, there may be structural breaks in this relationship. Does the relationship change in a systematic way that would suggest a life cycle of an MNC's decisions on how to service a foreign market? For example, to what extent do new foreign affiliates switch from importing inputs from the home parent to eventual sourcing from local inputs, and how long does this process take? In other words, does the strong complementarity effect from parents' exporting inputs to foreign affiliates decrease over time, so that we may eventually have a net substitution relationship? These questions suggest that there may be substantial differences between the short-run effect of affiliate sales on exports from the long-run effect, and hence, these issues invite future research.

The possibility of structural breaks, as suggested by data in figure 4.1, also points toward a resolution of differences between Swedenborg's study and Svensson's work (1993, 1996a, 1996b). Svensson's studies generally find net substitution using the same database of Swedish MNCs from 1978 to 1990, while Swedenborg's study finds no net substitution for the period from 1965 to 1994. Swedenborg argues that methodological concerns with Svensson's studies are the source of the difference. However, figure 4.1 suggests that the period of the data may also be a source of the discrepancy. Again, figure 4.1 shows that the share of foreign production to MNC sales almost doubles, while the share of exports falls by almost a third from 1978 to 1990. It seems quite plausible that Swedenborg's methodology would also estimate net substitution over this period of the data.

In summary, my interpretation of this study and previous studies of the relationship between foreign sales and exports is that the net relationship is still very much an open question. I'm not convinced that we can rule out that foreign production involves some net substitution of parent firms' exports—at least for some nontrivial lengths of time, if not overall. The reasons are the following. Swedenborg's paper has shown that controlling for unobserved cross-sectional fixed effects and endogeneity has a very significant impact on the estimated relationship, from one of complementarity to one of no net effect. In addition, there are future refinements (discussed previously) that may translate into a substantially different relationship between foreign production and exports. Finally, while Swedenborg finds there is no net substitution from 1965 to 1994, her own figure 4.1 and previous studies by Svensson suggest that for certain periods, such as with Swedish MNCs from 1978 to 1990, there may be significant net substitution.

Swedenborg's study is a significant contribution toward understanding the future work economists need to undertake in order to develop a fuller understanding of the relationship between foreign production and exports. This policy issue will no doubt continue to be an important one in the future, as we continue our pursuit to understand the increasing globalization of the world economy.

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