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Ronald B. Davies, Pehr-Johan Norbäck and
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Ronald B. Davies^{*}, Pehr-Johan Norbäck^{**}, and Ayça Tekin-Koru^{***}

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Abstract: This paper uses affiliate level data from Swedish multinationals to examine the impact of tax treaties on both overall affiliate sales and the composition of those sales. In line with previous results, we find little evidence for an effect of treaties on the level of total sales. We do, however, find that a tax treaty increases the probability of investment by a firm in a given country. In addition, we find that a treaty reduces exports to the parent but increases imports of intermediate inputs from the parent. This is consistent with treaties increasing the effective host tax. This suggests that tax treaties impact the behavior of multinationals along some dimensions but not along others.

JEL Classifications: F21, F23, H25

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^{*} Department of Economics, 435 PLC Building, 1285 University of Oregon, Eugene, OR 97405. Phone: +1 (541) 346-4671. Fax: +1 (541) 346-1243. Email: rdavies@uoregon.edu. Early stages of this work were completed while Davies was supported by the Institute for International Integration Studies at Trinity College, Dublin. He gratefully acknowledges their support. Norbäck was supported by the Marianne and Marcus Wallenberg Foundation, Tom Hedelius and Jan Wallander's Research Foundation, and The Foundation for Baltic and East European Studies. We are indebted to Marc Muendler and Alan Spearot for helpful discussions of the paper. We also thank participants at the Fall 2007 Midwest International Economics Group Meetings in Ann Arbor, the Econometric Society 2008 Winter Meetings in New Orleans, the Empirical Investigation in Trade and Investment Conference in Tokyo in 2008 and two anonymous referees.

^{**} Research Institute of Industrial Economics (IFN), P.O. Box 5501, SE-114 85 Stockholm, Sweden, Phone: +46 (8) 665-4522, Fax: +46 (8) 665-4599, Email: pehr-johan.norback@ifn.se.

^{***} Department of Economics, Ballard Extension Hall, 303, Oregon State University, Corvallis, OR 97331. Phone: +1 (541) 737-9825. Fax: +1 (541) 737-5917. Email: a.tekin-koru@oregonstate.edu.

There is little doubt that foreign direct investment (FDI) plays an increasingly large role in the world economy. This rising importance has led to increased research into the policies that governments use to influence multinational enterprises (MNEs). Of these, taxation has received the bulk of the attention.¹ Within this, there is a growing sub-literature on the effects of tax treaties on FDI.² Although this literature's theory generally presupposes that – in line with the OECD's (1997) model treaty – treaties are intended to increase FDI, the empirical work generally finds no evidence for this. Instead, researchers generally find either an insignificant or a weakly negative effect of treaty formation on FDI.³ This is often interpreted suggesting that the FDI-increasing aspects of treaties (such as tax certainty or withholding tax reductions) balance against their FDI-reducing aspects (such as information exchange and added transfer pricing regulations) yielding a zero net effect of treaties on MNEs.

This paper adds to this literature by utilizing firm-level data. This permits us to analyze both the level of FDI (measured by affiliate sales) as other papers do as well as several other dimensions of MNE behavior. In particular, we find that although there is no significant impact on the level of FDI (the intensive margin) when a tax treaty enters into force, it does increase the probability of investment in a country (the extensive margin), by 0.1%. Although small in absolute value, when one considers that the average probability of investment in our data is only 0.6%, this effect becomes meaningful. Examination of the extensive margin is impossible using the country-level data employed in other studies. Furthermore, we consider whether the

¹ See Wilson (1999), Gresik (2001), Gordon and Hines (2002), and Fuest, Huber, and Mintz (2003) for recent surveys.

² Davies (2004) provides an overview of this literature. Note that we focus on bilateral tax treaties which differ from bilateral investment treaties. See Desbordes and Vicard (2007), Egger and Pfaffermayr (2004), and Hallward-Driemeier (2003) for a discussion of bilateral investment treaties.

³ Examples include Louie and Rousslang (2007), Millimet and Kumas (2007), Egger, Larch, Pfaffermayr, and Winner (2006), di Giovanni (2005), Blonigen and Davies (2004a, 2004b), and Davies (2003).

implementation of a treaty affects other aspects of a MNE's behavior, specifically its exporting and importing activities. Using a simple model, we show that if a treaty affects the tax rate paid in the host, this may well affect the value of a subsidiary as a vertical affiliate (i.e. where output is exported back to the parent) or an export platform (where exports are sent to third countries).⁴ Furthermore, this affects the incentive to import from the parent. Here, we find that although a treaty has no effect on exports to third countries, we do find significant effects on trade with the parent. Specifically, exports to the parent fall while imports of intermediate goods from the parent rise. In particular, these effects are most significant for affiliates that trade little relative to the size of their overall sales. These changes in intra-firm trade are all consistent with a treaty increasing the effective host tax, leading the MNE to change trade behavior to minimize tax liabilities. Again, study of the issue is made possible by our use of firm-level data. Thus, our study broadens the empirical research on tax treaties by examining several heretofore unexplored facets of MNE behavior.

To put our results in context, it is useful to review the purposes of tax treaties. As discussed by Blonigen and Davies (2004b), tax treaties play four major roles, two of which are likely to increase FDI and two of which tend to reduce it. First, tax treaties standardize tax definitions and jurisdictions. Janeba (1996) theoretically shows that such coordination can reduce the double taxation of affiliate income. Second, tax treaties affect the taxation of MNEs by lowering withholding taxes and increasing tax certainty. In particular, Edmiston, Mudd, and Valev (2003) find that uncertainty over tax policy is a significant barrier to FDI. Thus, if a tax treaty reduces the likelihood of a host nation unilaterally changing its tax policy, this added certainty would increase FDI. Combined, these two roles of treaties increase the expected value

⁴ Helpman (1984) provides an early discussion of vertical MNEs. Ekholm, Forslid, and Markusen (forthcoming) provide a theoretic treatment of export-platform FDI. Blonigen, Davies, Waddell, and Naughton (2007) and Baltagi, Egger, and Pfaffermayr (forthcoming) provide evidence for this type of MNE structure.

of after-tax returns from FDI leading one to expect that the introduction of a treaty should increase FDI.

These FDI-increasing aspects of treaties are however at least partially offset by two FDI-reducing roles of treaties. The first of these is increased enforcement of transfer pricing regulation. This occurs by the introduction of additional regulations on the calculation of internal prices, establishing guidelines for resolving disputes between taxation authorities, and encouraging the exchange of information between authorities.⁵ Second, treaties often establish anti-treaty shopping provisions that inhibit the ability to funnel profits through low-tax treaty partners in order to minimize tax payments.⁶ Since these increase the taxation of affiliate income in a given host, they would lead one to anticipate that a tax treaty might reduce FDI.

Given the conflicting directions of these effects, which effects dominate becomes an empirical question. Blonigen and Davies (2004a, 2004b) represent the first attempts to estimate the impact of tax treaties on FDI. Respectively using panel data on OECD FDI (where FDI is measured as stocks) and US FDI (where it is measured as stocks or sales), these papers find that after controlling for country fixed effects there is either a small negative or insignificant effect of treaty formation on FDI. Davies (2003) finds a similar result for the renegotiation of a pre-existing treaty. In a similar fashion, Louie and Rousslang (2007) are able to eliminate the significance of treaties for the rate of return of an affiliate by including proxies for host country governance and political stability. Instead of investigating overall FDI, Di Giovanni (2005) utilizes panel data on cross-border mergers and acquisitions yet still finds no effect from treaty formation.

⁵ See Ligthart and Keen (2006) for a recent overview of the work on information exchange.

⁶ See Davies (2004) for a discussion on treaty shopping.

Two other papers, however, find significantly negative effects of treaty formation. Egger, Larch, Pfaffermayr, and Winner (2006), who control for the endogenous selection of which treaties are actually formed, find that treaties significantly reduce FDI stocks. Finally, Millimet and Kumas (2007) use a quantile treatment effects approach to the data of Blonigen and Davies (2004b) and find that although there is a slight positive effect when FDI levels are initially small, they are significantly negative in the upper quantiles of the FDI distribution. They therefore conclude that the use of a specification imposing a common coefficient on the treaty variable across all observations misses key information but that for the majority of FDI, treaties reduce investment.

Taken as a whole, the empirical evidence thus indicates that if anything the FDI-deterrent aspects of treaty formation win out. Our empirical work expands on this by utilizing affiliate-level data from Swedish-owned multinationals from 1965 to 1998. To our knowledge, this is the first time such micro-level data have been used. In line with earlier studies, we find no significant effect from treaty formation on the level of affiliate sales (the same measure of FDI used by Blonigen and Davies (2004b), Davies (2003), and Millimet and Kumas (2007)). Furthermore, unlike other studies, the micro nature of our data allows us to investigate the effect of a treaty on the probability an affiliate exists in a particular host country. Here we do find a positive impact of treaty formation on the probability of the existence of a subsidiary. Combining these results suggests that even if a treaty does not affect the desired size of investment, it can affect the attractiveness of one host country over another. This might be the case if MNEs are assured by the tax certainty that a treaty creates for even if this does not affect the marginal decisions of a firm after entering, it reduces the overall risk of entry.

We then go on to show to investigate the impacts of treaty formation on the composition of affiliate sales, i.e. whether affiliate sales are generated within the host or from exports. On the whole, we find little impact of treaties on the platform export behavior of MNEs. There are however significant changes in trade between the affiliate and the parent country (Sweden). Thus, our results combine to suggest that although treaties may reduce the perceived risk of entry, they nevertheless give a MNE cause to restructure trade flows to reduce the profitability of the affiliate relative to the parent. This result is most clear for vertical activities and for MNEs where the affiliate trade levels are fairly low. In addition, the impact of treaties on intra-firm trade is mitigated by tax sparing treaties which allow greater influence of host country tax incentives. Therefore, to the extent that treaty formation is costly, this is best weighed against the value generated by new affiliate creation rather than increases in the tax base of inbound MNEs.

The closest antecedent to our results is Clausing (2003). In that paper, she considers intrafirm trade as it depends on the host tax using two types of country-level data on US-owned MNEs. First, using data on affiliate imports from the US and exports to the US, she calculates the trade balance for intrafirm trade flows and finds that the trade balance is smallest between the US and low-tax countries. This suggests that US-owned affiliates in low-tax host nations import less from and export more to their US parents. Second, she calculates the sales of the affiliates in a given host to other foreign affiliates finding that this is smallest for high-tax host countries. This is comparable to our results for the host tax which indicate that exports both overall and to third nations fall in the host tax. She, however, does not use actual affiliate level data as we do nor does she consider the impact of tax treaties. Thus our results add to hers by utilizing affiliate level data (potentially avoiding the problems created by aggregating across firms), by analyzing

the impact of tax treaties on affiliate trade, and by considering the behavior of non-US owned MNEs.

The rest of the paper is as follows. Section 2 presents a simple model of the MNE in order to demonstrate why a treaty could affect affiliate exports. Section 3 describes the data we use in our analysis and describes our empirical specification. Section 4 presents our results on investment decision, the levels of affiliate activity and the composition of those activities. Section 5 concludes.

2. A Model of Tax Treaties and Affiliate Trade

To illustrate how the introduction of a tax treaty can affect affiliate sales and trade, this section presents a simple model of a MNE. This firm produces in two countries, the parent country (Sweden in our data) and a host country. Note that we take investment as a given and do not model the extensive margin.⁷ It sells its output in the host and in a third market. We characterize the non-host sales as taking place in a third market in order to streamline the discussion. Nevertheless this is not necessary as these sales can take place at home or in both the home country and a third market with similar results. In fact, our empirical investigation examines precisely whether a treaty changes exports back to the parent or exports to third countries.⁸ Production in the parent is X . For simplicity, we assume that all of this is exported.

⁷ The model could be extended to include this decision. In doing so, one direction would be to model the firm's choice as an investment decision made under uncertainty about the host tax. If a treaty increases the host tax rate, it would reduce the value of the subsidiary given investment. However, if the treaty also reduces uncertainty over the host tax, this would encourage investment by a risk-averse investor. Thus, it could be the case that a treaty both encourages the establishment of a subsidiary while simultaneously encouraging the parent firm to manipulate trade flows to shift profits out of the subsidiary. This is the pattern we find in our data.

⁸ Several other papers model the choice between importing from the parent or using local production to service the host market. Clausing (2003) models an affiliate that imports final goods from the parent for sale in the host. More complicated versions, such as Madan (2000), allow for imports of intermediates and /or final goods production from the parent. The standard result from these models is that an increase in the host tax replaces local production with

Production in the host is the sum of l , which is sold locally, and x , which is sold in the third market. The demand curve in the host is:

$$p = a - .5bl \quad (1)$$

while that in the third market is:

$$P = A - .5B(X + x). \quad (2)$$

The cost of parent production is $C(X)$ while that in the host is $c(l+x)$. Both of these functions are increasing and convex. For simplicity we assume no trade costs. In addition to these variable costs, the firm faces parent and host fixed costs of F and f respectively. Finally, the firm pays an average effective profit tax T on its parental profits and an average effective profit tax t on its host profits.⁹ A broader interpretation of these effective tax rates would include not only statutory tax rates (although these may be a dominant force within them) and other tax regulations, but also risk, the relative value of profits declared in one location versus the other, and so on. This latter tax rate is affected by the introduction of a tax treaty due to the impact of a treaty. To streamline discussion and in line with previous results on the level of FDI, we assume that the introduction of a tax treaty increases the effective host tax. However, this is merely for expositional purposes.

In addition to its real activities, the firm can “import” from its parent. For simplicity, we simply model this as a tax avoidance measure, i.e. a transfer of an amount of income I out of the

home production. Madan (2000) shows that there can still, however, be a rise in host sales depending on the assumptions regarding transfer pricing.

⁹ This host tax rate could well depend on the home tax rate in the case of foreign tax credits with a relatively high-home tax. However, since our purpose is to show how changes in the relative tax rate of host profits affects subsidiary export behavior, detailed modeling of this is not necessary. It is worth noting that Sweden utilizes foreign tax credits. If the Swedish tax exceeds the host tax (which in our sample was true for the 1998 statutory corporate taxes in Estonia, Latvia, Singapore, and Turkey), then from a pure tax perspective, one might expect that $T = t$ since firms would be in an excess limit position. However, if there are other reasons that a firm would prefer that its profits are declared in Sweden, this would still translate to $T > t$ under the broader notion of what these effective tax rates capture.

host into the parent. This is done at an increasing, convex cost of $E(I)$.¹⁰ For the firm to choose a positive level of imports, it must be the case that $t < T$. Note that under the broader notion of these taxes, this simply means that a dollar of profits declared in home is more valuable than a dollar of profits declared in the host, not necessarily that the host statutory tax exceeds the home statutory tax. These costs are assumed to be deducted from the host profits and could represent both actual importation costs (such as of intermediate inputs) or the costs of restructuring cash flows within the firm to reduce tax liability.

The firm's worldwide profit is:

$$\pi = (1-T)(PX - C(X) - F + I) + (1-t)(Px + pl - c(l+x) - f - I - E(I)). \quad (3)$$

From (3), the equilibrium conditions for parent exports, host exports, local sales, and imports are (dropping the arguments of the cost functions):

$$(1-T)(A - BX - .5Bx - C') - (1-t).5Bx = 0, \quad (4)$$

$$(1-t)(A - Bx - .5BX - c') - (1-T).5BX = 0, \quad (5)$$

$$a - bl - c' = 0, \quad (6)$$

and

$$(1-T) - (1-t)(1 + E') = 0. \quad (7)$$

We assume that parameter values are such that corner solutions are avoided. From these four conditions, we can derive the following results.

Proposition 1: *Suppose that a tax treaty increases the effective host tax. Then the introduction of a treaty will lower affiliate exports and raise parent production, local affiliate sales, and imports.*

¹⁰ We could model this as a function of the absolute value of I thereby implicitly allowing for transfers in either direction. However, given our empirical findings and to simplify the presentation, we assume that the transfer is out of the host into the parent. Furthermore, if no tax planning is done, then the treaty should have no impact on the level of imports, a possibility rejected by our empirical findings.

Proof: By direct calculation:

$$\frac{dx}{dt} = \Delta .5B(b+c'') \left[(1-T)^2 (1-t)^{-1} (B+C'') X + .5B[(1-T)+(1-t)]x \right] < 0 \quad (8)$$

$$\frac{dX}{dt} = -\Delta .5B(1-t) \left[(Bb+(b+B)c'')x + [(1-T)+(1-t)](1-t)^{-2} (1-T) .5B(b+c'') X \right] > 0 \quad (9)$$

and

$$\frac{dl}{dt} = -\Delta .5Bc'' \left[(1-T)^2 (1-t)^{-1} (B+C'') X + .5B[(1-T)+(1-t)]x \right] > 0 \quad (10)$$

and

$$\frac{dI}{dt} = (1-T)(1-t)^{-2} E''^{-1} > 0 \quad (11)$$

where

$$\Delta^{-1} \equiv (1-T)(1-t)(B+C'')c''^2 + (b+c'') \left\{ .25[(1-T)+(1-t)]^2 B^2 - (1-T)(1-t)(B+C'')(B+c'') \right\} < 0.$$

Q.E.D.

The intuition for these results is straightforward. When the tax rate on host profits increases, the MNE reduces host exports and replaces them with parent exports.¹¹ This decline in host exports redirects some of this production to the local host market. Thus, the imposition of a tax treaty that increases the effective host tax rate due to information sharing and limits on treaty shopping (both of which are reductions in the firm's ability to shield profits from taxation) reorients the affiliate's production towards its local market.¹² Finally, the increase in the effective host tax encourages the firm to shift profits from the affiliate to the parent through increased imports. Note that this latter effect could result from an increase in transfer pricing (an increase

¹¹ If on the other hand, a treaty lowers the effective host tax, then parent exports fall and host production and exports rise.

¹² Note that if no tax planning is done, one might expect that the reductions in double taxation created by a treaty would lower T , not raise it. In this case, one would expect a treaty to increase affiliate exports, lower affiliate local sales, and lower imports (or they would remain at zero). As discussed below, the data reject such an effect.

in the reported value of imports without a change in real economic activity), a shift towards importing more intermediate inputs from the parent (a change in real economic activity that shifts income even at arms-length prices since marginal costs are increasing), or both.

In order to tie this result into the empirical work on tax treaties, however, it is necessary to translate from quantities of affiliate output (l and x) into values (Px and pl). Looking at the value of affiliate exports, we see that (using (5)):

$$\frac{dPx}{dt} = \left((1-T)(1-t)^{-1} \cdot 5BX + c' \right) \frac{dx}{dt} - 5Bx \frac{dX}{dt} < 0 \quad (12)$$

thus, the value of affiliate exports falls as the host tax rises. Turning to the value of affiliate sales, we see that:

$$\begin{aligned} \frac{d(pl + Px)}{dt} = c' \Delta \cdot 5Bb \left[(1-T)^2 (1-t)^{-1} (B + C'') X + 5B [(1-T) + (1-t)] x \right] \\ + \left((1-T)(1-t)^{-1} \cdot 5BX \right) \frac{dx}{dt} - 5Bx \frac{dX}{dt} < 0 \end{aligned} \quad (13)$$

indicating that a rise in the host tax reduces the total revenue generated by the affiliate. If a tax treaty raises the average effective tax in a host country, then this would be one explanation for the negative effect sometimes found from a tax treaty on affiliate sales (e.g. Blonigen and Davies, 2004). Note that by combining (12) and (13), it is easy to show that the fall in total affiliate sales is greater than the fall in exports, thus the export share (i.e. exports divided by total affiliate sales) falls with the treaty. Finally, since imports rise as affiliate sales fall, the import share rises with the treaty. These results are summarized in Proposition 2.

Proposition 2: *Suppose that a tax treaty increases the effective host tax. Then the introduction of a treaty will lower the share of affiliate exports in total affiliate sales and raise the share of imports in total affiliate sales.*

3. Data and Empirical Approach

In this section, we begin by describing the source of our firm level data and Swedish tax treaties. This is followed by a description of the empirical specifications and data we use to study the various aspects of MNE behavior.

3.1 The RIIE Survey on the Foreign Activities of Swedish Multinationals

To examine the effect of tax-treaties on FDI we use unique micro data on affiliates to Swedish Multinational firms. This section briefly describes these data.

Our data come from the Research Institute of Industrial Economics (IfN) which has conducted eight surveys of the foreign activities of Swedish Multinational firms in the years 1965, 1970, 1974, 1978, 1986, 1990, 1994, and 1998.¹³ The purpose of the surveys has been to study all Swedish firms meeting the following criteria: (i) the firm's main activity should be within the manufacturing sector, (ii) the total number of employees should be at least 50, and (iii) the firm should have at least one producing affiliate abroad and the domicile be located in Sweden. To gain an appreciation for the coverage of the surveys, consider Table 1 which reviews the number of firms and affiliates taking part of the survey. As can be seen, the answering rate is very high both among firms and their affiliates. There is a slight decline in 1998 but the answering rate is still high, almost 80 percent. In the earlier surveys about 70% of the firms remain in two consecutive surveys, whereas in the later surveys, only about half of the firms remain in the sample in two consecutive surveys. This may reflect the decline in answering rate but also mirrors that in the 1990s, regulations against foreign acquisitions of Swedish firms were lifted. A number of large Swedish MNEs such as Pharmacia, Astra, Volvo and SAAB were also acquired by or merged with foreign firms.

¹³ There was also a survey in 2003, however, given the considerable fall in the answering rate we only use the data from 1965 to 1998.

Swedish multinationals dominate Swedish manufacturing activity. In 1990 MNEs accounted for more than 50 percent of Swedish exports, about 25 percent of Swedish total manufacturing employment and roughly 90 percent of R&D expenditures (Svensson, 1996). The importance of their foreign activities has increased. As Figure 1 illustrates, overseas employment by Swedish MNEs increased from slightly above 30% in 1965 to almost 70% in 1998.

In 1998 about one out of five foreign workers in Swedish MNEs had their employment in an affiliate in the US. Other important locations for foreign employment were the large Western European countries: Germany, France, Italy and UK. The share of employment in the European countries remains fairly stable over time whereas the importance of the US market has increased. These investments are likely to be driven by market-seeking (horizontal) FDI. Developed countries attract the bulk of investments, a pattern not unique for Swedish multinationals. For developing countries, Swedish firms have traditionally had significant investments in Latin America, in particular Brazil, in response to import-substituting policies. In the 1990s, there is evidence of cost-driven (vertical) FDI growing in importance, and affiliate employment emerging in the Eastern European countries such as Estonia, Hungary and Poland. Swedish firms are also starting to invest in China. There is a large percentage increase in both the number of firms and the number of affiliates in almost every host over time.

A great advantage of our data on affiliate activities is that intra-firm trade can be studied. For example, as Figure 2 illustrates, we can decompose affiliate total sales in several ways, such as into goods assembled at the affiliate (i.e. production) and sales not assembled by the affiliate (i.e. direct sales). A further distinction can be made between sales for exports and sales for the local market. Exports, in turn, can be broken up into sales to Sweden and those to other

countries than Sweden, e.g. platform exports. We can also decompose imports into imports for further procession. i.e. inputs, and finished goods for resale.

Figures 3 through 6 decompose our data on intra-firm trade in these ways. Figure 3 shows the decomposition of total affiliate sales into goods assembled in the affiliate and goods simply imported for resale. As we can see, production activities dominate with over 75 percent of sales originating from assembly, a pattern that is quite stable over time. The destination of these sales, however, has experienced change. In Figure 4, there is a clear pattern that affiliates over time are becoming more export oriented. This mirrors globalization and highlights the increasing importance of intra-firm trade. Looking at the destination of these exports in Figure 5, we see that the increasing export intensity of affiliates is driven by exports to other countries to Sweden. This is perhaps not surprising given that Sweden is a small home market. Finally, Figure 6 turns to the data on imports from Sweden. As this figure shows, relative to affiliate sales, imports of both final and intermediate goods have fallen. For example, in 1965 about 10 percent of affiliate sales was direct sales of products assembled in Sweden but by 1998 this share had shrunk to half that. Prior to 1990, imports of intermediate inputs from Sweden had a comparable trend, although they have since rebounded to their initial level.

3.2 Tax Treaties

Let us now turn to which host countries entered into tax treaties with Sweden during the sample period. Table 2 gives a list of these countries and the year in which the treaty became effective^{14, 15}. Over the period covered by our data, Swedish treaties have experienced a fairly constant growth rate with the exception of a burst of activity during 1980-1982, when nine

¹⁴ We refer to these countries as “new treaty countries” to distinguish them from countries that had treaties in place before 1965. Note that since our data analysis uses country fixed effects, we restrict our sample to these new treaty countries as they are the only ones with time-series variation in the variable of interest.

¹⁵ For a treaty to become effective, the Swedish government must first sign it and then the treaty must be approved by the Swedish parliament to pass it into law. A comparable process is common for most other countries.

treaties became effective (a third of the treaties in our sample). Geographically, Eastern Europe has been a major focus of the new treaties, comprising nine of the treaties in the sample. Given Sweden's proximity to these countries, this is not surprising. This changed somewhat during the late 1980s where four treaties with Asian countries become effective. Economically, the majority of the new treaty countries fall into the World Bank's middle income category, with four classified as low income and eight high income countries.¹⁶ To indicate the extent of Swedish FDI into these countries we also give the number of firms investing in each country, the number of affiliates, and total affiliate employment. Comparing the total number of employees abroad in Table 1 with that in new treaty countries from Table 2, we note that in 1998 about 13 percent of foreign employment was located in the new treaty countries.

Sweden has concluded tax treaties with a large number of countries over the years, most of which follow the OECD model treaty. By 2007, Sweden had tax treaties with all its major trade partners. Under most Swedish treaties, dividends from a foreign subsidiary are held exempt from Swedish tax to the same extent as if the subsidiary had been located in Sweden. Swedish tax treaties most commonly use the method of credit to avoid double taxation. Credit is calculated according to the internal law, which provides a generally favorable foreign tax credit rule overall. However, if a treaty grants a higher tax reduction than the internal law, the treaty overrides. A common alternative is the exemption method, which is often provided in a treaty for certain income, even if credit is the main method. The tax treaties also ensure that the authorities of the two countries will exchange information that is relevant to an application of the treaty or to put a stop to fraud or tax evasion. As discussed above, this latter provision may be an

¹⁶ The low income countries are Bangladesh, Kenya, Zambia, and Zimbabwe. The high income countries are Australia, Czech Republic, Estonia, Korea, Luxembourg, Malta, Singapore, and Spain.

important facet of a treaty since it may reduce the incentive to use an affiliate as an export platform.

An additional feature of Swedish treaties is that a significant number of them with developing countries also include tax sparing provisions. Under these provisions, Sweden agrees to use the host statutory tax for the calculation of foreign tax credits even when the firm is granted a special, low tax rate as an investment incentive by the host (see OECD, 1998, for a discussion of tax sparing). This then allows for greater effectiveness of host tax incentives which would otherwise be limited by the MNE's Swedish tax obligations. Table 2 lists those treaties in our sample that contain tax sparing provisions.

Since our data runs from 1965 and 1998, we limit the sample to the set of countries with which a tax treaty with Sweden became effective during this period to ensure that we have information on both the pre- and post-treaty period.¹⁷ This leaves us with 27 countries which, with the exceptions of Australia and Luxembourg, are developing countries. The data come from the Worldwide Tax Treaties database at Tax.com (2007).

3.3 Empirical Approach

In our empirical analysis, we wish to investigate three items: the probability of investment, the level of investment and trade, and the share of imports or exports in affiliate sales. Here we present our baseline specifications.

We start our investigation by estimating the effect of a tax treaty on the probability that an affiliate exists in a particular host country. Although our model took investment in the host as given, it is certainly possible that even if a treaty does not affect behavior conditional on entry it affects the probability of investment. While the effects of tax rate on the investment decision

¹⁷ Thus, our estimates gauge the effect of a treaty on MNEs given that a treaty becomes effective during the sample period.

have been considered in a number of papers, including Head and Mayer (2004) which uses firm level data, to our knowledge this is the first time the effects of tax treaties on the extensive margin have been investigated.

To this end, we consider binary variable $Affiliate_{i,j,t}$ which is equal to one if the Swedish firm i , has an affiliate in the host country j in year t and zero otherwise. This is regressed on our variable of interest, a dummy variable $TREATY_{j,t}$ which is equal to one if there is an effective tax treaty between Sweden and country j in year t and other covariates drawn from the previous MNE literature on first time entry¹⁸. This yields the specification:

$$Affiliate_{i,j,t} = TREATY_{j,t} + \beta X_{i,j,t} + \gamma Country_j + \eta Ind_{i,t} + \delta Year_t + \varepsilon_{i,j,t} \quad (14)$$

where $X_{i,j,t}$ are the additional regressors, some of which are country- or firm-specific, and $\varepsilon_{i,j,t}$ is the error term. In all of our results, we utilize country, industry, and year dummies ($Country_j$, $Ind_{i,t}$, and $Year_t$ respectively). Note that the use of country dummies eliminates the need for controls such as distance between country j and Sweden.

We then follow this by analyzing the impact of treaties on the level of economic activity by affiliates of firm i in a country j in year t .¹⁹ Here we use:

$$Level_{i,j,t} = TREATY_{j,t} + \beta X_{i,j,t} + \gamma Country_j + \eta Ind_{i,t} + \delta Year_t + \varepsilon_{i,j,t}. \quad (15)$$

We consider several level choices: total sales, sales from local production, sales from resale of imported final goods, local sales, exports, exports to third countries (platform), exports back to

¹⁸ See Blonigen (1997), Norbäck (2001), Yeaple (2005) and Tekin-Koru (2006) for example.

¹⁹ Note that we are not explicitly conditioning on the entry decision in these results and therefore acknowledge that the results must be interpreted as conditional on there being affiliates in that country in that year for a given firm. In other word, we avoid using a two-stage Heckman estimation because we do not investigate the entry decision of the firm. That would require aggregating the affiliate level data to firm level data and we would not observe the plant level trade flows. In any case, taking entry as given brings the empirics of this section more in line with our theory, where entry was assumed.

Sweden (vertical), total imports, imports of intermediate goods from the parent, and imports of final goods from the parent.

Finally, we turn to share regressions, using the specification:

$$Share_{i,j,t} = TREATY_{j,t} + \beta X_{i,j,t} + \gamma Country_j + \eta Ind_{i,t} + \delta Year_t + \varepsilon_{i,j,t} \quad (16)$$

Here, we consider the share of the various measures of exports and imports relative to total affiliate sales to understand how the orientation of an affiliate might vary with the existence of a treaty. Norbäck et al. (2007) show that using shares as the empirical measure excludes the effects of the change in the product variety within an existing affiliate and other omitted affiliate-specific variables which are time invariant. Thus, these results may be more robust than our level results.

The country level controls in our analysis originate from the standard gravity framework and our sign expectations for these variables come from that framework.²⁰ Note that since we use year dummies in our specification, we do not include information on the source country (Sweden) since it does not vary across firms. We proxy the host country market size by real gross domestic product ($GDP_{j,t}$) of country j in year t .²¹ We control for trade barriers by using various dummy variables that indicate whether a country belongs to a regional trade agreement ($ASEAN_{j,t}$, $CACM_{j,t}$, $CEFTA_{j,t}$, $EU_{j,t}$, $MERCOSUR_{j,t}$ and $NAFTA_{j,t}$ which we collectively refer to as RTA dummies (which equal one when a country is a member and the agreement is in force and equal zero otherwise) and by the host country openness measure ($OPEN_{j,t}$) which is the ratio of exports plus imports per nominal GDP. The labor costs in the host country are picked up by GDP per capita ($GDPCAP_{j,t}$). Note that this also captures the level of development of the host

²⁰ See Blonigen (2005) for a recent overview.

²¹ In unreported results, we used the foreign market potential variable of Hanson (1998) which is the distance-weighted sum of GDP. This is intended to capture third-country effects. This was not significant in our results and was therefore omitted from the presented specification.

country. Thus, while one might expect FDI to be deterred by costly workers, it may also be attracted by wealthy consumers or highly skilled workers. Thus, the anticipated effect of this variable is ambiguous. The country level data used in this paper come from the Penn World Tables²².

An additional important control variable we use is the tax rate ($TAX_{j,t}$). We employ the highest tax bracket of corporate income taxes reported in the World Tax Database of the Office of Tax Policy Research in University of Michigan. It is generally accepted that international tax rules and the tax rates of other countries can affect a broad range of corporate and individual behavior, including, the location and scope of foreign direct investment²³. Therefore, we expect a negative sign for the TAX in our estimations. In addition, in some specifications, we include a variable $TAX SPARING$ which takes the value of 1 if the host country has a tax sparing provision in an effective treaty and 0 otherwise. We expect tax sparing provisions to positively affect the level of economic activity by the affiliate in the host country.²⁴ In addition, since tax sparing increases the value of tax incentives provided by the host, we expect them to mitigate the MNE's desire to shift profits to the parent when a treaty becomes effective, i.e. $TAX SPARING$ should have a positive coefficient in the export share regression and a negative coefficient in the import share regression.

Turning to firm-level variables, we include a measure of fixed costs in terms of plant scale ($SCALE_{i,t}$). This covariate is characterized as the average number of employees in Swedish plants with more than 200 employees in the 4 digit industry level to which the affiliate belongs in

²² See Summers and Heston (1991) for details.

²³ See, for example, Hines (1999) who offers a survey of this literature. Altshuler et al. (2001) and Hines (2001) are recent examples of this work.

²⁴ Hines (2001) provides evidence suggesting that tax sparing positively influences the level and location of FDI using data on Japanese and American outbound FDI in large sample of countries. Azémar et.al (2007) again find evidence that tax sparing provisions positively influences the location of Japanese FDI even after having taken reverse causality into account.

the period under consideration. The data come from the Statistics Sweden. We expect a negative influence of *SCALE* on the probability of new investments but no effect on the level of FDI and share of trade equations. We use total sales of the group, $FSIZE_{j,t}$ as an indicator of the size of the MNE and its experience abroad. The expected sign of this covariate is positive. We proxy firm specific assets by the research and development intensity ($R\&D_{j,t}$) of the mother firm. It is calculated as the share of total expenditure on R&D in sales. This variable's effect on the probability, the size and the composition of FDI is ambiguous²⁵. The knowledge of local business conditions is picked up by the previous experience ($EXPERIENCE_{j,t}$) in the host country. This is a dummy variable which takes value one if the Swedish MNE had an affiliate in this country before and zero otherwise. Previous experience is expected to positively affect the entry probability but not the level or the composition of sales. Another variable that we use to control for the local conditions is the age ($AGE_{j,t}$) of the affiliate under consideration. *AGE* is calculated by subtracting the year of establishment from the current year and it is expected to positively affect the level of activity. Finally, we use a dummy variable ($PRODAFF_{j,t}$) to proxy the purpose of establishment. It takes value one if the affiliate was established as a sales-company and value zero if it is established as a production unit. Note that this variable seems to indicate that the affiliate is more directed towards local sales. This variable is important because it gives us information on the initial intent of the mother firm. The interpretation of the sign of this variable will closely hinge on the signs of other covariates. In our estimations we also use the OECD taxonomy of industries (*Resource Intensive*, *Labor Intensive*, *Scale Intensive*,

²⁵ If the MNE enters by using greenfield investments, *R&D* is expected to have a positive effect on the probability of investment due to internalization reasons. If the MNE uses mergers and acquisitions, then this variable might not have any effect on the entry probability. See Tekin-Koru (2006) for discussion. The effect of *R&D* on the composition of sales is also multi-faceted. For example, as the level of R&D intensity goes up, we expect an increase in the imports of finished goods from the parent for resale in the host country. On the other hand, an R&D intensive firm will produce the high-tech components at headquarters and ship them to the affiliate for assembly. In this case, we expect a positive effect both on intermediate goods imports and total exports if the host country is used as an export platform.

Differentiated Goods and Science Based) to account for the industry specific effects that we cannot observe in our data. It is important to note that these do change for an affiliate over time.

Table 3 gives descriptive information on all the covariates discussed in this section. From these baseline specifications, we utilize various alternatives, including the use of industry dummy variables, firm dummy variables, and interaction terms.

4. Results

4.1. Investment Decision

We begin with the extensive margin estimations. Table 4 presents the probit estimates of treaty effects on new entry by Swedish multinationals. Column (1) is our base specification with country fixed effects. Columns (2) and (3) include firm and more detailed industry fixed effects (defined up to the five digit level), respectively. All regressions include region and time dummies. The Pseudo R^2 is between 0.49 and 0.54 in Table 4, indicating a relatively good fit.

TREATY is significant and positive in all specifications in Table 4, revealing that bilateral tax treaties increase the likelihood of a Swedish affiliate in the host country. This significant treaty effect is a new result. Previously in the literature, researchers generally find either an insignificant or a weakly negative effect of the treaty formation on the level of FDI using aggregate data²⁶. Here, we show that tax treaties have a favorable effect on the extensive margin. This might be the case if the MNEs are convinced about the tax certainty provided by the treaty. Nevertheless, the economic size of this effect is very small. Calculating the marginal effect shows that if a host county signs a treaty with Sweden this increases the probability that a Swedish firm will invest by 0.1%. Although this is small in absolute magnitude, compared to the probability evaluated at the sample mean of 0.6%, this is nevertheless economically meaningful.

²⁶ See Davies (2004) for a recent review of this literature.

TAX is insignificant across all the specifications, pointing out no effect of host country tax rates on the probability that there is an affiliate in the host country. This supports the findings of the previous literature when country fixed effects are included (e.g. Head and Mayer, 2004).

Looking at the probit estimations in column (1) to (3) of Table 4, a larger market size (*GDP*), a larger firm size (*FSIZE*) and previous experience (*EXPERIENCE*) in the host country increase the likelihood of having an affiliate in the country as expected. The regression with firm fixed effects in column (2) results in a higher number of significant covariates. *GDP**CAP* is not significant, perhaps due to its proxying for both the skill and the cost of workers. *SCALE*, which is used to control for the fixed costs of investments is also insignificant. This might be due to the elusiveness of this variable as a proxy for the fixed costs.

Many of the industry dummies are significant in the regression with firm fixed effects. The probability of having an affiliate in the host country is higher in the labor, scale and differentiated goods intensive sectors. That in the science intensive sector is less common, although the coefficient is insignificant. We expected a decline in the likelihood of having an affiliate when the firm has a high research and development intensity due to the risk of losing the new technology.

4.2. Compositional Effects

As illustrated in Figure 2, the data allows us to make a detailed decomposition of affiliate sales. We therefore turn to the estimation of the compositional effects of tax treaties to test the predictions summarized in Proposition 1. Table 5 reports the OLS estimates of treaty effects on the level of sales, exports, and imports of the Swedish affiliates, both for their total values as well as the value of their various components²⁷.

²⁷ It is possible that the existence of a treaty with the parent country is endogenous. Egger, Larch and Pfaffermayr (2006) and Millimet and Kumas (2007) are two recent papers which explicitly treat the tax treaty endogeneity. We

In line with Proposition 1, our variable of interest, *TREATY* is slightly negative although insignificant in column (1) of Table 5. This confirms the previous empirical result that tax treaties do not significantly affect the level of FDI (measured by affiliate sales) by using micro data. Even though bilateral tax treaties positively affect the probability of new investments, they have no aggregate or “total” effect on the level of FDI by a firm. This suggests that treaties may not affect a firm’s marginal FDI decision even if they affect the extensive margin of a firm.

Next, we decompose the total sales of an affiliate into different categories. The first breakdown is to decompose total sales into those generated by local production and those from resale of imported goods. The second separates total sales into those generated by local sales and those from exports. Exports themselves can be broken down into platform sales (those to third countries) and vertical sales (those to Sweden). Finally, we can consider total imports or their two components, intermediate good imports and finished good imports. Thus, by breaking the affiliate data into these various components one gets a clear overview of the total effect and the compositional effect.

Columns (2) and (3) report the estimation results for the sales of goods produced by the affiliate and the resale of finished goods imported from elsewhere. *TREATY* has an insignificant negative (positive) effect on the former (latter). Columns (4) and (5) show local sales and total exports. *TREATY* has an insignificant negative effect on total exports and yet again insignificant but positive effect on local sales. *TAX* has similar insignificant coefficients. Columns (6) and (7) report the results for platform and vertical exports. *TREATY* has an insignificant negative effect on platform exports. In other words, exports to third countries do not change after the treaty.

use OLS in our estimates because, for endogeneity to be a problem in our data, the existence of a treaty would need to depend on the sales or overall exports (imports) of a single affiliate. We do not feel that this is likely. Nevertheless, in unreported IV estimations with credit regulations in the host country as our instrument for a treaty, we find out that our results do not change qualitatively. These results are available upon request.

Vertical exports, on the other hand, has a weakly significant negative coefficient suggesting a decline in exports back to home country after the treaty goes into effect. This result might be interpreted such that the treaty increases the average effective tax in the host country and the MNE shifts away from this affiliate as a way of servicing the home market as discussed in Proposition 1.

Columns (8), (9) and (10) present results for the total imports and the composition of imports as intermediate and finished goods. *TREATY* affects all of them positively; however, it is only significant for the level of total imports. As shown in the model, if the introduction of a treaty increases the effective tax rate, this would encourage shifting profits out of the host. One way to achieve this is to import more. Thus, in line with the vertical export result, this is somewhat suggestive of a treaty increasing the effective host tax. However, the estimated increase is an astounding 11 fold rise and therefore there is reason to be suspect of attributing this estimated effect to treaty formation alone.

In unreported results, we also considered the interaction between *TREATY* and *TAX*. Some of the previous literature finds a weakly negative effect of tax treaties on FDI (suggesting transfer pricing), one might expect this effect to be stronger when the affiliate is in a low tax location. We did not find any robust effect of the interaction variable. Although we omitted these results for brevity, they are available upon request.²⁸

Most of the other covariates exhibit their expected signs, though some are insignificant. Throughout almost all equations *AGE*, *Fsize* and *PRODAFF* have significant positive signs, pointing out that Swedish MNEs with more foreign market experience, bigger size and were established as sales affiliates have higher levels of sales, exports and imports. In short, the degree

²⁸ We also experimented with different cuts of the data, e.g. by host country development level, by age of the affiliate and by region, however, many of the results are not sensible due to the large number of dummy variables and the small sample sizes in these sub-samples. Nevertheless, we offer these upon request.

of multinationality matters. *GDPCAP*, the level of host country development, matters for the total affiliate sales, production and platform exports but not for other compositions of those sales. The fit of regressions measured by the R^2 ranges from 0.47 to 0.68.

When we look at the panorama of the results in Table 5 there is no evidence that the level of FDI is affected by the bilateral tax treaty going into effect. These results then confirm the findings of the current literature on the effects of tax treaties on FDI and add to it by using firm level data and by exploring the impact of these treaties on the investment and sales behavior of the MNE. There is some evidence, however, suggesting that the composition of sales shift in a way that reallocate profits to the parent country.

4.3. Export and Import Shares

To further explore our results from the previous section, we use the share regressions, which are a way of controlling for the endogeneity of sales levels. For example, if there is a shock that increase both sales and exports proportionally, although this might bias the level estimates, it would wash out in the share estimates. This approach thus cleans out omitted affiliate- and firm-specific variables which are not time invariant²⁹. One result of our model is that the fall in the value of affiliate exports should be larger than the fall in the value of total affiliate sales. Therefore, the ratio of the value of affiliate exports to total affiliate sales should decline after a tax treaty is signed if a treaty raises the effective host tax rate. In line with Proposition 2, we expect export shares to fall and import shares to rise following the introduction of a treaty.

²⁹ Another likely problem with OLS which we have not discussed is the omitted variable problem. Countries which switched to tax treaties in our sample period might have switched to other policies which might affect the sales or exports of the affiliates. However, if the tax treaty is a part of a movement towards more international ties, one would imagine export intensity to rise, not to fall, thus, if anything our results are biased towards zero.

Table 6 presents the OLS estimates of the effects of tax treaties on the composition of affiliate exports as a share of sales. Columns (1), (3) and (5) look at platform exports/sales while columns (2), (4) and (6) consider vertical exports/sales. Even though the platform exports are not affected in any significant way by signing tax treaties, vertical exports are. More specifically, after the treaty becomes effective the share of exports back to Sweden declines by 78%³⁰. Different from the existing literature, here we observe a statistically and economically significant effect of tax treaties on the firm behavior, one that is consistent with a treaty increasing the effective host tax.

To explore these results more deeply, we examine whether the treaty effects vary across different types of affiliates. To this end, we introduce a new dummy variable *PROD* which takes the value of 1 if the affiliate reports production and zero otherwise. Note that the affiliates always report sales in our sample. If we find a significant and positive interaction term (*TREATY*PROD*), it would mean that the export reduction is larger for those affiliates which only report sales without giving information on whether or not these sales were assembled by the affiliate. If the affiliate exists solely for resale (as might occur if a primary reason for its existence is tax avoidance), then this would be suggestive evidence for a reduction in tax evasion when the treaty becomes effective. Columns (3) and (4) present the specification with the *TREATY*PROD* interaction. The coefficient of this term although insignificant is negative in the vertical export share estimation and positive in the platform export share estimation. In this specification, we see no significant effect of tax treaties on the export behavior of the affiliate.

We continue testing the robustness of this result by introducing an additional dummy variable, *LOWEXP*, which takes the value 1 if the export share of the affiliate is less than 10%

³⁰ We calculate this magnitude for column (2) of Table 6 by using $e^{-1.496}-1=0.775$.

and 0 otherwise³¹. If the primary purpose of an affiliate is to gain access to local consumers, then it is possible that changes in the effective host tax affect such a firm's exports more than one highly geared towards international markets, leading to a greater decline in exports relative to affiliate sales for the low exporter. Columns (5) and (6) present the specification with this *TREATY*LOWEXP* interaction. Once again we find no significant impact of a treaty on the platform share; however, it still has a significant negative effect on the vertical share. Furthermore, the decline is greater for firms that export little back to Sweden. If the affiliate's export share is less than 10%, then the decline in the vertical export share is 82%; otherwise it is 70%.

Turning to the other controls, it is worth recognizing that although it is not significant, *TAX* carries the theory predicted negative coefficient in every case. Not surprisingly we find that the host country market size (*GDP*) and being established as a sales affiliate (*PRODAFF*) reduce the platform export intensity as would happen if the affiliate exists primarily to serve local consumers. Conversely, *OPEN* positively affects the platform export share, indicating greater access to international markets increases the international orientation of affiliate sales. Openness, on the other hand, negatively affects the vertical export shares. Platform export shares in scale intensive, science based and differentiated goods intensive sectors are also lower than those in other sectors.

Next we turn to our estimates of import shares. Given the results of Proposition 2, here we anticipate a positive effect of a tax treaty. Table 7 shows the OLS estimation of the effects of tax treaties on the composition of affiliate imports as a share of sales. Columns (1), (3) and (5) report the input imports shares whereas columns (2), (4) and (6) report the finished goods imports shares. In line with Proposition 2 *TREATY* increases the import shares; however it is

³¹ We use other benchmark values (20%, 30% and the sample mean) and our results do not change qualitatively.

only significant for imports of inputs. This is consistent with an attempt to shift profits out of a new treaty country. After a tax treaty, our estimates suggest that the Swedish affiliate triples its intermediate goods imports from Sweden. This result matches the significant negative impact of *TREATY* on vertical export shares. Thus, the impact of tax treaties seems to be not on the level of affiliate sales, but on the degree of vertical interactions between the parent and the host parts of the MNE.

This finding does not vary according to whether or not the affiliate reports production. It does, however, seem to be most important for affiliates that import less than 10% of their total shares (as in columns (5) and (6) which use a dummy variable *LOWIMP* which is defined analogous to *LOWEXP*). In fact here we find a weakly significant but positive effect for imports of intermediate goods. This finding would be consistent with a setting in which a treaty increases the effective host tax, encouraging profit shifting and where the firm is able to adjust its behavior with the greatest ease when it is initially importing a small amount relative to its overall activities.

4.4. Tax Sparing

Since our sample consists mostly of developing countries (with the exceptions of Australia and Luxembourg) and Sweden has a tax credit system, in this section we distinguish treaties with and without tax sparing provisions when measuring the effects of tax treaties on FDI. With tax sparing, the effective host country tax is not bounded from below by the Swedish tax because during a tax holiday Sweden treats the host tax as if it had not fallen when calculating the firm's tax credits. As such, for treaties with sparing, we would expect that relative to treaties without it: i. more economic activity, ii. less need to reduce exports (i.e. less need to move profit generating activity out of the host), iii. less need to increase imports.

Table 8 repeats the regressions in the previous tables with *TAX SPARING*³². The first two columns report the probit results with firm and industry fixed effects, respectively. The results show that probability of having an affiliate in the host country is not significantly affected by the existence of tax sparing provisions. Our previous finding about the significant and positive impact of *TREATY* on this probability remains intact.

The next five columns report the levels regressions. As expected, the economic activity in terms of total sales, column (3), and production, column (4), significantly increases. This is consistent with the previous literature's findings regarding the effects of tax sparing provisions on FDI. The economic magnitude of tax sparing's impact is non-negligible. Total sales, for example, goes up by 81% after the introduction of a tax treaty with sparing provisions. Columns (5) and (6) show the level results for total exports and platform exports. Again, tax sparing provisions have a significant and positive impact. As column (6) indicates, no significant impact of tax sparing is found for imports, however. One notable change relative to the earlier results is that the addition of *TAX SPARING* to the regressions improves the significance of *TREATY*. In contrast to Table 5, *TREATY* is now a significant determinant of all three trade measures with a sign that is consistent with our theory. Also consistent with our expectations, tax sparing reduces the impact of the treaty (although it is significant only in the export regressions).

The last four columns present the shares regressions for low levels of exports and imports. Our previous results in terms of the direction of the effect remain the same, however, the significance of our treaty variables is somewhat less. In particular, the only significant effects are for tax sparing where, consistent with our expectations, tax sparing significantly increases firm platform exports and significantly reduces imports of finished goods.

³² We report only a select set of results due to brevity. All other results are also consistent with our previous findings and are available upon request.

5. Conclusion

This paper presents the first firm-level estimates of the effects of bilateral tax treaties. The use of such data allows us to examine not only on the level of FDI but also on the probability and the composition of firm activities. This gives us a much broader idea of the extent to which tax treaties influence MNE behavior by considering several heretofore unexplored aspects of such firms.

Our results indicate that, given entry, for the most part tax treaties seem to have little effect on the level of FDI activity, measured in levels or as shares of affiliate sales. We do, however, find that tax treaties increase the probability of a Swedish MNE having an affiliate in a given country. Thus, in terms of the level of FDI, the impact of tax treaties seems to be greatest along the extensive margin, not the intensive margin. While there is no guarantee that the lessons learned from this study of Swedish firms applies universally, our results suggest that the impact of treaties might be greatest due to their impact on issues of uncertainty, not by adjusting the effective tax rates firms face. This is in fact the argument of Jones (1996).

We do, however, find an impact of treaties on MNE's marginal trade decisions. Here, we find evidence suggesting that the introduction of a treaty leads the firm to change its trade behavior in a way that lowers the profits reported in the host. This is primarily achieved by manipulating intra-firm trade and is consistent with the idea that a tax treaty raises the effective host tax due to increased information exchange or stricter transfer pricing regulations. This result is strongest for trade between the parent and the affiliate. Furthermore, we find stronger effects of treaties when affiliates trade small amounts relative to the scale of their overall operations. Thus, it is our hope that this analysis adds insight into the debate on tax treaties and the overall behavior of multinational firms.

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Table 1. Description of the RIIE Surveys

Year	Participating firms	Answering rate (%)	Participating affiliates	Answering rate (%)	Total affiliate employment
1965	108	95	328	82	147292
1970	108	95	418	100	182087
1974	108	95	480	100	221111
1978	122	93	567	100	227149
1986	108	95	646	99	259823
1990	120	*	871	91	440879
1994	132	86	689	97	531994
1998	118	77	703	71	223061

* Not available.

Table 2. Countries Signing Tax-Treaties with Sweden During 1965-1998

Country	Treaty signed with Sweden	No of firms active in 1998	No affiliates active in 1998	Total affiliate employment in 1998
Australia	1982	4	7	1154
Bangladesh [†]	1984	0	0	0
China [†]	1987	8	14	2849
Czech Republic	1982	3	3	717
Estonia [†]	1980	8	9	5636
Indonesia [†]	1990	*	*	*
Kenya [†]	1973	*	*	*
Korea, Rep. [†]	1981	*	*	*
Latvia [†]	1980	*	*	*
Lithuania [†]	1994	*	*	*
Luxembourg	1981	*	*	*
Malaysia	1968	4	4	915
Malta [†]	1975	0	0	0
Mexico [†]	1993	6	8	4718
Peru	1969	*	*	*
Philippines [†]	1970	*	*	*
Poland	1974	21	23	3893
Romania	1978	0	0	0
Russian Federation	1980	4	4	462
Singapore [†]	1967	3	4	222
Slovak Republic	1982	*	*	*
Spain [†]	1975	9	15	4593
Sri Lanka [†]	1985	*	*	*
Turkey	1991	*	*	*
Yugoslavia, Fed. Rep. [†]	1982	*	*	*
Zambia [†]	1976	*	*	*
Zimbabwe [†]	1990	*	*	*
Number of firms/affiliates/employed		42	114	30190

* Information suppressed when there are less than three firms due to confidentiality reasons.

[†] Denotes treaty with tax sparing provisions. Note that China's tax sparing provisions expired in 1997.

Table 3. Summary Statistics (level and share regressions)

Variables	Obs	Mean	Std.Dev.	Minimum	Maximum
<i>TREATY</i>	568	0.688	0.463	0	1
<i>TAX SPARING</i>	568	0.331	0.471	0	1
<i>TAX</i>	473	35.780	5.77	25	60
<i>GDP (log)</i>	559	19.265	1.264	14.999	22.124
<i>GDP CAP (log)</i>	559	9.078	0.657	6.755	10.589
<i>OPEN (log)</i>	559	3.707	0.730	2.572	5.818
<i>AGE</i>	533	11,911	14.073	0	71
<i>R&D (log)</i>	547	-3.990	1.337	-9.210	-1.336
<i>EXPERIENCE</i>	568	0.948	0.241	0	1
<i>FSIZE (log)</i>	568	8.866	2.081	2.297	12.314
<i>SCALE (log)</i>	568	6.318	0.351	5.739	7.531
<i>PRODAFF</i>	526	0.785	0.411	0	1
<i>Total Sales (log)</i>	566	3.735	1.756	-1.291	8.636
<i>Production (log)</i>	473	3.305	1.814	-6.908	7.730
<i>Resale (log)</i>	256	2.502	2.230	-5.116	7.687
<i>Local Sales (log)</i>	495	3.554	1.823	-3.163	8.626
<i>Platform Exports (log)</i>	254	2.078	2.497	-4.711	6.786
<i>Vertical Exports (log)</i>	154	1.105	1.997	-5.809	5.808
<i>Input Imports (log)</i>	249	1.338	2.357	-6.908	6.701
<i>Finished Imports (log)</i>	194	1.088	2.370	-5.298	7.112
<i>Vertical Export Share (log)</i>	154	-3.078	2.149	-8.769	0
<i>Platform Export Share (log)</i>	254	-2.373	1.877	-9.239	0.042
<i>Input Import Share (log)</i>	249	2.363	1.358	-7.601	0.361
<i>Finished Import Share (log)</i>	194	-2.830	1.707	-10.108	0.053

**Table 4. Probit Estimates of Treaty Effects on Having An Affiliate in the Host Country:
Alternative Specifications**

Variables	Dependent Variable: Entry versus No-Entry		
	(1) Country FE	(2) Firm FE	(3) Industry FE
<i>TREATY</i>	0.395** (0.191)	0.747* (0.419)	0.652*** (0.214)
<i>TAX</i>	0.005 (0.021)	0.009 (0.029)	0.005 (0.021)
<i>GDP</i>	0.405** (0.190)	3.952** (1.663)	0.021** (0.200)
<i>GDPCAP</i>	0.165 (0.292)	-2.607 (1.673)	0.420 (0.324)
<i>OPEN</i>	-0.007 (0.266)	0.081 (0.425)	-0.185 (0.338)
<i>R&D</i>	-0.055 (0.043)	-0.105** (0.051)	-0.016 (0.071)
<i>EXPERIENCE</i>	2.251*** (0.178)	2.499*** (0.236)	2.608*** (0.228)
<i>FSIZE</i>	0.072** (0.032)	0.226** (0.172)	0.017 (0.080)
<i>SCALE</i>	-0.019 (0.151)	0.691 (0.306)	0.160 (0.184)
<i>Labor Intensive</i>	-0.309** (0.135)	7.772*** (0.646)	
<i>Scale Intensive</i>	-0.065 (0.149)	8.145*** (0.539)	
<i>Differentiated Goods</i>	-0.179 (0.149)	8.304*** (0.982)	
<i>Science Based</i>	-0.227 (0.231)	-1.003 (0.908)	
<i>Intercept</i>	-11.726*** (3.446)	-43.877*** (13.212)	
Pseudo R ²	0.487	0.508	0.537
Observations	11,048	3,235	5,578

Note: All regressions include country, RTA, and year dummies. Standard errors are in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 5. OLS Estimates of Treaty Effects on the Level of Sales, Exports and Imports of Swedish Affiliates

Variables	Dependent Variable									
	Total Sales	Composition of Sales		Composition of Sales		Composition of Exports		Total Imports	Composition of Imports	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Production	Resale	Local Sales	Total Exports	Platform	Vertical		Input	Finished	
<i>TREATY</i>	-0.125 (0.241)	-0.473 (0.498)	0.497 (0.898)	0.526 (0.346)	-2.244 (1.359)	-1.631 (1.735)	-1.076* (0.513)	2.291*** (0.497)	0.419 (1.025)	0.285 (1.126)
<i>TAX</i>	-0.014 (0.023)	0.006 (0.025)	-0.001 (0.016)	0.022 (0.028)	-0.053 (0.040)	-0.072 (0.060)	-0.124 (0.084)	-0.006 (0.033)	-0.029 (0.029)	-0.005 (0.040)
<i>GDP</i>	-2.364 (1.531)	-1.687 (2.008)	-4.447 (3.366)	0.811 (1.778)	-10.615** (4.391)	-13.185** (4.648)	-8.317 (6.483)	1.702 (3.910)	2.162 (2.908)	0.362 (5.679)
<i>GDPCAP</i>	3.490** (1.303)	3.070* (1.784)	5.779** (2.678)	0.429 (1.797)	7.409* (3.739)	11.936*** (4.089)	5.849 (5.781)	0.856 (3.922)	-2.516 (4.157)	-2.188 (4.863)
<i>OPEN</i>	-0.046 (0.385)	-0.751 (0.517)	-0.504 (0.906)	0.340 (0.545)	-0.020 (0.616)	1.778* (0.872)	-3.273*** (0.924)	-0.444 (1.008)	0.380 (2.112)	0.747 (1.567)
<i>R&D</i>	-0.065 (0.065)	-0.117 (0.089)	0.276 (0.167)	-0.014 (0.068)	-0.156 (0.099)	-0.145 (0.100)	-0.099 (0.086)	0.314 (0.187)	0.069 (0.098)	0.695*** (0.189)
<i>EXPERIENCE</i>	-0.344 (0.289)	-0.635* (0.327)	-1.015 (1.185)	-0.432 (0.377)	0.053 (0.295)	0.169 (0.333)	0.119 (0.512)	-1.106*** (0.344)	-1.069** (0.441)	-0.283 (1.285)
<i>AGE</i>	0.026*** (0.003)	0.017*** (0.003)	0.026*** (0.008)	0.026*** (0.003)	0.027*** (0.008)	0.012 (0.010)	0.028*** (0.006)	0.022*** (0.005)	0.028 (0.017)	0.019** (0.009)
<i>FSIZE</i>	0.419*** (0.033)	0.425*** (0.049)	0.423*** (0.117)	0.451*** (0.061)	0.294*** (0.073)	0.410*** (0.117)	0.219** (0.094)	0.322*** (0.067)	0.336** (0.139)	0.218 (0.194)
<i>PRODAFF</i>	0.854*** (0.264)	0.298 (0.276)	1.979*** (0.273)	1.057*** (0.272)	-0.334 (0.551)	-0.267 (0.359)	0.505 (0.611)	1.666*** (0.428)	0.853** (0.393)	1.712** (0.773)
<i>Intercept</i>	14.761 (19.588)	4.555 (24.038)	34.789 (47.224)	-22.920 (21.079)	142.098** (55.976)	133.246** (58.236)	123.702 (79.620)	-41.937 (47.221)	-21.666 (32.088)	10.975 (75.814)
R ²	0.654	0.594	0.620	0.626	0.495	0.515	0.466	0.577	0.678	0.544
Observations	412	367	197	363	237	198	127	270	187	146

Note: All regressions include country, RTA, and year dummies. Standard errors are in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 6. Effects on Tax Treaties on the Composition of Affiliate Exports as a Share of Sales: Alternative Specifications

Variables	Dependent Variable					
	All Affiliates		Production Reporting		Low Export	
	(1) Platform/ Sales	(2) Vertical/ Sales	(3) Platform/ Sales	(4) Vertical/ Sales	(5) Platform/ Sales	(6) Vertical/ Sales
<i>TREATY</i>	-1.530 (1.700)	-1.496** (0.517)	-4.026 (2.448)	-0.329 (0.692)	-1.024 (0.976)	-1.202*** (0.379)
<i>TAX</i>	-0.043 (0.048)	-0.039 (0.075)	-0.071 (0.044)	-0.016 (0.090)	-0.027 (0.036)	-0.0009 (0.047)
<i>PROD</i>			-1.607 (1.441)	1.051* (0.578)		
<i>TREATY * PROD</i>			2.322 (1.424)	-0.583 (0.434)		
<i>LOWEXP</i>					-2.878*** (0.483)	-2.592*** (0.194)
<i>TREATY * LOWEXP</i>					0.672 (0.473)	-0.510** (0.178)
<i>GDP</i>	-10.504*** (3.270)	-4.448 (4.459)	-13.649*** (3.434)	-.073 (6.127)	-5.291* (3.009)	3.766 (2.547)
<i>GDPCAP</i>	8.717*** (2.774)	2.528 (4.207)	11.677*** (3.511)	-1.694 (5.666)	4.630** (2.207)	-4.018 (2.376)
<i>OPEN</i>	1.783*** (0.556)	-3.229*** (0.839)	1.305* (0.766)	-2.675** (1.089)	0.238 (0.466)	-2.049** (0.900)
<i>R&D</i>	-0.058 (0.099)	0.164 (0.118)	-0.066 (0.091)	0.169 (0.126)	0.016 (0.080)	0.206 (0.138)
<i>EXPERIENCE</i>	0.711 (0.433)	-0.024* (0.389)	0.708 (0.417)	-0.067 (0.461)	0.685*** (0.182)	-0.192 (0.342)
<i>AGE</i>	-0.017 (0.012)	-0.009 (-0.005)	-0.018 (0.012)	-0.010* (0.005)	-0.015* (0.009)	-0.017*** (0.003)
<i>FSIZE</i>	-0.021 (0.114)	-0.343*** (0.098)	-0.017 (0.113)	-0.332*** (0.103)	0.007 (0.029)	-0.105* (-0.056)
<i>PRODAFF</i>	-0.961*** (0.265)	0.057 (0.394)	-0.869*** (0.232)	0.002 (0.451)	-0.257* (0.137)	0.631** (0.207)
<i>Labor Intensive</i>	-0.899 (0.542)	-0.535 (0.299)	-0.881* (0.526)	-0.520* (0.279)	-0.446** (0.208)	-0.603** (0.169)
<i>Scale Intensive</i>	-0.878* (0.469)	0.202 (0.889)	-0.835* (0.452)	0.131 (0.935)	-0.433* (0.217)	-0.175 (0.394)
<i>Differentiated Goods</i>	-0.755** (0.247)	-0.113 (0.537)	-0.698*** (0.228)	-0.109 (0.521)	-0.436** (0.147)	-0.319 (0.266)
<i>Science Based</i>	-1.335** (0.454)	0.311 (0.678)	-1.239*** (0.404)	0.436 (0.571)	-0.637 (0.459)	0.102 (0.355)
<i>Intercept</i>	111.919* (39.563)	79.854 (52.837)	148.559*** (39.725)	42.882 (72.487)	55.735 (41.178)	-23.998 (29.828)
<i>R²</i>	0.484	0.629	0.501	0.633	0.734	0.812
<i>Observations</i>	198	127	198	127	198	127

Note: All regressions include country, RTA, and year dummies. Standard errors are in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 7. Effects on Tax Treaties on the Composition of Affiliate Imports as a Share of Sales: Alternative Specifications

Variables	Dependent Variable					
	All Affiliates		Production Reporting		Low Import	
	(1) Input/ Sales	(2) Finished/ Sales	(3) Input/ Sales	(4) Finished/ Sales	(5) Input/ Sales	(6) Finished/ Sales
<i>TREATY</i>	0.968** (0.386)	0.449 (0.812)	1.797* (0.893)	1.354 (1.301)	-0.516 (0.889)	0.251 (0.984)
<i>TAX</i>	-0.027 (0.038)	-0.034 (0.044)	-0.023 (0.038)	-0.017 (0.050)	-0.018 (0.036)	-0.061 (0.036)
<i>PROD</i>			-0.259 (0.775)	2.023** (0.691)		
<i>TREATY * PROD</i>			-1.145 (0.949)	-0.821 (1.214)		
<i>LOWIMP</i>					-3.648*** (0.601)	-2.475*** (0.255)
<i>TREATY * LOWIMP</i>					1.223* (0.665)	0.617* (0.343)
<i>GDP</i>	3.671 (3.764)	-0.500 (4.223)	3.196 (4.479)	3.052 (4.934)	-2.662 (3.019)	-1.249 (4.551)
<i>GDPCAP</i>	-5.402 (5.024)	-1.531 (3.802)	-5.365 (5.627)	-5.593 (4.079)	0.797 (3.600)	1.516 (4.429)
<i>OPEN</i>	0.529 (1.205)	1.061 (1.288)	0.819 (1.416)	2.041 (1.181)	0.880 (0.969)	-0.281 (1.449)
<i>R&D</i>	-0.041 (0.162)	0.586*** (0.174)	-0.038 (0.159)	0.572*** (0.175)	0.157 (0.097)	0.202 (0.184)
<i>EXPERIENCE</i>	-1.522* (0.862)	-0.711 (0.419)	-1.574* (0.829)	-0.731* (0.411)	-1.108* (0.565)	-0.077 (0.554)
<i>AGE</i>	-0.023 (0.016)	-0.0007 (0.009)	-0.022 (0.017)	0.002 (0.009)	-0.016 (0.014)	-0.008 (0.006)
<i>FSIZE</i>	-0.163 (0.102)	-0.192** (0.072)	-0.179 (0.107)	-0.177** (0.084)	-0.208** (0.083)	-0.083 (0.089)
<i>PRODAFF</i>	-0.896*** (0.284)	0.712* (0.371)	-0.874*** (0.282)	0.678* (0.365)	-0.718* (0.371)	-0.008 (0.276)
<i>Labor Intensive</i>	1.418 (1.114)	2.132** (0.543)	1.411 (0.945)	2.086*** (0.488)	0.741 (0.927)	1.013* (0.548)
<i>Scale Intensive</i>	1.215 (0.921)	0.941* (0.344)	1.249 (0.810)	0.939** (0.392)	0.631 (0.625)	0.332 (0.459)
<i>Differentiated Goods</i>	0.835 (0.811)	0.971** (0.185)	0.873 (0.686)	1.015*** (0.248)	0.617 (0.594)	0.614*** (0.199)
<i>Science Based</i>	1.279 (1.122)	0.602 (0.801)	1.119 (1.056)	0.749 (0.881)	0.292 (0.879)	0.553 (0.766)
<i>Intercept</i>	-23.641 (30.498)	21.298 (52.296)	-15.798 (39.800)	-16.601 (63.342)	42.249 (30.319)	12.399 (53.522)
R ²	0.676	0.413	0.683	0.449	0.796	0.635
Observations	187	146	187	146	187	146

Note: All regressions include country, RTA, and year include region and time dummies. Standard errors are in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 8. Estimates of Treaty Effects with Tax Sparring on the Probability, Level and Share of Swedish MNE Activity

Variables	Dependent Variable										
	Probit		Levels					Shares for Low Exports/Imports			
	(1) Firm FE	(2) Industry FE	(3) Total Sales	(4) Production	(5) Total Exports	(6) Platform Exports	(7) Total Imports	(8) Platform Exports	(9) Vertical Exports	(10) Input Imports	(11) Finished Imports
<i>TREATY</i>	1.013*** (0.385)	0.796*** (0.185)	-0.403 (0.307)	-0.831 (0.545)	-3.490** (1.232)	-3.372** (1.344)	2.555*** (0.545)	-1.521 (0.923)	-0.808 (1.148)	0.561 (0.367)	0.797 (1.287)
<i>TAX SPARRING</i>	-0.513 (0.433)	-0.464 (0.335)	0.596*** (0.211)	0.720*** (0.229)	2.356*** (0.824)	3.209*** (0.839)	-0.553 (0.526)	0.894** (0.393)	-0.494 (1.416)	0.083 (0.273)	-1.065* (0.559)
<i>LOW</i>								-2.875*** (0.483)	-2.593 (0.191)	-2.268*** (0.137)	-2.474*** (0.238)
<i>TREATY * LOW</i>								0.690 (0.483)	-0.505** (0.176)	0.241 (0.227)	0.694** (0.324)
<i>TAX</i>	0.017 (0.031)	0.009 (0.021)	-0.019 (0.019)	-0.0007 (0.022)	-0.089** (0.037)	-0.115** (0.048)	0.005 (0.039)	-0.039 (0.035)	0.007 (0.057)	-0.020 (0.020)	-0.038 (0.039)
<i>GDP</i>	4.540*** (1.735)	0.483** (0.190)	-3.146* (1.581)	-2.695 (2.215)	-13.33*** (4.615)	-16.46*** (4.632)	2.756 (4.654)	-6.295** (3.369)	4.273 (3.389)	2.165 (1.709)	1.639 (5.243)
<i>GDPCAP</i>	-3.232* (1.826)	0.435* (0.268)	4.186*** (1.343)	3.946** (1.947)	8.569** (3.555)	13.28*** (3.649)	-0.122 (4.638)	5.088** (2.404)	-4.277 (2.681)	-3.029 (1.832)	-1.140 (4.775)
<i>OPEN</i>	0.247 (0.413)	-0.148 (0.326)	-0.013 (0.344)	-0.698 (0.502)	-0.971 (0.669)	0.564 (0.955)	-0.414 (1.030)	-0.096 (0.513)	-1.941* (1.017)	1.251** (0.476)	-0.128 (1.315)
<i>R&D</i>	-0.106** (0.050)	-0.017 (0.071)	-0.064 (0.068)	-0.117 (0.091)	-0.160 (0.104)	-0.154 (0.107)	0.317 (0.186)	0.013 (0.079)	0.201 (0.144)	0.062* (0.030)	0.211 (0.172)
<i>EXPERIENCE</i>	2.487*** (0.237)	2.597*** (0.228)	-0.342 (0.285)	-0.624* (0.324)	-0.023 (0.298)	-0.043 (0.371)	-1.127*** (0.337)	0.626*** (0.196)	-0.158 (0.375)	-0.915*** (0.296)	-0.101 (0.525)
<i>AGE</i>			0.026*** (0.003)	0.018*** (0.003)	0.027*** (0.008)	0.014 (0.011)	0.022 (0.005)	-0.015* (0.008)	-0.016*** (0.003)	-0.007 (0.004)	-0.008 (0.006)
<i>FSIZE</i>	0.249 (0.165)	0.019 (0.079)	0.419*** (0.034)	0.425*** (0.051)	0.290*** (0.074)	0.402*** (0.117)	0.322*** (0.066)	0.004 (0.030)	-0.105* (0.056)	-0.026 (0.035)	-0.078 (0.086)
<i>PRODAFF</i>			0.837*** (0.265)	0.277 (0.278)	-0.341 (0.553)	-0.271 (0.364)	1.677*** (0.430)	-0.262* (0.135)	0.635*** (0.217)	0.057 (0.122)	0.018 (0.257)
<i>Intercept</i>	-48.21*** (12.21)	14.51*** (3.99)	23.82 (19.95)	15.73 (26.33)	190.4*** (63.17)	187.6*** (62.48)	-49.72 (50.55)	71.87 (46.44)	-32.43 (46.71)	-16.99 (19.30)	-21.04 (63.97)
(Pseudo) R ²	0.509	0.539	0.656	0.596	0.502	0.526	0.577	0.735	0.812	0.774	0.638
Observations	3235	5578	412	367	237	198	270	198	127	187	146

Note: All regressions include country, RTA, and year dummies. Standard errors are in parentheses. ***, ** and * denote significance at 1%, 5% and 10%, respectively.

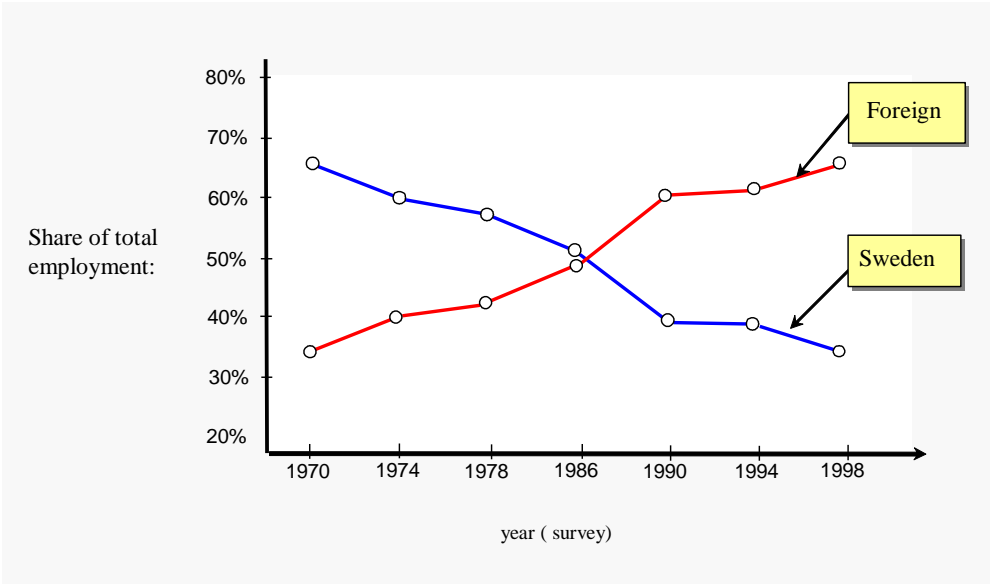


Figure 1. Swedish and Foreign share of employment in Swedish MNE's

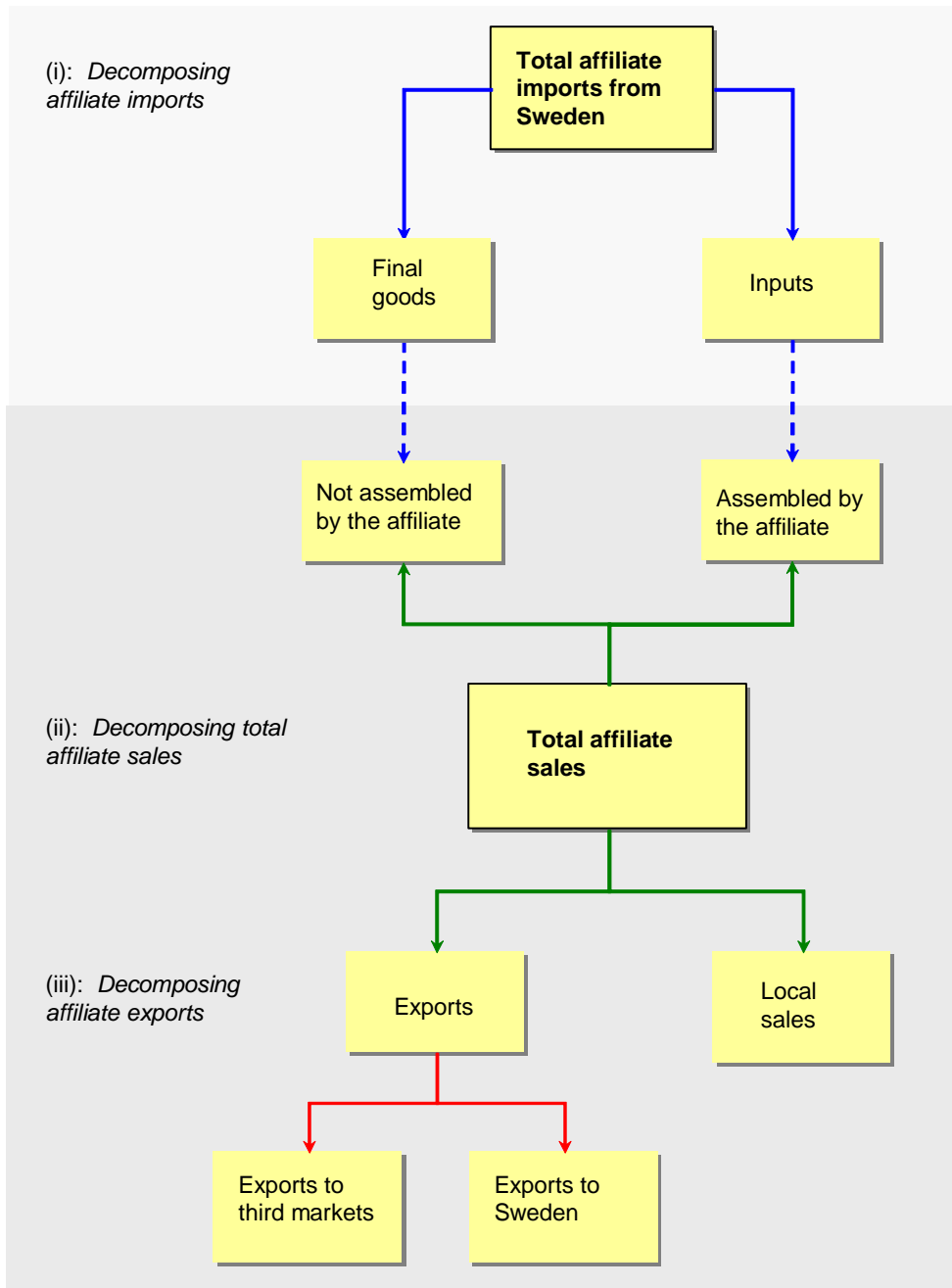


Figure 2. Decomposing affiliate imports and affiliate sales

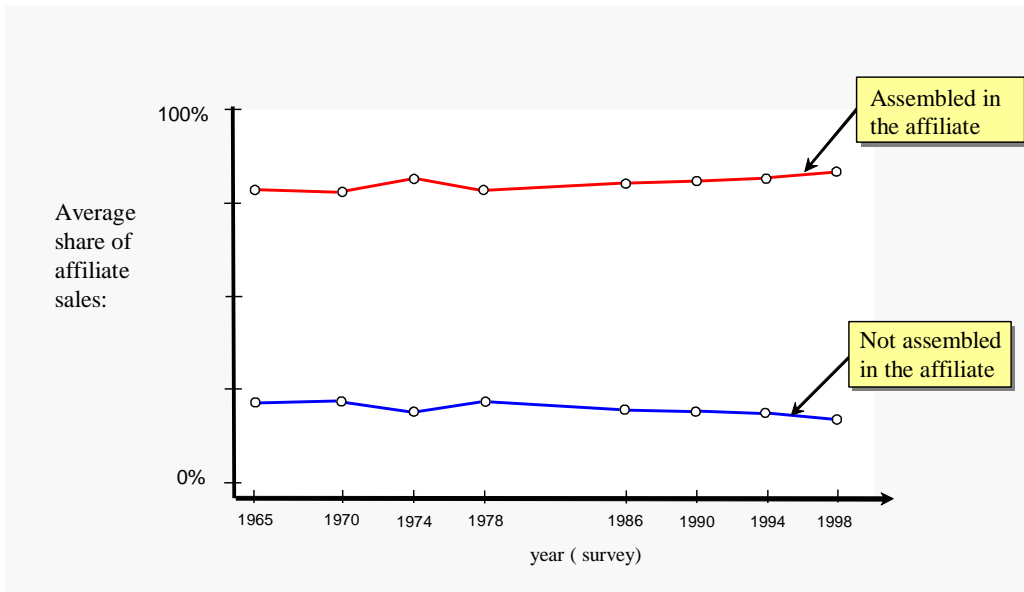


Figure 3. Assembly and affiliate sales

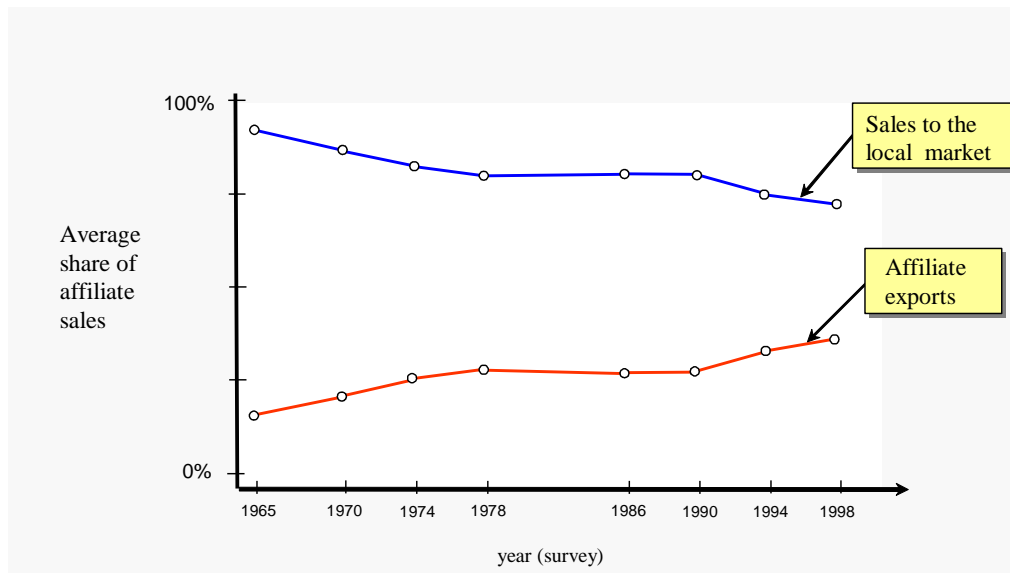


Figure 4: Exports and affiliate sales

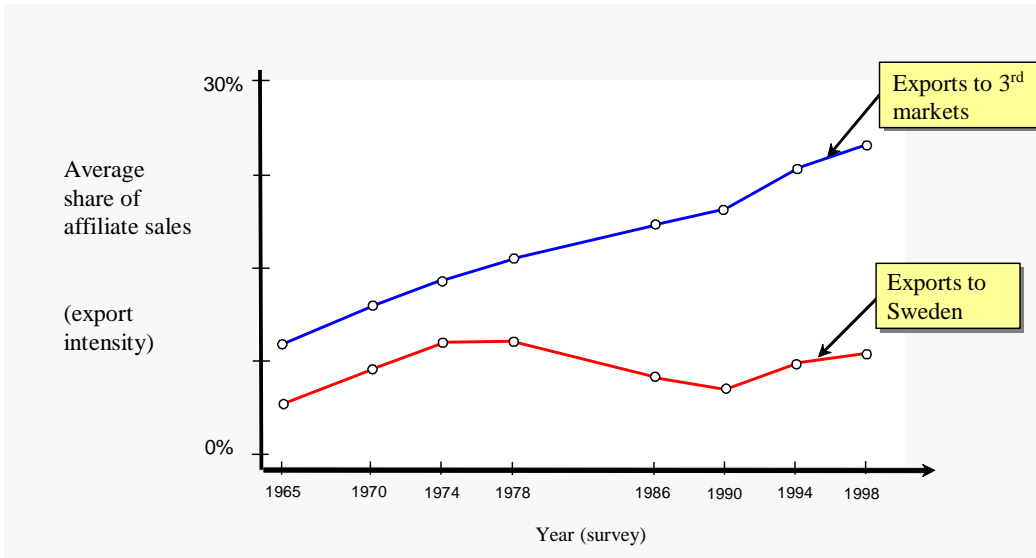


Figure 5. Decomposing affiliate exports

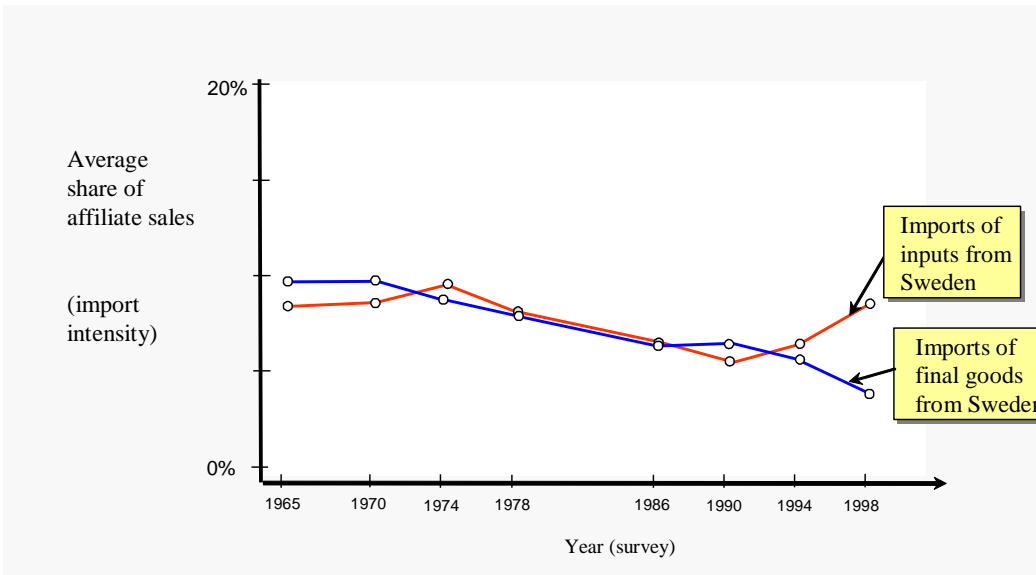


Figure 6. Decomposing affiliate imports