Swedish Multinationals and Competition from Low-Wage Countries

Henrik Braconier and Karolina Ekholm
The Research Institute of Industrial Economics (IUI)
P.O. Box 5501, S-114 85 Stockholm, Sweden
E-mail: henrikb@iui.se, karolinae@iui.se

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Abstract

This study uses data on Swedish multinationals to estimate cross elasticities of labour demand in different locations. With a vertical decomposition of the firm's activities, whether there is substitution or complementarity between employment in different parts of the firm will depend on whether wage changes lead to a relocation of activities or simply to changes in marginal costs and demand for inputs in other parts of the firms. We find that there is some evidence of a substitutionary relationship between employment in the Swedish parts of the firms and employment in other high-income locations, but we do not find any evidence of substitution stemming from employment in low-income locations. We find mainly a relationship of complementarity between employment in different affiliates.

Keywords: labour demand, multinational firms, vertically integrated firms

JEL classification: F23, J23

1 Introduction

One major concern regarding the operations of large multinational firms is that by locating activities abroad they may reduce employment and wages in

their home countries. By the multinational firms' ability to relocate activities to countries with lower wages, the home countries may very directly become involved in wage-competition with other countries. However, the relationship between the multinationals' foreign employment and their domestic employment in the home country is not unambiguously a substitutionary one.

The theoretical literature on multinationals has been centered around the distinction between horizontal and vertical foreign direct investment (FDI).[1] With horizontal FDI, meaning foreign investments in similar activities as are conducted at home, there is a substitutionary relationship between the firm's foreign and domestic activities in the sense that either the firm produces the good at home and then exports it or it produces it in its foreign affiliate. With vertical FDI, meaning foreign investment in activities that can be considered to be either upstream or downstream in relation to activities undertaken at home, there is an element of complementarity between the firm's domestic and foreign operations. Both upstream and downstream activities are undertaken to produce the good that is demanded by the firm's customers. When one of these activities expands, it tends to bring with it an expansion of the other activity as well. Hence, based on theory, the effect of an expansion of foreign activities on the demand for labour in the parent firm is ambiguous; it depends on whether the multinational firms are mainly horizontally or vertically organized.[2]

To examine the effect of the multinationals' foreign activities on the domestic economy is a very difficult task. There are two strands in the literature dealing with such issues. First, there is a literature dating from the 1970's, where the relationship between affiliate production and exports from the home country is analysed. (e.g. Swedenborg 1979, Lipsey and Weiss 1981, 1982, Svensson 1996). The earlier studies showed that there seemed to be a positive effect of outward FDI on exports and this was taken to indicate that FDI tends to generate intra-firm trade because of the vertical nature

[1] See, for instance, the survey by Markusen (1995).

[2] The distinction between horizontal and vertical multinationals is not completely unambiguous. Even in the case where a firm locates a production plant abroad simply to supply a foreign market from a foreign subsidiary, some complementary activities such as headquarter activities will be undertaken at home. In the case of a vertical multinational, typically labour intensive production stages will be located in low-wage countries while physical and human capital intensive production stages will be located in high-wage countries. If this is the case, there will still be an element of substitution between the firm's labour intensive activities at home and in the foreign location.

of the firms' activities. However, at a conceptual level it is unclear why these studies focussed on exports rather than employment.[3] Even if exports were to decrease as a consequence of increased overseas activities at the firm level, employment could still be unaffected (e.g. if there was an offsetting expansion of production for the domestic market).

There is also a more recent literature on the role played by outsourcing by multinational firms in reducing demand for unskilled labour in the home country (e.g. Slaughter 1995, Feenstra and Hanson 1996a, 1996b).[4] These studies have a more clearly spelled out theoretical framework, which makes it easier to interpret the results. The upshot of this literature is that outsourcing seems to play a very limited role in affecting the relative demand for skilled and unskilled labor. However, these studies are conducted on industry-distributed data, which means that important information at firm-level is lost in these studies.

In two recent working papers, Brainard and Riker (1997a, 1997b) have used firm-level data for the U.S. to analyse the effect of affiliate employment on the demand for labour in other parts of the firm. They estimate labour demand equations within multinational firms, yielding estimates of cross-elasticities between labour demand in different parts of the firm. They find that for the U.S. multinationals, a substitutionary relationship seems to exist mainly between labour employed in affiliates located in the same type of locations with regards to their relative factor endowments (or rather their relative endowments of skilled and unskilled labour). Between labour employed in affiliates located in different types of locations, i.e. one located in a high-wage country and the other located in a low-wage country, there seems to be mainly a relationship of complementarity.

This study employs a similar method as the one in Brainard and Riker (1997a, 1997b) and applies it to firm-level data on Swedish multinational firms. We thus estimate cross elasticities, which enable us to assess the effect of wage changes in one type of locations on the demand for labour in another location and thus whether there is a relationship of complementarity or substitution between the employment in different parts of the firm.

In the analysis, we distinguish between affiliates located in high-income and low-income countries on the assumption that cross elasticities may vary

[3] An early attempt to focus directly on the effect of outward FDI on home country employment is Kravis and Lipsey (1988) (see also Lipsey, 1994, and Blomström, Fors and Lipsey, 1997).

[4] See also Lawrence, 1994.

depending on the type of location. If a vertical decomposition of the firm's activities tend to be based on differences in factor intensities, complementarity is in some sense more likely to prevail between locations with large differences in relative factor endowments (i.e. between high- and low-income locations). However, because the size of trade costs will also be important for the firm's decision on where to locate production of inputs used in other parts of the firm, it is not necessarily the case that we will observe such a vertical decomposition between the locations that differ the most in terms of relative factor endowments.

The paper is organised as follows: In section 2, the theoretical framework is presented. We use a simple model of a vertically integrated firm that has production plants in several locations. The data used in the analysis is presented in section 3 and the specification of the econometric model explained in section 4. Section 5 presents and discusses the results and, finally, section 6 gives some concluding remarks.

2 Theoretical Framework

A firm with production units in several locations that only seeks to minimise production costs will choose to produce wherever it is least costly to do so. However, if the whole production process can be divided in separate stages and there are costs associated with trade between locations, an increase in production costs in one location does not necessarily lead to a relocation of production from that unit to another unit. For instance, let us assume that a unit located abroad experiences a cost increase and this unit is located in a country that differs substantially from the home country in terms of relative factor endowments. In such a case it is more likely that the cost increase will lead to a relocation of production to plants located in similar locations with regards to relative factor endowments. If these plants are related to the parent firm through trade flows, however, the increase in costs is likely to have a negative effect on production and employment at home. This would be the case if the foreign plants serve the parent firm with components that are assembled at home. Then costs would increase in the parent firm as well, which in turn would have a negative effect on product demand. If the parent firm instead exports components to the foreign plants, demand for components will decrease, with a similarly negative effect on labour demand in the home firm.

In order to analyse the different types of relationships that can prevail between the different parts of a multinational firm, we construct a simple model of a vertically integrated firm that has production plants in several locations. More specifically, we assume that there are two distinct activities that has to be undertaken in order to supply the product in a market and that high trade costs make one of these activities non-traded. We assume that the firm has some monopoly power, while it is a price taker in the labour market. Markets are assumed to be segmented so that the firm sets price independently in the different locations.

The two different production stages are labeled X and Y . We assume the following production function for the firm:

$$Q = \min(X, Y) \qquad X = \gamma L \qquad Y = \lambda L \tag{1}$$

where L denotes labour. If either X or Y are shipped across borders, an iceberg trade cost has to be incurred. We assume that when one unit of a good is shipped across a border, only $\tau < 1$ arrives at the destination. These trade costs differ between goods and pairs of locations.

The firm maximizes total profits Π, which can be defined as net revenue over all its locations i:

$$\Pi = \sum_i \left(P_i^D \left(Q_i \right) Q_i - w(\frac{1}{\gamma} X_i + \frac{1}{\lambda} Y_i \right) \tag{2}$$

where $P_i^D \left(Q_i \right)$ is the inverse demand function, $X_i = \sum_j X_{ij}$, $Y_i = \sum_j Y_{ij}$, the first subscript being the index for the location in which the good is produced and the second one being the index for the location in which the good is used to produce the final good; and w is the wage rate.

Because there are trade costs associated with trade between locations, cross-hauling of the inputs X and Y will never occur. For each location i, the following relationship must hold:

$$Q_i = X_i + T_{Xi} = Y_i + T_{Yi} \tag{3}$$

where

$$T_{Gi} = -\sum_{j \neq i} G_{ij} \quad \text{if the affiliate exports good } G,\ G = X, Y \tag{4}$$

$$T_{Gi} = \sum_{j \neq i} \tau_{Gji} G_{ji} \quad \text{if the affiliate imports good } G,\ G = X, Y \tag{5}$$

If trade costs are high, production will be organised in a strictly horizontal fashion. This means that $T_{Gi} = 0$, i.e. there will be no intra-firm trade. In such a case, the different production units will operate completely independent of each other and wage changes in one location will not affect the demand for labour in another location.

To bring out the relevant results as clearly as possible, let us assume that trade costs associated with cross-border trade in X are prohibitively high. The motivation for this assumption is that for some activities, especially the supply of services such as marketing and sales services, there are very strong advantages with being in proximity to the consumers. We assume the following:

$$\tau_{Xij} w_i < w_j \qquad \forall i, j \tag{6}$$

which implies that $T_{Xi} = 0, \forall i$. X is thus now effectively non-traded and output of X will depend directly on the size of local demand:

$$Q_i = X_i \tag{7}$$

The total demand for labour in location i then becomes:

$$L_i = \frac{1}{\gamma} Q_i(P_i^D, \mathbf{w}) + \frac{1}{\lambda} Y_i \tag{8}$$

where $\mathbf{w}$ is the vector of wage rates in the different locations.

Expression (8) reveals that anything that affects the amount of final goods supplied in the domestic market will also affect the domestic labour demand. Q_i will depend on the domestic consumers' demand for the final product and cost factors affecting marginal costs of producing Q, which may not only include the domestic wage rates, but the wage rates in foreign locations as

well. Labour demand will increase with an increase in domestic demand and decrease with increases in domestic wages. Labour demand will also depend of the amount of Y that is produced. Apart for the case where trade costs associated with Y are so high that Y becomes non-traded as well, there are two possible cases: the case where Y is produced and exported to other locations and the case where Y is not produced but instead imported from other locations. Let us analyse each of these two cases in turn.

2.1 *Case I: Y is exported*

If the production plant in location i exports Y to other parts of the firm, the amount exported will stand in direct proportion to the amount of the final good produced in each location, i.e. $Y_{ij} = Q_j$. Labour demand is then given by:

$$L_i = \left(\frac{1}{\gamma} + \frac{1}{\lambda}\right) Q_i(P_i^D, w_i) + \frac{1}{\lambda} \sum_{j \in E} Q_j(P_j^D, w_i, w_j) \tag{9}$$

where E is the set of locations that import Y from i (which will be the locations j for which the inequalities $w_i < \tau_{Yij} w_j$ and $\tau_{Ykj} w_i < \tau_{Yij} w_k$, $\forall k$ holds). Since Q_j will depend on local demand and wage rates in location j, it follows that an increase in product demand in location j will increase the demand for labour in location i, while an increase in wage rates in location j will decrease the demand for labour in location i. That is,

$$\frac{dL_i}{dw_j} < 0,\ j \in E \tag{10}$$

This is the case where the relationship between labour demand in different parts of the firm is one of complementarity.

2.2 *Case II. Y is imported*

Assume now that $w_j < \tau_{Xij} w_i$, $\exists j$, which implies that Y will be imported to location i. Domestic labour demand in location i is now given by:

$$L_i = \frac{1}{\gamma} Q_i(P_i^D, w_i, w_m) \tag{11}$$

where w_m is the wage in the location from which Y is imported (this could be a vector if Y is imported from several locations, but unless the trade cost inclusive marginal cost happen to be equal in several locations, Y would be imported from the location with the lowest trade cost inclusive marginal cost). Because wage increases in the locations from which Y is imported will increase the marginal cost of producing Q in location i, Q_i is a negative function of the wage rates in those locations. Thus, a marginal increase in the wages in location m, where m is the location for which the following inequalities $w_m < \tau_{Xim} w_i$ and $\tau_{Xij} w_m < \tau_{Xim} w_j$, $\forall j$ hold, will have a negative effect on the domestic labour demand in location i.

$$\frac{dL_i}{dw_m} < 0 \tag{12}$$

However, in the case where the wage change is sufficiently large to produce changes in the trade pattern within the firm, there may be a different outcome. Suppose the increase in the wages in location m is sufficiently large for the following inequality to hold:

$$w_m > \tau_{Xim} w_i \tag{13}$$

Production of Y may then shift from location m to location i, since it will be cheaper to produce Y than to import it from location m. However, this outcome would require that $w_j > \tau_{Xij} w_i$, $\forall j$, i.e. that it is cheaper to produce Y in location i than to import it from any other location in which the firm has production units. If this is not the case, the production of Y would instead shift to another foreign location, and the resulting increase in the cost of producing Y would feed into an increase in marginal costs in location i. Thus, even in this case, there would be a negative effect on the domestic labour demand in location i.

However, if the inequality $w_j > \tau_{Xij} w_i$, $\forall j$ holds after the wage increase in location m, production of Y will shift to location i and there will be a discrete increase in the domestic demand for labour. The size of this increase will depend on whether location i will only produce the amount of Y that is used domestically, or if it will also produce Y for exports to other locations. Thus, in the case where the change in foreign wages are sufficiently large to create a relocation of production activities, there may be a relationship of

substitution between foreign and domestic labour. However, from the point of view of a particular location, this is not necessarily the case, because the relocation may shift production to a completely different part of the firm.

Under what circumstances is it likely that a change in foreign wages will result in a relocation of activities? Except for the trivial observation that this is likely to occur for very large wage changes, we may also note that a relocation is more likely between locations that have similar wages, i.e. similar relative factor endowments and technologies, and between locations for which trade costs are low.

To conclude, demand for labour in location i will depend on domestic and foreign product demand together with domestic and foreign wages. In reduced form, the equation for labour demand in location i can be written as:

$$L_i = f(w_i, \mathbf{w}_E, \mathbf{w}_M, P_i^D, \mathbf{P}_E^D) \tag{14}$$

where $\mathbf{w}_E$ is the vector of wages in the locations to which location i is exporting, $\mathbf{w}_M$ is the vector of wages in the locations from which location i is importing and $\mathbf{P}_E^D$ is the demand for the final product in the locations to which location i is exporting. Whether changes in foreign wages have a positive or negative effect on domestic labour demand depends on whether they lead to a relocation of activities or simply to a change in marginal costs.

In the empirical analysis, we shall estimate a log-linear variant of (14) where we put restrictions on the way wages and measures of product demand in different locations enter into the equation.

3 Data

We use firm-level data on Swedish multinationals. This data have been collected since the early 1970's about every fourth year. In our sample, we have data for six years: 1970, 1974, 1978, 1986, 1990 and 1994.[5]

The full sample of Swedish multinationals cover some 700 observation at the firm level (the information is mostly related to the home parts of the firms) and some 3000 observation at the affiliate level. In our analysis, we have eliminated all affiliates that are operating in substantially different

[5]A description of these data can be found in Braunerhjelm and Ekholm (1998)

industries from each other or to the Swedish part of the firm. This is done in order to ensure that the activities in the affiliates are sufficiently integrated with each other and the ones undertaken in the home part of the firm for there to be potential interactive effects on employment. Moreover, we have eliminated all firms that appear only once or twice in the time series.

Having done this, we are left with an unbalanced panel with about 200 observations at the firm level and 1300 observations at the affiliate level.

We divide the host countries into a high-income group and a low-income group based on the level of per capita income. Ideally, we would want to group countries according to their relative factor endowments and perhaps their geographical location as a basis for judging the relative importance of trade costs. However, per capita income can serve as a crude measure of both these things. The group of high-income countries consists of the Western European countries (except Greece, Portugal and Spain), the US, Canada, Japan, Australia and New Zealand, while the group of low-income countries consists of all other countries.

Before we enter into the specification of the econometric analysis, we shall present some descriptive evidence based in these data. Figure 1 shows the distribution of firm employment among the three different types of locations: the home location (i.e. Sweden), high-income foreign locations and low-income foreign locations. As can be seen from this figure, the relative importance of employment in Sweden has decreased over time. In this sense there is evidence of a substitution of domestic employment for foreign employment. However, it is also evident that it is mainly the group of high-income countries that have gained employment in relative terms. The increase in the share of employment in low-income locations is very modest; only a few percentage points.

In figure2, we can see the development of real wages (labour costs) in these three different types of locations. Again, the numbers are calculated based on our panel sample of multinationals. The Swedish wage is the average wage paid by our sample of Swedish multinationals. The wage in high-income (low-income) locations is the employment-weighted average of the wage paid by affiliates of Swedish multinationals which are located in high-income (low-income) countries.

As can be seen from figure 2, the Swedish wage is the highest for most of the period. In real terms, it has increased somewhat 1970-1994, as has the wage rate in low-income locations. In high-income locations, however, there has been a substantial increase in the real wage during this time period;

so much so that it surpasses the Swedish real wage towards the end of the period.

Two observations can be made based in relation to this. First, the fact that the type of location that has substituted the most for Swedish employment is a location where wages have risen much more than in either Sweden or in other locations is evidence against wage competition between the Swedish parts of the firms and the foreign parts of the firms. Secondly, the difference in the development of the Swedish wage rate and the wage rate in high-income locations could be evidence of a successive shift in the skill-composition of the labour force in different types of locations. That is, underlying this may be a development where the skill-intensity have risen faster in the high-income foreign locations than in Sweden.

Figure 3 compares the development of relative wage between high-income locations and Sweden for the sample of Swedish multinationals, on the one hand, and for the manufacturing industry as a whole, on the other. The difference between these two relative wages is striking. Whereas the wage rate in the Swedish parts of the multinationals has been substantially higher than that in foreign affiliates in high-income locations for most of the period, for the manufacturing industry as a whole, the Swedish wage has not differed very much from that in other high-income locations. Up until the mid 1980's, the relative wage between high-income foreign locations and Sweden increased both for the multinationals and for the manufacturing industry as a whole. However, from the mid 1980's and onwards, the relative wage of high-income foreign locations continued to increase for the multinationals, while it decreased for the manufacturing industry as a whole.

Taken together this suggests that in the beginning of the period, the affiliates located in other high-income countries employed workers with less skills on average than the parent firms in Sweden. Over time, however, there seems to have been a continuously changing composition of the level of skills so that the skill-intensity has increased more in the foreign affiliates than in the Swedish parents (cf. Blomström, Fors and Lipsey, 1997). Thus, there may have been a substitution of skilled workers between the Swedish parents and affiliates located in high-income countries.

4 Estimation

In our econometric analysis we estimate two different types of labour demand equations; one that focuses on the relationship between employment in the parent firms in Sweden and the employment in the foreign affiliates and one that focuses on the relationship between affiliate employment in different types of locations.

In the first type of equation, we estimate the effect of wage changes in high- and low-income foreign locations, respectively, on the employment in the Swedish parts of the firms. More specifically, we estimate the following equation:

$$lnL_{it}^0 = \alpha + \delta_i + \gamma_t + \beta_0 lnw_{it}^0 + \beta_1 lnw_{it}^H + \beta_2 lnw_{it}^L + \beta_3 lnD_{it}^0 + \beta_4 lnD_{it}^E + \varepsilon_{it} \tag{15}$$

where L_{it}^0 is employment in the home part of firm i, w_{it}^0 is the wage rate in the home country, w_{it}^H the wage rate in high-income countries and w_{it}^L the wage rate in low-wage countries, all averaged over the firm i's affiliates located in such countries. The variable D_i^0 is a measure of domestic final demand and D_i^E a measure of demand in countries to which the firms export. The subscript t denotes time. The parameter δ_i captures a fixed firm-specific effects and γ_t a fixed time-effect.

In order to reduce potential problems of endogeneity, our measures of w_{it}^0, D_i^0 and D_i^E are based on industry data for Sweden. The variable D_i^0 is proxied by domestic industry consumption and D_i^E by industry exports. The variables w_{it}^H and w_{it}^L are calculated in the following way: First we construct a wage rate for each location in the sample by taking the average over all affiliates that are located in that particular host country. Then we construct employment-based averages for each parent firm distinguishing between high- and low-income locations.[6]

We expect β_0, the elasticity showing the effect of changes in the domestic wage on domestic employment, to be negative, while we expect β_3 and β_4 to be positive. The sign of β_1 and β_2, which can be interpreted as cross-elasticities showing the effect of changes in foreign wages on domes-

[6]That is, we define the variables as $w_{it}^H \equiv \sum_{k \in H} \frac{L_{ikt}}{L_{it}} w_{ikt}$ and $w_{it}^L \equiv \sum_{k \in L} \frac{L_{ikt}}{L_{it}} w_{ikt}$, where H and L are the sets of high- and low-income host countries, respectively, and w_{ikt} is measured as an average over all affiliates in the sample that are located in country k.

tic employment, will depend on whether affiliate employment substitutes or complements employment in the home part of the firms.

In the second part of the analysis, we follow Brainard and Riker (1997b) in performing an analysis where we utilise the information on the affiliates in the data-set. More specifically, we estimate the following equation:

$$lnL_{jt} = \alpha + \delta_j + \gamma_t + \beta_0 lnw^0_{jt} + \beta_1 lnw^H_{jt} + \beta_2 lnw^L_{jt} + \beta_3 lnD^0_{jt} + \varepsilon_{jt} \quad (16)$$

where L_{jt} is the employment in affiliate j, w^0_{jt} is the wage rate in the host country of affiliate j, w^H_{jt} and w^L_{jt} are the wage rates in the high- and low-income locations, respectively, that other affiliates of affiliate j's parent firm are located in. All wage variables are averages over all the affiliates that produce in a particular host country, subtracting affiliate j. The variable D_{jt} is a measure of local demand and here we follow Brainard and Riker (1997b) in proxying this with aggregate consumption of affiliate j's host country. In these regressions we omit the variable for export demand on the grounds that it is likely to be much less important for the employment in the affiliates (the parent firms have a fairly high ratio of exports to sale, while the same ratio is on average very low for the affiliates). Moreover, whatever influence there may be from export demand is likely to be proxied very poorly by total exports of the host country.

5 Results

Table 1 presents the results from the regressions using parent firm employment as regressand. The first two columns contain the results from regressions on the sub-set of firms that have affiliates on both high- and low-income locations (in the second column, the wage rate in low-income locations has been dropped), whereas the third column contains results from regressions on the whole sample of firms, which consists of a large number of firms with affiliates in high-income locations only. As expected the estimates of β_3 and β_4 are positive, but the regressions perform badly in some other respects. The precision of the estimates is fairly low, and the point estimates of β_0 are positive.

In the regressions performed on the sub-sample of firms with affiliates in both high- and low-income locations, the only significant estimates are the ones for the cross-elasticity with respect to wages in high-income locations

and for the export demand variable. Dropping the wage rate for low-income locations from the regression has very little effect on the point estimates, which means that they are at least robust to the elimination of this variable. The estimate of the cross-elasticity with respect to wages in high-income locations has a positive sign, indicating a relationship of substitution between parent firm employment and affiliate employment in high-income locations. The estimate indicates that a one percent increase in wages in other high-income locations in which Swedish multinationals operate would increase employment in the Swedish parts of the firms with 0.8 percent.

In the third column we report the results from a regression without the wage rate in low-income countries on the whole sample (reported as regression (3) in Table 1). As can be seen from Table 1, this does not affect the point estimates for the coefficients of the own wage and the demand variables very much, but it does affect the estimate for the cross-elasticity β_1, which now switches sigh and becomes insignificant. Thus, while we find some evidence of a substitutionary relationship between employment in Sweden and employment in affiliates in high-income locations for firms that have affiliates in both high- and low- income locations, we do not find any evidence of such a relationship for the whole sample of firms. Moreover, we do not find any evidence of a substitutionary relationship between employment in the Swedish parts of the firms and affiliate employment in low-income locations.

It is interesting to note that exports seem to have a significantly stronger effect on parent firm employment than domestic consumption. In fact, we cannot reject the hypothesis that domestic consumption has no effect at all, whereas exports have a significantly positive effect. An interpretation is that for multinational firms based in a small country such as Sweden, the domestic market constitute such a small part of the firms' total markets so that changes in domestic demand have very small effects on employment decisions.

We now turn to the regressions based on equation (16). In Table 2, results from regressions with affiliate employment in high-income countries are reported. The table reports results from two different regressions; the difference lying in the level on which the fixed effects enter into the equation. We have only a few observations over time, while quite a few of the affiliates do not remain in the sample in all time periods. In order to increase the number of observations relevant for the within-variation, we report results for an alternative specification with fixed effects defined at firm level rather than affiliate level. In regression (1) the fixed effects are based on affiliate dummies, exactly as specified in (16). In regression (2), however, they are

based on firm dummies instead. The assumption underlying regression (2) is that there are differences in characteristics at the level of the firm rather than at the level of the affiliate that need to be controlled for; in other words; affiliates belonging to the same firm do not differ in their characteristics. Affiliate dummies control for both firm and location characteristics. Since we believe that location characteristics may be important, however, we control for locations by also including country dummies.

As can be seen in Table 2, the two different specifications yield similar results. Again, as expected, the estimates of the elasticity for the local wage are negative and the estimates of the coefficient for local aggregate consumption are positive. The estimates of the cross elasticities are both negative, indicating a relationship of complementarity with both types of locations. The point estimate for the cross-elasticity with respect to employment in high-income locations is somewhat higher in regression (2) compared to regression (1). The precision in these estimates is higher than in the regressions based on parent firm employment, although a cross-elasticity of zero between the employment in the high-wage countries and affiliate employment in low-wage countries cannot be rejected at conventional levels.

In fact, the results suggest that there is a stronger complementarity between affiliates located in different high-income countries than between affiliates that are located in different types of locations. This result contrasts starkly to the findings of Brainard and Riker (1997) for U.S. firms, where there is a relationship of complementarity between affiliates in different types of locations and a substitutionary relationship between affiliates in the same type of locations. One interpretation of this result is that trade costs really matter for the kind of vertical decomposition of production stages that we believe gives rise to a complementarity relationship between employment in different affiliates. While differences in production costs may be larger between affiliates located in high- and low-income countries, from the perspective of the affiliates in high-income countries, this difference may be offset by larger trade costs. Therefore, there may be more of a vertical decomposition between the different affiliates in high-income countries than between these affiliates and affiliates located in low-income countries.

In Table 3, we present the results for the same type of regressions for affiliate employment in low-income countries. Here, the problem with our panel being unbalanced becomes crucial. To begin with, because the foreign activities of Swedish multinationals are heavily biased towards industrialised countries, the number of affiliates located in low-income countries is much

lower than the number of affiliates located in high-income countries. Moreover, fairly few of the affiliates remain in the sample for more than three points of observation. This means that our estimation based on (16) performs very badly indeed. However, in the regression with firm- and country dummies instead of affiliate dummies, we are able to increase the precision in our estimates considerably.

Looking at the results of regression (2) in Table 3, we see that, again, the elasticity of the local wage is negative while the coefficient of local aggregate demand is positive. The cross elasticity showing the effect of wage changes in high-income countries is positive, but not significantly different from zero. However, the cross elasticity for wage changes in other low-income locations is significantly negative, indicating a relationship of complementarity between employment in different low-income locations. This is a slightly odd finding, as it would suggest that affiliates located in different low-income locations are more strongly linked to each other through intra-firm trade in inputs than affiliates located in different types of locations with respect to whether they are low- or high-income locations.

However, if we decompose the affiliates located in low-income locations along geographical lines, we find that the complementarity effect really stems from affiliates located in low-income countries in Europe. In Table 4, we show the result from the same type of regressions as in Table 3 (in the last column) when we run them separately for affiliates in low-income countries in Europe (to which we have included Turkey) and for affiliates in the rest of the low-income countries (because there are no African countries represented in the sample, this corresponds to affiliates in Asian and Latin American countries). As it turns out, the cross-wage elasticity with respect to wages in low-income countries is strongly negative for the affiliates in the European low-income countries, while we cannot reject the hypothesis that the corresponding elasticity for the affiliates in other low-income countries is zero. Hence, there seems to be vertical linkages between affiliates in low-income locations and affiliates in low-income locations in Europe, while we do not find any evidence of linkages at all between affiliates in low-income locations in Asia and Latin America and other affiliates.

6 Concluding Remarks

In this study we have analysed to what extent labour employed in different parts of a multinational firm substitutes for each other and to what extent they are complement to one another. Based on data for Swedish multinationals, we have found some evidence of a substitutionary relationship between parent firm employment in Sweden and affiliate employment in other high-income locations. However, we do not find any evidence of a relationship in either direction between parent firm employment and affiliate employment in low-income locations.

When we estimate cross-wage elasticities for affiliates located in different types of locations we find mainly a relationship of complementarity. We interpret this as indicating the importance of a vertical decomposition of production stages within firms, where affiliates serve each other through intra-firm trade in inputs. For affiliates located in high-wage countries, there seems to be stronger complementarity with affiliates located in other high-income locations. An interpretation is that higher trade costs associated with trade with low-income countries offset the potential gains from lower production costs so that the extent of vertical decomposition is larger between affiliates in different high-income locations than between affiliates in high- and low-income locations.

We also find a strong complementarity relationship between affiliates located in low-income countries in Europe and other affiliates located in low-income countries. The employment in affiliates located in Asia and Latin America, on the other hand, does not seem to be affected by wages in other locations.

All in all, we conclude that we do not find any evidence of competition from low-wage countries having a negative impact on employment in Sweden through the activities of multinational firms. If there is an element of wage-competition from other countries, it seems to stem from other high-wage countries rather than form low-wage countries. Overall, the employment in different parts of firms seem to be linked through a relationship of complementarity rather than substitution.

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Table 1. *Results from fixed-effects regression. Regressand: parent firm employment*

Regressors:	(1)	(2)	(3)
w^0	0.17	0.05	0.05
	(0.28)	(0.23)	(0.26)
w^H	0.78*	0.79*	-0.01
	(0.35)	(0.35)	(0.16)
w^L	0.06	--	--
	(0.11)		
D^0	0.08	0.08	0.06
	(0.13)	(0.13)	(0.12)
D^E	0.35*	0.35*	0.28*
	(0.09)	(0.09)	(0.06)
Constant	-7.84	-6.31	-6.83
	(6.34)	(6.20)	(7.83)
Number of observations	123	123	201
R^2 (within)	0.35	0.34	0.18
F-test:			
Prob(firm dummies=0)	0.00	0.00	0.00

Note: Regressions (1) and (2) are performed on a sub-sample consisting of firms with affiliates in both high- and low-income locations. Regression (3) is performed on the whole sample. Standard errors are reported in parentheses. The regressions also includes time dummies, which are not reported. An asterisk (*) indicates significance at the 5 percent level.

Table 2. *Results from fixed-effects regressions. Regressand: affiliate employment in high-income location*

Regressors:	(1)	(2)
w^0	-0.42*	-0.47*
	(0.18)	(0.21)
w^H	-0.68*	-1.01
	(0.26)	(0.55)
w^L	-0.13	-0.20
	(0.08)	(0.19)
D^0	0.20	0.12*
	(0.13)	(0.04)
Constant	13.1*	19.6*
	(3.79)	(6.68)
Number of observations	919	919
R^2 (within)	0.05	0.09
F-tests:		
Prob($\beta_1=\beta_2$)	0.04	0.16
Prob(affiliate dummies=0)	0.00	
Prob(firm dummies=0)		0.00

Note: Standard errors are reported in parentheses. Both regressions include time dummies and regression (2) includes country dummies, which are not reported. An asterisk (*) indicates significance at the 5 percent level.

Table 3. *Results from fixed-effects regressions. Regressand: affiliate employment in low-income location*

Regressors:	(1)	(2)
w^0	0.04	-0.25
	(0.12)	(0.13)
w^H	-0.37	0.48
	(0.39)	(0.65)
w^L	-0.10	-0.71*
	(0.14)	(0.19)
D^0	-0.03	0.46*
	(0.14)	(0.07)
Constant	10.4*	-1.45
	(5.14)	(7.20)
Number of observations	378	378
R^2 (within)	0.10	0.44
F-tests:		
Prob($\beta_1=\beta_2$)	0.42	0.08
Prob(affiliate dummies=0)	0.00	
Prob(firm dummies=0)		0.00

Note: Standard errors are reported in parentheses. Both regressions include time dummies and regression (2) includes country dummies, which are not reported. An asterisk (*) indicates significance at the 5 percent level.

Table 4. *Results from fixed-effects regressions. Regressand: affiliate employment in low-income location in Europe and Asia/Latin America, respectively*

Regressors:	*Europe*	*Asia/Latin America*
w^0	-0.83	-0.32*
	(0.52)	(0.15)
w^H	0.03	0.46
	(1.28)	(0.71)
w^L	-1.50*	-0.21
	(0.57)	(0.23)
D^0	0.46*	0.44*
	(0.20)	(0.06)
Constant	16.5	-4.68
	(15.6)	(7.81)
Number of observations	71	307
R^2 (within)	0.44	0.45
F-tests:		
Prob($\beta_1=\beta_2$)	0.27	0.37
Prob(firm dummies=0)	0.00	0.00

Note: Standard errors are reported in parentheses. The regressions also include time and country dummies, which are not reported. An asterisk (*) indicates significance at the 5 percent level.

Figure 1. Domestic and foreign employment as shares of total firm employment

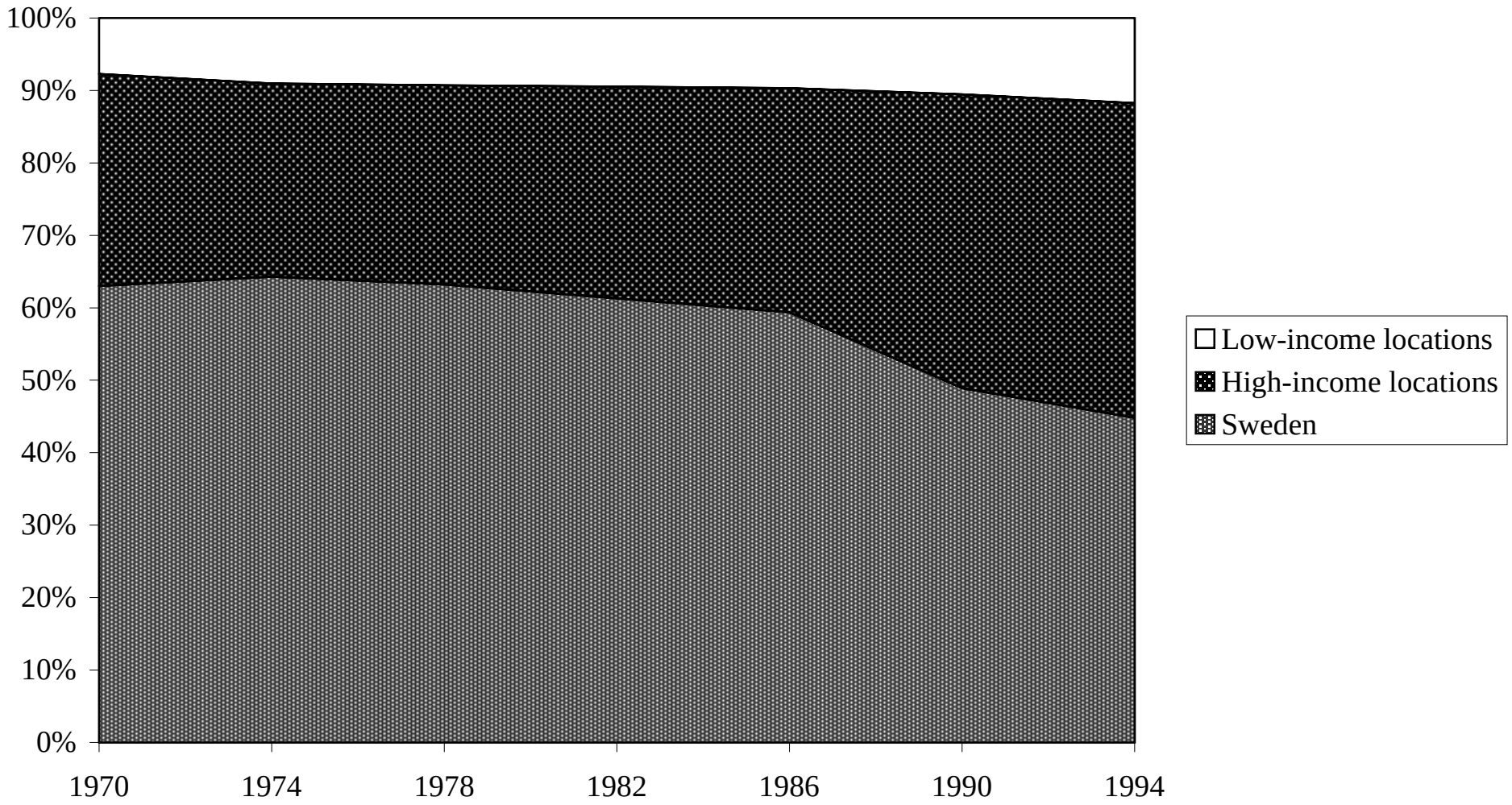

Figure 2. Average real wages in Sweden and in foreign locations

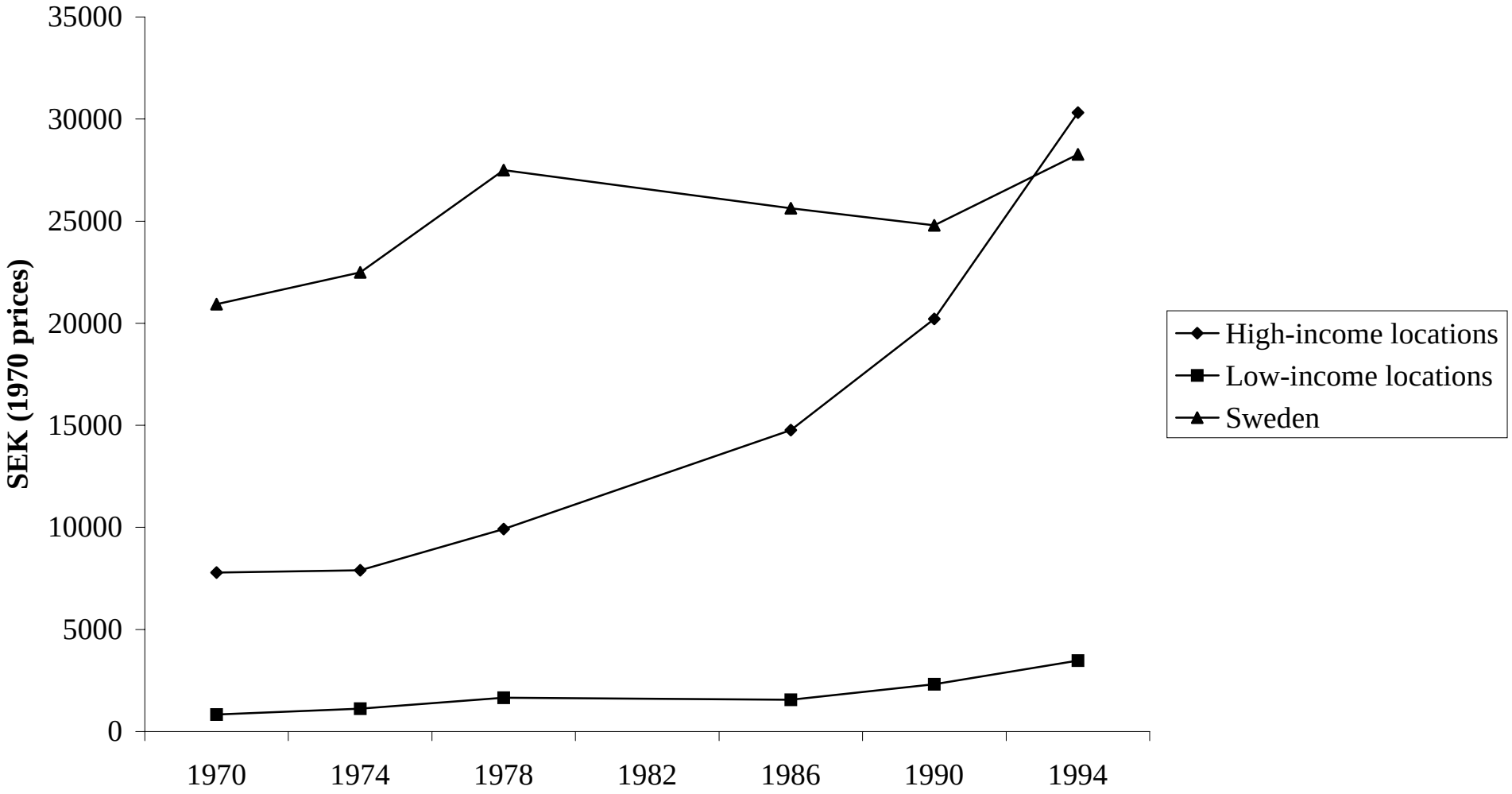

Figure 3. Relative labour costs between high-income locations and Sweden