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# Swedish Multinationals and Competition from High- and Low-Wage Locations

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## Abstract

This study uses data on Swedish multinationals to estimate cross-elasticities of labor 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/or demand for inputs in other parts of the firms. It is found 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 no evidence of substitution stemming from employment in low-income locations.

## 1. Introduction

One major concern regarding the foreign operations of multinational enterprises (MNEs) is that they may reduce employment and wages in the MNEs' home countries. By these firms' ability to relocate activities to countries with lower wages, the home countries may become more exposed to factor price adjustment in terms of falling relative wages. Although a relocation of activities from the home country to affiliates abroad may enhance efficiency in production in the long run, there may be substantial adjustment costs associated with such relocations. Consequently, relocations may have a significant impact on the overall welfare and income distribution of the countries in which the MNEs operate.

However, the relationship between the MNEs' foreign employment and their domestic employment in the home country is not unambiguously a substitutionary one. With horizontal FDI, meaning foreign investments in the same type of activities as are conducted at home, we would expect mainly a substitutionary relationship between the firm's foreign and domestic activities as long as the produced good is a tradable.[1] Either the firm produces the good at home and exports it, or it produces the good in a foreign affiliate, in which case employment in the domestic part of the firm has to be lower than in the exporting case.[2] With vertical FDI, however, meaning foreign investment in activities that are either upstream or downstream in relation to the 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 a good demanded by the firm's customers. When one of

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these activities expands, it tends to bring with it an expansion of the other activities as well.[3]

To examine the effect of the MNEs' foreign activities on the domestic economy is a difficult task. There are two strands in the literature dealing with such issues. First, there is a literature dating from the 1970s, where the relationship between affiliate production and exports from the home country is analyzed (e.g., Swedenborg, 1979; Lipsey and Weiss, 1981, 1984; 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 intrafirm trade because of the vertical nature of the firm's activities. However, it is not possible to infer from these studies whether an expansion of foreign activities tends to reduce or expand domestic employment. For instance, if a downstream activity were relocated from the home country to abroad, there could very well be a positive effect on home country exports even though home country employment was reduced. Similarly, if exports were to decrease as a consequence of increased overseas activities, home country employment could still increase if there were a more than offsetting expansion of production for the domestic market.[4]

There is also a more recent literature on the role played by outsourcing by MNEs in reducing demand for unskilled labor in the home country (e.g., Slaughter, 1995; Feenstra and Hanson, 1996a,b).[5] These studies are based on a Heckscher–Ohlin type of framework, where outsourcing is taken to lead to increased imports of unskilled labor-intensive goods. The upshot of this literature is that outsourcing seems to play a 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 the firm level is lost in these studies.

In two recent working papers, Brainard and Riker (1997a,b) have used firm-level data for the US to analyze the effect of affiliate employment on the demand for labor in other parts of the firm. They estimate labor demand equations within MNEs, yielding estimates of cross-wage elasticities for labor demand in different parts of the firm. They find that for US MNEs, a substitutionary relationship seems to exist mainly between labor employed in affiliates located in the same type of locations with regards to their relative factor endowments. Between labor 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 to the one in Brainard and Riker (1997a,b) and applies it to firm-level data on Swedish MNEs. We thus estimate cross-wage elasticities, which enable us to assess the effect of wage changes in one type of location on the demand for labor 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-wage elasticities may vary depending on the type of location. In particular, we are interested in examining whether employment in the Swedish parts of the firms is affected differently by wage changes in low-wage countries compared with wage changes in other high-wage countries. Furthermore, we also want to study whether there are differences in the effect on affiliate employment of wage changes in locations that are either of the same or different type with regards to whether it is a high-wage or low-wage location.

Our study differs from the studies by Brainard and Riker in a number of respects. To begin with, the type of multinational activity conducted by firms from a small

country such as Sweden is likely to differ markedly from the activities of firms from a large country such as the US (cf. Markusen et al., 1996). Therefore, the pattern of interaction between different parts of the firm may differ between Swedish and US MNEs. Furthermore, our empirical implementation differs somewhat from the one chosen by Brainard and Riker. In particular, we explicitly address, and try to control for, potential problems of endogeneity with respect to wages and productivity differences across locations.

What we find is some evidence of a substitutionary relationship between employment in the Swedish parts of the firms and employment in other high-wage locations. However, between employment in the different foreign affiliates, there seems to be mainly a relationship of complementarity.

The theoretical framework is presented in section 2. 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 section 6 gives some concluding remarks.

## 2. Theoretical Framework

In order to analyze the different types of relationships that can prevail between the different parts of a multinational firm, we construct a simple model of a both horizontally and vertically integrated firm that has production plants in several locations.[6] More specifically, we assume that two distinct intermediate inputs have to be combined in order to supply the product in a market, and that high trade costs make one of these inputs nontraded. We assume that the firm has some monopoly power, while it is a price-taker in the labor market. Markets are assumed to be segmented so that the firm sets price independently in the different locations. The two different intermediate inputs are labeled $X$ and $Y$, while the final product is labeled $Q$.

We assume the following production function for the firm:

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

where $L$ denotes labor. 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 $\Pi$, which can be defined as net revenue over all its locations $i$:

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

where $P_i^D(Q_i)$ is the inverse demand function, $X_i = \Sigma_j X_{ij}$, $Y_i = \Sigma_j Y_{ij}$, the first subscript being the index for the location in which the intermediate input is produced and the second one being the index for the location in which the intermediate input 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 organized in a strictly horizontal fashion. This means that $T_{Gi} = 0$; i.e., there will be no intrafirm 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 labor 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, there are very strong advantages with being in proximity to the consumers. We assume the following:

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

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

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

The total demand for labor 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 **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 labor 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. Labor demand will increase with an increase in domestic demand and decrease with increases in domestic wages. Labor demand will also depend of the amount of $Y$ that is produced. Apart from the case where trade costs associated with $Y$ are so high that $Y$ becomes nontraded as well, there are two possible cases: the case where $Y$ is produced and exported to other locations, and the case where $Y$ is imported from other locations. Let us analyze each of these two cases in turn.

*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 and to the trade costs; i.e., $Y_{ij} = Q_j/\tau_{Yij}$, where $\tau_{Yij}$ is the trade cost associated with exporting from $i$ to $j$.[7] Labor demand is then given by

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

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 $\tau_{Ykj} w_i < \tau_{Yij} w_k$, $\forall k$, $k \neq i$ 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 labor in location *i*, while an increase in wage rates in location *j* will decrease the demand for labor in location *i*. That is:

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

This is the case where the relationship between labor demand in different parts of the firm is one of complementarity. 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 that there is a decrease in the wage rate in location *j* that is sufficiently large for the following inequality to hold:

$$\tau_{Yij} < w_j w_i. \tag{11}$$

Production of *Y* may then shift from location *i* to location *j*, since it will be cheaper to produce *Y* in *j* than to import it from location *i*. An outcome with relocation of production will therefore lead to a substitutionary relationship of labor demand between different parts of the firm.

*Case II: Y is Imported*

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

$$L_i = \frac{1}{\lambda} Q_i \left( P_i^D, w_i, \frac{w_m}{\tau_{Yim}} \right), \tag{12}$$

where $w_m$ is the wage in the location from which *Y* is imported, and $\tau_{Yim}$ is the trade cost associated with imports to *i* from *m*. For location *m* the following inequalities hold: $w_m < \tau_{Yim} w_i$ and $\tau_{Yij} w_m < \tau_{Yim} w_j$, $\forall j$. 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 decreasing in the wage rates in those locations. Thus, a marginal increase in the wage rate in location *m* will have a negative effect on the domestic labor demand in location *i*:

$$\frac{dL_i}{dw_m} < 0. \tag{13}$$

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:

$$w_m > \tau_{Yim} w_i. \tag{14}$$

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 $w_j > \tau_{Yij} w_i$, $\forall j$; 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 labor demand in location *i*.

However, if the inequality $w_j > \tau_{Yij} w_i, \forall j$, 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 labor. 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 is sufficiently large to create a relocation of production activities, there may be a relationship of substitution between foreign and domestic labor. 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 not 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 labor in location $i$ will depend on domestic and foreign product demand together with domestic and foreign wages. In reduced form, the equation for labor demand in location $i$ can be written as

$$L_i = f(w_i, \mathbf{w}_E, \mathbf{w}_M, \boldsymbol{\tau}_{YiE}, \boldsymbol{\tau}_{YiM}, P_i^D, \mathbf{P}_E^D), \tag{15}$$

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, $\boldsymbol{\tau}_{YiE}$ and $\boldsymbol{\tau}_{YiM}$ denote vectors of trade costs for exports to and imports from other locations, while $\mathbf{P}_E^D$ is a vector of inverse 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 labor 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 (15) where we put restrictions on the way wages and measures of product demand in different locations enter into the equation. As we have no direct measures of trade costs, these will be captured by fixed-effect dummies.

## 3. Data

We use firm-level data on Swedish MNEs within the manufacturing sector. These data have been collected since the early 1970s about every fourth year. In our sample, we have data for six years: 1970, 1974, 1978, 1986, 1990, and 1994, and the full sample of Swedish MNEs cover some 700 observations at the firm level and some 3,000 observations at the affiliate level.[8] Only producing affiliates are included in the database.

In our analysis, we have eliminated affiliates that are operating in substantially different industries from the Swedish parent firm; i.e., conglomerates. 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. We have not eliminated any affiliates belonging to the same two-digit ISIC group as the parent, as these can be considered to be either upstream or downstream in relation to the industry of the parent firm. Affiliates belonging to a different two-digit group from the parent have been eliminated on a case-by-case procedure.[9]

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 1,300 observations at the affiliate level. There are 44 firms included in the panel and 594 affiliates.[10]

We divide the host countries into a high-income group and a low-income group based on the level of per-capita income. 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. For our panel of MNEs, the relative importance of Sweden as a production location has decreased over time (Braconier and Ekholm, 1999). In this sense there is evidence of a substitution of foreign employment for domestic employment. However, it is mainly 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.

## 4. Estimation

In our econometric analysis we estimate two different types of labor 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:

$$\ln L_{it}^0 = \alpha + \delta_i + \gamma_t + \beta_0 \ln w_{it}^0 + \beta_1 \ln w_{it}^H + \beta_2 \ln w_{it}^L + \beta_3 \ln D_{it}^0 + \beta_4 \ln D_{it}^E + \varepsilon_{it}, \tag{16}$$

where $L_{it}^0$ is employment in the home part of firm $i$, $w_{it}^0$ is the wage rate in the home country, $w_{it}^H$ is the wage rate in high-income countries, and $w_{it}^L$ is the wage rate in low-wage countries. The wage variables $w_{it}^H$ and $w_{it}^L$ are averaged over all high- and low-income host-countries, respectively, in which firm $i$ operates. 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 $\delta_i$ captures a fixed firm-specific effect and $\gamma_t$ 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 wage in Sweden, $w_{it}^0$, is measured by industry-distributed average labor costs in Swedish manufacturing.[11] The variable $D_i^0$ is proxied by industry-distributed domestic consumption and $D_i^E$ by industry exports.[12] Ideally, we would like to have exogenous wage cost data for all the other countries too, but finding such data is difficult. The variables $w_{it}^H$ and $w_{it}^L$ are therefore instead calculated in the following way. First we construct a wage rate for each location in the sample by taking the average over all affiliates of all the firms in the sample 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.[13]

We expect $\beta_0$, the elasticity showing the effect of changes in the domestic wage on domestic employment, to be negative, while we expect $\beta_3$ and $\beta_4$ to be positive. The signs of $\beta_1$ and $\beta_2$, which can be interpreted as cross-elasticities showing the effect of changes in foreign wages on domestic 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 utilize the information on the affiliates in the dataset. More specifically, we estimate the following equation:

$$\ln L_{jt} = \alpha + \delta_j + \gamma_t + \beta_0 \ln w^0_{jt} + \beta_1 \ln w^H_{jt} + \beta_2 \ln w^L_{jt} + \beta_3 \ln w^S_{jt} + \beta_4 \ln D^0_{jt} + \beta_5 \ln D^S_{jt} + \beta_6 \ln Y^0_{jt} + \varepsilon_{jt}, \quad (17)$$

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, and $w^S_{jt}$ is the wage rate in Sweden in the industry in which the parent firm operates. The wage variable $w^0_{jt}$ is an average over all the affiliates in the sample that produce in affiliate $j$'s host country, subtracting affiliate $j$. The wage variables $w^H_{jt}$ and $w^L_{jt}$ are the employment-based averages of the wage rates in other host countries in which the parent firm of affiliate $j$ operates.

The variable $D^0_{jt}$ 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.[14] The variable $D^S_{jt}$ is Swedish consumption in the industry in which affiliate $j$ operates. It is included as a proxy for the demand for exports to the home country. Finally, the variable $Y^0_{jt}$ is a proxy for overall labor productivity in host country $j$ (measured as real GDP per capita).[15] It is included in order to control for the fact that if labor productivity differs across locations, wage differences may partially reflect productivity differences instead of pure cost differences.

## 5. Results

Table 1 presents the results from the regressions based on (16). The first two columns contain the results from regressions on the subset of firms that have affiliates in 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 sample of firms that have affiliates in high-income locations only. As expected, the estimates of $\beta_3$ and $\beta_4$ are positive, but the regressions perform badly in other respects. The precision of the estimates is fairly low, and the point estimates of $\beta_0$ are positive.

In the regressions performed on the subsample 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 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 1% increase in wages in other high-income locations in which Swedish MNEs operate would increase employment in the Swedish parts of the firms by 0.8%. However, 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.

In the third column we report the results for the sample with affiliates in only high-income locations. This estimation also yields positive estimates for the coefficients of the demand variables, whereas the estimate of the own-wage elasticity now has the

*Table 1. Results from Fixed-Effects Regression (Regressand: Parent-Firm Employment)*

| *Regressors* | *(1)* | *(2)* | *(3)* |
|---|---|---|---|
| $w^0$ | 0.17 | 0.16 | –0.25 |
| | (0.28) | (0.28) | (0.46) |
| $w^H$ | 0.77* | 0.77* | –0.08 |
| | (0.35) | (0.35) | (0.20) |
| $w^L$ | 0.06 | — | — |
| | (0.11) | | |
| $D^0$ | 0.08 | 0.07 | 0.41 |
| | (0.13) | (0.13) | (0.48) |
| $D^E$ | 0.35* | 0.35* | 0.24* |
| | (0.09) | (0.09) | (0.11) |
| Constant | –7.84 | –7.10 | –1.44 |
| | (6.34) | (6.17) | (12.1) |
| Number of observations | 120 | 120 | 78 |
| Obs. per group (min/avg/max) | 2/4.0/6 | 2/4.0/6 | 2/4.0/6 |
| $R^2$ (within) | 0.35 | 0.35 | 0.16 |
| *F*-test: Prob (firm dummies = 0) | 0.00 | 0.00 | 0.00 |

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

expected negative sign (although it is still insignificant). The estimate of the cross-elasticity $\beta_1$, however, switches sign and becomes insignificant. Thus, while we do 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 sample of firms with affiliates in only high-income locations.[16]

We now turn to the regressions based on equation (17). In Table 2, results from regressions with affiliate employment in high-income and low-income countries, respectively, are reported. In the first two columns, results for affiliate employment in high-income locations are presented. The difference between the two regressions lies in the level on which the fixed effects enter into the equation. In regression (1) the fixed effects are based on the identity of the affiliate, as specified in (17). However, by specifying fixed effects on the firm level in regression (2), we are able to increase the number of observations relevant for the within-variation. Since location characteristics may be important, we control for locations in regression (2) by also including country dummies.

As can be seen from Table 2, the two different specifications yield similar results. 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 with respect to high- and low-income locations, respectively, are both negative, indicating a relationship of complementarity with both types of locations. The point estimates are somewhat higher in regression (2) than in regression (1).

*Table 2. Results from Fixed-Effects Regressions (Regressand: Employment)*

| | *High-income locations* | | *Low-income locations* | | | *ULC data* | | |
|---|---|---|---|---|---|---|---|---|
| *Regressors* | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* |
| $w^0$ | –0.41* | –0.56* | –0.36* | –1.27 | –0.29* | –1.35 | –0.57 | –0.69 |
| | (0.18) | (0.23) | (0.14) | (0.89) | (0.16) | (1.53) | (0.42) | (0.43) |
| $w^H$ | –0.68* | –0.98 | 0.17 | –0.22 | 0.02 | 0.77 | –2.05* | –1.72 |
| | (0.26) | (0.56) | (0.68) | (1.43) | (0.74) | (1.27) | (0.75) | (1.38) |
| $w^L$ | –0.11 | –0.21 | –0.81* | –1.65* | –0.29 | — | — | — |
| | (0.08) | (0.13) | (0.19) | (0.63) | (0.21) | | | |
| $w^S$ | 0.20 | –0.07 | –0.75 | –0.64 | –0.80 | — | 1.98 | 2.01 |
| | (0.17) | (0.41) | (0.39) | (0.85) | (0.42) | | (1.00) | (1.76) |
| $D^0$ | 0.22 | 0.23* | 0.28* | 1.91 | –0.00 | –0.13 | 0.34* | 0.20* |
| | (0.14) | (0.03) | (0.06) | (1.01) | (0.10) | (0.16) | (0.08) | (0.03) |
| $D^S$ | 0.07 | 0.04 | –0.10 | 0.28 | –0.09 | — | 0.08 | 0.06 |
| | (0.05) | (0.13) | (0.13) | (0.23) | (0.1) | | (0.05) | (0.12) |
| $D^E$ | — | — | — | — | — | 0.21* | — | — |
| | | | | | | (0.08) | | |
| $Y^0$ | –0.16 | –0.39 | 0.44* | 1.42 | 0.52* | — | — | — |
| | (0.50) | (0.38) | (0.17) | (1.71) | (0.20) | | | |
| Constant | 9.51* | 19.0* | 16.6 | –12.9 | 18.3 | 15.44* | 2.90* | 4.13 |
| | (4.58) | (8.84) | (10.5) | (30.5) | (11.3) | (2.57) | (1.22) | (2.44) |
| Number of observations | 880 | 919 | 380 | 71 | 309 | 197 | 1,048 | 1,083 |
| Obs. per group (min/avg/max) | 2/3.0/6 | 4/30.6/157 | 4/21.1/49 | 2/6.5/11 | 2/17.2/40 | 2/4.5/6 | 2/3.0/6 | 3/24.6/157 |
| $R^2$ (within) | 0.06 | 0.07 | 0.44 | 0.51 | 0.49 | 0.13 | 0.06 | 0.05 |
| *F*-tests: | | | | | | | | |
| Prob ($\beta_1 = \beta_2$) | 0.03 | 0.18 | 0.17 | 0.31 | 0.69 | | | |
| Prob (affiliate dummies = 0) | 0.00 | | | | | | 0.00 | |
| Prob (firm dummies = 0) | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 |

*Note*: Standard errors are reported in parentheses. The regressions include time dummies, and regressions (2)–(5) include country dummies, which are not reported. The results reported in columns (1) and (7) refer to a regression with affiliate-specific fixed effects, whereas the other results refer to regressions with firm-specific fixed effects. An asterisk indicates significance at the 5% level.

However, the precision of the estimates in (1) is higher. The estimated cross-elasticity with respect to the Swedish wage is insignificant.

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 with the findings of Brainard and Riker (1997b) for US 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, the vertical decomposition between different affiliates in high-income countries may be more extensive than between these affiliates and affiliates located in low-income countries.

In columns (3)–(5), we present results 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 MNEs are heavily biased towards industrialized 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 (17) performs very badly indeed. However, in regressions with firm-specific fixed effects instead of affiliate-specific fixed effects, we are able to increase the precision in our estimates considerably. Therefore, Table 2 presents results from the regressions with firm-specific fixed effects (see Braconier and Ekholm (1999) for results from regressions with affiliate-specific fixed effects).

Column (3) shows that the estimated own-wage elasticity is again negative, while the estimated coefficient of local aggregate demand is positive. The cross-elasticity showing the effect of wages in high-income countries is positive, but not significantly different from zero. However, the cross-elasticity for wages 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 intrafirm trade in inputs than are 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. Columns (4) and (5) show the results from regressions 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, respectively. As it turns out, the cross-wage elasticity with respect to wages in low-income countries is strongly negative for 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.

We may also note that, in these regressions, our control variable for differences in labor productivity is positive and significant, whereas it was insignificant in the regressions for affiliates in high-income locations. Again the estimated cross-elasticity with respect to the Swedish wage is insignificant.

In order to further explore whether the heterogeneity of labor may bias our results, we also use PPP-adjusted unit labor cost (ULC) data to check the robustness of our previous results.[17] The ULC data have the additional benefit of being exogenous to the MNEs. However, a drawback is that we only have ULC data for high-income locations. Because ULC data are available only at the country level, we do not include country-specific dummies in the regression for affiliate employment in high-income locations.[18] ULC composites for individual firms are constructed in the same way as in the previous analysis and all the other data are the same.

Column (6) of Table 2 shows the results for employment in the parent firm in Sweden. The results are similar to those presented in column (2) of Table 1, with the exceptions that the estimated own wage elasticity is negative (but insignificant) while the substitutionary relationship with high-income locations is no longer significant (but the estimated coefficient is still positive). Exports is the only variable that turns out to be significant.

Columns (7)–(8) show the results for employment in high-income affiliates. The signs of all the estimated coefficients are the same as in columns (1)–(2), although the precision of the estimates is generally somewhat lower. The estimated cross-elasticity with respect to wages in other high-income locations is negative (indicating complementarity), while the estimated cross-elasticity with respect to Sweden is positive (indicating substitution), but insignificant.

## 6. Concluding Remarks

Based on data on Swedish MNEs, we find 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. We find mainly a relationship of complementarity between affiliate employment in different locations. Our results are in this respect different from what has previously been found for the US, where complementarity seems to prevail only between affiliates in locations with different relative factor endowments. One possible explanation for this difference in results is that Swedish MNEs are vertically integrated to a larger extent than US ones. This is consistent with the results found in recent models of FDI (e.g., Markusen et al., 1996), where vertically integrated MNEs tend to dominate in small and skilled-labor abundant countries.

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## Notes

1. See, for instance, the survey by Markusen (1995).
2. However, even in the case where a firm locates production abroad in order to supply a foreign market, complementary activities such as headquarter activities are likely to be undertaken at home.
3. However, if an upstream or downstream activity previously conducted in the home country becomes relocated to a foreign affiliate, there will be substitution associated with vertical FDI as well.
4. An early attempt to focus directly on the effect of outward FDI on home country employment was Kravis and Lipsey (1988) (see also Lipsey, 1994, and Blomström et al., 1997).
5. See also Lawrence (1994).
6. The model is inspired by the theoretical framework used in Brainard and Riker (1997b).
7. We assume that a unique location has the lowest cost (i.e., marginal costs plus trade costs) of supplying $Y$ to another location.
8. A description of these data can be found in Braunerhjelm and Ekholm (1998).
9. In this process, we have eliminated less than 5% of the affiliates.
10. These MNEs employ between 74% and 86% of the total employment in Sweden that can be attributed to Swedish MNEs.
11. Wage data have been collected from Statistics Sweden, while information about payroll taxes have been supplied by the Swedish Employers' Confederation.
12. Data on industry-distributed consumption are from the 1998 STAN database (OECD) and on industry-distributed exports from Statistics Sweden.

13. The variables are defined as $w_{it}^{g} \equiv \sum_{k \in g} \frac{L_{ikt}}{\sum_{k \in g} L_{ikt}} w_{kt}$ $g = H, L$, where $H$ and $L$ are the sets of high- and low-income host countries, respectively, and $w_{kt}$ is measured as an average over all affiliates in the sample that are located in country $k$.
14. Data have been collected from 1998 World Development Indicators on CD-ROM (World Bank).
15. The data have been collected from Penn World Tables 5.6.
16. Firms with affiliates in only high-income locations are located in natural-resource-intensive and capital-intensive low-tech sectors as pulp & paper, steel & iron, and rubber products. Changes in labor cost differences between locations may have a weaker effect on labor demand in such industries.
17. Our measure of ULC is defined as $ULC = \frac{wL}{GDP \times PPP}$, where $w$ is the current wage cost, $L$ is employment in the private business sector, $GDP$ is volume GDP, and $PPP$ the PPP exchange rate with respect to USD. All data are collected from *Economic Outlook* (OECD, 1998).
18. Both the own-labor cost and the local demand only vary across countries.