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# DOMESTIC JOBS AND FOREIGN WAGES: LABOUR DEMAND IN SWEDISH MULTINATIONALS

**J. HATZIUS**

## ABSTRACT

The labour demand decisions of multinational corporations (MNCs) are likely to depend not only on domestic, but also on foreign labour costs. This paper tests this hypothesis by estimating labour demand equations for a sample of Swedish MNCs. Indeed, higher foreign costs increase an MNC's Swedish employment and reduce its foreign employment. As MNCs become more important in many OECD countries, the role of foreign labour costs in the determination of aggregate domestic employment is likely to increase.



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# DOMESTIC JOBS AND FOREIGN WAGES: LABOUR DEMAND IN SWEDISH MULTINATIONALS

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## 1. INTRODUCTION

The labour demand decisions of multinational corporations (MNCs) should depend not only on domestic, but also on foreign labour costs. This paper tests this hypothesis by estimating labour demand equations for a sample of Swedish multinational corporations (MNCs). If higher foreign costs increase Swedish labour demand, this would be evidence that MNCs shift employment in response to relative cost changes. Globalisation, or more specifically an increasing output share of MNCs, will then make foreign cost conditions more important to aggregate domestic employment. This would be consistent with the public perception that globalisation leads to competition between national wage-setting institutions.

Traditional labour demand theory posits that employment depends on the real wage, the cost of capital, and total output. In the public debate, by contrast, it is often claimed that the most important measure is labour costs *relative to other countries*. For instance, many commentators attribute Germany's rising unemployment to the fact that its hourly labour costs are the highest in Europe. By contrast, the traditional labour demand framework suggests that changes in (un)employment depend on changes in labour costs or demand variables, rather than on comparisons with other countries.

When does economic theory predict an effect of foreign labour cost on domestic employment? In a closed economy, home-country labour demand does not depend on foreign labour costs by definition. However, international integration creates a potential role for foreign costs. If trade is opened up, lower costs abroad will typically increase foreign and lower domestic output and labour demand. Capital mobility introduces a similar dependence of domestic labour demand on foreign costs. For instance, a fall in

foreign labour costs may prompt a multinational corporation (MNC) to produce more of a given total output abroad, and less at home.

If economic integration introduces a positive effect of *foreign* labour costs on domestic labour demand, it should also increase the negative effect of *domestic* labour costs. Assume that the labour demand curve slopes down under autarky, because higher wages prompt firms to substitute capital for labour. Now assume that trade is liberalised or capital becomes mobile, ensuring that relative wages have an additional negative effect. This means that, all else equal, higher foreign wages increase labour demand, and higher domestic wages lower labour demand by the (presumably unchanged) amount attributable to capital-labour substitution plus the amount attributable to production relocation. In a previous paper (Hatzius, 1996), I argue that capital mobility has increased the investment and labour demand elasticity. In this paper, I am concerned with the effect of foreign labour costs on domestic labour demand. Clearly, the arguments are closely related.

There is little direct evidence on whether foreign labour costs affect domestic employment. In recent years, a number of authors have investigated the interplay of trade, FDI, and labour markets. In the trade literature, papers such as Grossman (1986), Revenga (1992), and Konings and Vandenbussche (1995) have examined the effect of import volumes, or other more qualitative indicators of import competition, on domestic employment and wages. Much of the FDI literature has examined the effects of labour costs on foreign direct investment. While some of these studies can be used to derive the effects of foreign labour costs on domestic investment and labour demand, the procedure is quite indirect and requires a number of simplifying assumptions (see Hatzius, 1996). Moreover, authors such as Lipsey, Kravis, and Roldan (1982) have asked whether multinational firms adapt their factor proportions to relative factor prices. However, no study has investigated directly whether

multinational firms shift employment in response to relative factor price changes.

The remainder of the paper is organised as follows. Section 2 develops a simple labour demand framework for a multinational corporation. Section 3 discusses the data set and issues of econometric specification. Section 4 presents the empirical results, and Section 5 concludes.

## 2. FRAMEWORK

Consider an MNC that may produce total world output $Y$ either in Sweden, denoted by the subscript *SVE*, or in the group of all other countries, denoted by *f*. Assuming that capital is financed in Sweden but may be deployed in either country, the cost function is given by

$$C = C\left(Y, W_{SVE}, W_f, R\right) \tag{1}$$

where $W$ stands for labour costs and $R$ for capital costs, all defined in Swedish crowns. Simply differentiating the cost function yields the labour demand equations

$$L_{SVE} = C_2\left(Y, W_{SVE}, W_f, R\right), \tag{2}$$

$$L_f = C_3\left(Y, W_{SVE}, W_f, R\right), \tag{3}$$

To estimate these labour demand equations, perhaps the simplest approach is to take a first-order logarithmic approximation. Neglecting changes in capital costs, this yields

$$\Delta l_{SVE} \approx h_{21}\Delta y + h_{22}\Delta w_{SVE} + h_{23}\Delta w_f, \tag{4}$$

(5) $$\Delta l_f \approx h_{31}\Delta y + h_{32}\Delta w_{SVE} + h_{33}\Delta w_f ,$$

where lower-case letters denote natural logarithms and $h_{ij}$ is the partial elasticity of $C_i$ with respect to its $j$th argument. As cost functions are concave, $h_{ii} \leq 0$. If firms relocate employment in response to relative labour cost changes, the parameters $h_{23}$ and $h_{32}$ should be greater than zero.

Equation (1) assumes that production can only take place in two countries, namely Sweden and the group of all other countries. In practice, however, the data set used in the empirical analysis contains data on employment and labour costs in a large number of countries. Since aggregating all foreign countries into country *f* eliminates a lot of information, one may argue that it is better to think of labour demand relocation as taking place between Sweden, a given foreign country *c*, and the group of all other countries *o*. In this case, one would think of the cost function as

(6) $$C = C(Y, W_{SVE}, W_c, W_o, R).$$

Differentiating this cost function yields labour demand in country *c*

(7) $$L_c = C_3(Y, W_{SVE}, W_c, W_o, R).$$

Again neglecting changes in capital costs, a logarithmic approximation gives the estimating equation

(8) $$\Delta l_c \approx g_{31}\Delta y + g_{32}\Delta w_{SVE} + g_{33}\Delta w_c + g_{34}\Delta w_o .$$

The cost function framework implies that the parameter $g_{33}$ should be negative. If labour demand relocation takes place, the parameters $g_{32}$ and/ or $g_{34}$ should be positive.

# 3. DATA AND ECONOMETRIC METHODS

## 3.1 Data

The data set is based on a repeated survey of all Swedish multinational corporations which has been carried out by Industriens Utredningsinstitut (IUI) in Stockholm since 1965. It contains all Swedish manufacturing MNCs with 50 or more employees and covers the years 1965, 1970, 1974, 1978, 1986, 1990 and 1994. The IUI database covers the activities of the Swedish companies in the group as well as the operations of each subsidiary abroad. The response rate is very high (over 90 per cent in most years). The total number of MNCs has grown from about 110 to over 170 since 1965. In addition, the firms have become more internationalised in both production and sales. The share of their world output produced in Sweden has declined from over 70 per cent to less than 50 per cent, while the proportion sold in Sweden has fallen from about 40 per cent to less than 20 per cent (Braunerhjelm *et al*, 1996). On the whole, Swedish MNCs show a high and increasing degree of internationalisation. Given that relative factor costs vary quite substantially around the world, these figures suggest that firms may find it worthwhile to take relative costs into account when designing their geographic production pattern.

Most foreign production is located in western Europe and North America. The European share has fallen from almost 70 per cent in 1965 to less than 60 per cent in 1994. The American share fell for most of the 1960s and 1970s but has risen from 13 per cent in 1978 to over 30 per cent in 1994. The production shares located in other regions are fairly small; in particular, Asia only accounts for one per cent of the output of Swedish MNCs. The industrial

distribution of production has remained somewhat more stable and is concentrated in engineering and chemicals, which account for around 70 and 10 per cent of all foreign employees, respectively. In addition, the share of basic materials has risen from less than three per cent to around ten per cent during the last ten years. A more detailed description of the IUI database is available in Braunerhjelm *et al* (1996).

Firm-level employment, firm-level labour costs, and firm-level world output are the most important variables for the purposes of this study. Capital costs are excluded; however, note that time dummies, which are included in some equations, control for changes in capital costs that are common to all Swedish MNCs. The years 1965 and 1970 were dropped because there is no information on total firm-level labour costs, so that the data set consists of four first-difference periods (1974-78, 1978-86, 1986-90, 1990-94).

The basic explanatory variables in the empirical analysis are given by log first differences in firm-level annual labour costs per worker in Swedish crowns. These are obtained by calculating total labour costs for Sweden and all foreign countries for equations (4) and (5) – or total labour costs for Sweden, each foreign country, and all other countries for equation (8) – and dividing by the respective total employment figure and the Swedish producer price index.

As cost functions condition on total output, the log change in the MNC's world production needs to be calculated. The required variable is a volume measure, so that world production in Swedish crowns must be adjusted for exchange rate changes. Hence, the change in a firm's world output is defined as a weighted average of the change in Swedish sales value deflated by the Swedish producer price index and the change in foreign sales value deflated by the Swedish producer price index and the real exchange rate, where the weights are given by the firm's base-period Swedish and foreign sales shares. The real exchange rate change deflates the firm's foreign output, and is therefore defined as a weighted average of bilateral

exchange rate changes between Sweden and all countries in which the MNC sells output, where the weights are given by base-period sales in each foreign country as a share of total foreign sales.

To check the identifying restrictions, firm-level labour costs are instrumented in some equations. For this purpose, information from the IUI database has been combined with aggregate data on prices and exchange rates taken from the IMF's *International Financial Statistics*. Real exchange rate changes provide the basic instrument for identifying the effects of labour costs. For equations (4) and (5), they are defined as firm-specific weighted averages of bilateral real exchange rate changes. Unlike the exchange rate used to deflate output, however, the exchange rate used as an instrument uses as weights base-period wage bill rather than sales shares. The idea is that changes in currencies in which a large share of the MNC's labour costs (rather than revenues) are denominated, will cause a relatively large change in foreign labour costs. For equation (8), bilateral currency movements between country *c* and Sweden are added to the instrument set. In some equations, Swedish industry-level labour costs, taken from the OECD's *STAN* database, are added to the instrument set (see below).

The number of observations is 213 for equations (4) and (5), and 861 for equation (8). Table 1 gives an overview over the samples. Across the observations used in the empirical analysis, as in the IUI data set as a whole (see above), average foreign employment has grown considerably, while Swedish employment has declined somewhat. Note that the average total foreign employment increase substantially exceeds the average increase *by country*. Presumably, this is due to the establishment of new foreign subsidiaries. This will increase total foreign employment but not foreign employment by country, which only refers to existing subsidiaries (more precisely, employment in countries with at least one existing subsidiary).

It is evident from Table 1 that there is a great deal of sample variation in foreign labour costs. Even after taking account of

possibilities such as composition and hours changes over the four to eight year interval of observation, log changes of up to 2.3 in absolute value stretch credulity. Hence, we need to consider the possibility of serious measurement error. The associated econometric problems and possible remedies are discussed below.

## 3.2 Econometric Methods

In the empirical analysis, equations (4), (5), and (8) are estimated by ordinary least squares (OLS) and instrumental variables (IV). In principle, (4) and (5) may form a system of seemingly unrelated regressions (SUR), as their residuals are likely to be correlated because of MNC-specific shocks. However, since both equations contain the same set of explanatory variables, OLS and SUR estimates coincide.

Even though Hamermesh (1993) argues that assuming factor prices to be exogenous is reasonable in firm-level studies, there are two possible sources of bias in OLS estimation of the labour demand equations. First, labour costs are mechanically inversely related to employment because they are calculated as the ratio of total labour costs to the number of workers. Hence, measurement error in the employment data would cause a *downward bias* on the own labour cost coefficient. Second, an unobserved productivity shock in one country is likely to increase both employment and labour costs there. This would bias the estimates on both Swedish and foreign labour costs towards zero, because it would partially offset the expected negative (positive) correlation between labour costs and employment in the same (other) country. Taken together, measurement error and simultaneity will bias the coefficient on labour costs in the other country towards zero, but may bias the own labour cost coefficients in either direction.

It is therefore important to check any OLS estimates by IV methods. Fortunately, both bilateral exchange rates and firm-specific effective exchange rates provide very plausible instruments for labour costs in a common currency and are used as the primary instruments in the empirical analysis. The procedure is analogous to Revenga (1992), who estimates reduced-form equations that relate changes in US industry employment and wages to changes in import prices. She instruments the potentially endogenous import prices by industry-specific effective exchange rate changes, which she believes to be primarily determined by macroeconomic factors.

In addition to exchange rates, some equations use Swedish industry-level labour costs as an instrument for Swedish firm-level labour costs. While instrumenting firm-level labour costs by industry-level labour costs avoids the measurement error bias mentioned above, such an equation may still be subject to simultaneity bias if the MNCs (or rather, their Swedish affiliates) are large relative to the industry as a whole.

In the results, all standard errors and test statistics are robust to general heteroskedasticity. Each equation is reported with up to four specification tests. First, all equations are estimated both with and without a full set of time dummies, and the marginal significance level of the test for its exclusion is reported as “TD”. Second, the test statistic for residual autocorrelation is simply the marginal significance level of the lagged residual in a regression on the current residual, as suggested by Goldberger (1991, p. 305). Third, a Hausman test for endogeneity of the labour cost variables is computed from the IV estimates. It involves the residuals from the auxiliary regressions of Swedish and foreign labour costs (in Swedish crowns) on all available instruments. If these residuals are jointly insignificant as additional variables in the OLS regression of labour demand on labour costs and total output, the exogeneity hypothesis is accepted and OLS is assumed to be consistent. The procedure is described in Godfrey (1988, p. 194). The marginal significance level

of this test is reported in the IV results as "Exogeneity". Fourth, the test statistic "Validity" is the marginal significance level of the test that Swedish industry-level labour costs are valid instruments, given all other instruments. It is obtained by regressing the residual from the IV regression that use only exchange rates and output as instruments, on Swedish industry labour costs.

# 4. RESULTS

## 4.1 Swedish Labour Demand

Table 2 shows the estimates of equation (4). Columns (1) and (2) contain OLS estimates, and columns (3) to (6) contain IV results. In terms of specification, excluding time dummies is rejected at the five per cent level in every equation. Moreover, there is no evidence for residual autocorrelation. The hypothesis that labour costs are exogenous is rejected at the ten per cent level in the equations without time dummies. It is accepted with time dummies, but the power of the specification test may be quite low in this case, given the imprecisely estimated IV coefficients. Hence, it is probably safer to concentrate on the IV results.

The first result is that the elasticity of Swedish employment with respect to world output is around 0.63. Hence, Swedish labour demand increases less than proportionately with worldwide output. In the context of this paper, the effects of Swedish and foreign labour costs are perhaps more interesting. In every equation, the coefficient on Swedish costs is insignificant. The point estimates are negative in the OLS results, but positive in the IV results. Taken at face value, these results do not support a downward-sloping labour demand curve in the home employment of Swedish MNCs. However, higher foreign labour costs seem to increase Swedish employment. In most equations, the effect is significant at the five

per cent level and lies around 0.25. Although the coefficients become insignificant when time dummies are included in the IV equations, the point estimates actually increase to around 0.35. Hence, it does seem that firms increase Swedish employment when foreign labour costs rise.

## 4.2 Total Foreign Labour Demand

Table 3 shows the estimates of equation (5) and is organised as Table 3. Excluding time dummies is rejected at or close to the ten per cent level in every equation. There is little evidence for residual autocorrelation. Moreover, the hypothesis that labour costs are exogenous is accepted at the ten per cent level in every specification. Hence, column (2) is my preferred specification.

The output elasticity of foreign labour demand is larger than that of Swedish labour demand. The point estimate is around 0.8, and it does not differ significantly from unity. Hence, foreign employment varies more strongly with worldwide output (although the difference is not statistically significant). Most likely, this reflects the simple fact that both total output and its foreign share have expanded in the typical Swedish MNC.

More importantly, foreign labour costs have a negative and highly significant effect on foreign labour demand, in every specification. By contrast, the effect of Swedish labour costs is insignificant, though the point estimate is positive everywhere except in the IV time-dummy results (which have very high standard errors). Hence, there is only weak evidence that higher Swedish labour costs (in Swedish crowns) raise foreign labour demand, but strong evidence that the foreign labour demand curve slopes down with respect to foreign costs.

The apparent contrast, both in the Swedish and foreign results, between the effects of Swedish and foreign labour costs, with the former much weaker than the latter, is somewhat puzzling. Quite possibly, however, it is a statistical artefact, as foreign costs in

Swedish crowns vary strongly with exogenous exchange rate changes, but Swedish costs in Swedish crowns may have little exogenous variation. This is not only because Swedish costs in Swedish crowns are a purely domestic variable, but also because Swedish wage-setting has traditionally been quite centralised, thereby leaving little room for exogenous labour cost variation at the level of the firm. If much of the variation in Swedish costs is driven by movements in the labour demand rather than labour supply or wage curve, and the available instruments for Swedish costs are bad, both the OLS and the IV estimates on Swedish labour costs will be of limited use.

Taken together, Tables 4 and 5 indicate that firms relocate abroad when their foreign costs fall in terms of Swedish crowns. This is in line with the observation that Sweden's net foreign direct investment outflows were extremely high between the mid-1980s and early 1990s, reaching six per cent of GDP in 1990 (OECD, 1995), but have become negative since the crown devaluation of 1992 which effectively raised the cost of producing abroad. It is interesting that the firm-level results of this paper mirror the aggregate trends so closely, even when controlling for all aggregate factors.

### 4.3 Country-by-Country Foreign Labour Demand

Tables 4 and 5 disaggregate foreign employment and labour costs by country. Let us first focus on Table 4, which aims to check the results of Table 3 by estimating a similar specification that includes only Swedish and country *c* labour costs. OLS is accepted if time dummies are excluded, but rejected when time dummies are included. Since the exclusion of time dummies is only narrowly accepted in the OLS and IV2 results, and there is some evidence for

residual autocorrelation everywhere, a satisfactory specification is hard to find.

Let us nevertheless go through the parameter estimates. The country-by-country output elasticity is less than 0.5 and therefore much smaller than the total foreign output elasticity. This is probably because a growing MNC will expand world output partly by increasing output per subsidiary, and partly by setting up new subsidiaries. Both of these effects are included in the total foreign labour demand estimates of Table 3, but only the first is included in the country-by-country estimates of Tables 4 and 5.

The labour cost effects, however, are broadly in line with those of Table 3. Swedish costs enter positively but are significant only when time dummies are excluded. Foreign labour costs, by contrast, are negative and significant. On the whole, the country-by-country results are similar to the total foreign results, but are less strong and also less trustworthy in terms of specification.

The only additional potential of the country-by-country sample is for estimating third-country labour cost effects, and the corresponding results are shown in Table 5. All equations are subject to (positive) residual autocorrelation, which implies that the standard errors are biased downwards, and labour cost exogeneity is rejected throughout.

With these caveats, let us look at the labour cost estimates. In the OLS results, third-country labour costs are basically irrelevant, and the results are similar to those of Table 4. However, the exogeneity assumption is rejected, and one may therefore prefer to look at the IV results. As before, Swedish labour costs are significantly positive, and country *c* labour costs significantly negative. However, third-country labour costs now have a large and significant negative coefficient. Taken at face value, this would mean that, all else equal, higher labour costs in Germany prompt the French subsidiaries of Swedish MNCs to reduce employment. Such a relationship might be rationalised in terms of complementarity

between labour inputs in countries *c* and *o*. However, note that both Swedish and third-country labour costs become insignificant when time dummies are included, so that a fair degree of scepticism is probably in order. On the whole, the country-by-country results do not appear to add much insight.

## 5. CONCLUSION

Using a unique panel of Swedish multinational corporations, this paper has investigated whether MNCs relocate employment as relative costs change. The answer is a qualified yes. Higher foreign labour costs, measured in Swedish crowns, reduce foreign employment and increase Swedish employment. The evidence for a similar effect of Swedish labour costs on labour demand, either in Sweden or abroad, is much weaker. Quite possibly, however, this disparity is more apparent than real, and reflects an insufficient amount of exogenous variation in Swedish labour cost. In any case, a rise in *relative* Swedish costs increases foreign and reduces Swedish employment, and the results support the view that multinationals shift employment between countries to take advantage of relative labour cost changes.

Labour demand relocation by multinationals is one channel through which "globalisation" can increase cost competition between countries. As MNCs expand relative to the rest of the economy, one would expect the effects of both foreign and domestic labour costs on total domestic labour demand to become stronger. Moreover, a greater role of MNCs means that a real depreciation will increase labour demand not only because export demand rises – the traditional expansionary effect of a depreciation – but also because multinational firms relocate employment towards the home country, whose relative labour costs have fallen. "Globalisation" may

therefore enhance the effect of exchange rate or incomes policy on domestic labour demand. In that case, countries would have a greater incentive to depreciate their currencies. Arguments along these lines are sometimes used to justify the need for a single European currency. For instance, German proponents of a single currency have contended that a deutschmark appreciation following a failure of the single currency project may cause a recession in Germany. The results of this paper suggest that the strength of such arguments increases with the importance of multinationals in the international economy.

## TABLE 1
## Descriptive Statistics

| Variable | NT | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| $\Delta l_{SVE}$ | 213 | -0.129 | 0.455 | -2.566 | 1.105 |
| $\Delta l_f$ | 213 | 0.309 | 0.720 | -2.727 | 3.360 |
| $\Delta w_{SVE}$ | 213 | 0.134 | 0.249 | -0.453 | 1.352 |
| $\Delta w_f$ | 213 | 0.180 | 0.432 | -1.864 | 2.354 |
| $\Delta y$ | 213 | 0.117 | 0.432 | -2.751 | 1.284 |
| $\Delta l_c$ | 861 | 0.159 | 0.845 | -4.315 | 4.778 |
| $\Delta w_{SVE}$ | 861 | 0.105 | 0.207 | -0.453 | 0.846 |
| $\Delta w_c$ | 861 | 0.189 | 0.366 | -1.592 | 2.187 |
| $\Delta w_o$ | 861 | 0.157 | 0.337 | -2.053 | 2.521 |
| $\Delta y$ | 861 | 0.188 | 0.330 | -1.633 | 1.284 |

**Notes:** All variables are defined in log first differences. "NT" stands for the total number of observations. Note that the descriptive statistics of variables such as $\Delta w_{SVE}$ and $\Delta y$ differ between the total and the country-by-country samples because the latter excludes companies that have no information on country-by-country employment or labour costs.

# TABLE 2
# Swedish Labour Demand

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $y$ | 0.689*** | 0.693*** | 0.637*** | 0.625*** | 0.639*** | 0.631*** |
| | (0.156) | (0.167) | (0.160) | (0.181) | (0.158) | (0.174) |
| $w_{SVE}$ | -0.075 | -0.159 | 0.356 | 0.315 | 0.253 | 0.134 |
| | (0.073) | (0.093) | (0.223) | (0.958) | (0.260) | (0.777) |
| $w_f$ | 0.234*** | 0.213*** | 0.238** | 0.351 | 0.295** | 0.370 |
| | (0.059) | (0.063) | (0.120) | (0.251) | (0.124) | (0.277) |
| Tests: | | | | | | |
| TD | 0.000 | - | 0.039 | - | 0.030 | - |
| Serial Corr. | 0.599 | 0.813 | 0.417 | 0.761 | 0.440 | 0.870 |
| Exogeneity | - | - | 0.044 | 0.772 | 0.060 | 0.755 |
| Validity | - | - | - | - | 0.737 | 0.881 |
| Adjusted $R^2$ | 0.479 | 0.504 | 0.376 | 0.383 | 0.394 | 0.412 |
| Estimator | OLS | OLS | IV1 | IV1 | IV2 | IV2 |
| TD? | no | yes | no | yes | no | yes |
| NT | 213 | 213 | 205 | 205 | 205 | 205 |

**Notes:** Robust standard errors are in parentheses. The dependent variable is the log change in the MNC's employment in Sweden. All equations are estimated in first differences and contain a constant. The instrument set IV1 contains various exchange rates and total MNC output. The instrument set IV2 adds Swedish industry labour costs. The symbols *, **, and *** indicate significance at the ten, five, and one per cent level, respectively. The test statistics, which are all robust to heteroskedasticity, refer to the marginal significance levels (p-values) of the following null hypotheses:

- TD: time dummies are jointly insignificant.
- Serial corr.: absence of first order serial correlation in the residuals.
- Exogeneity: Swedish and foreign labour costs are jointly exogenous.
- Validity: Swedish industry-level labour costs are valid instruments, given instrument set IV1.

# TABLE 3
# Total Foreign Labour Demand

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $y$ | 0.786*** | 0.765*** | 0.816*** | 0.823*** | 0.818*** | 0.824*** |
| | (0.131) | (0.136) | (0.139) | (0.157) | (0.137) | (0.154) |
| $w_{SVE}$ | 0.255* | 0.236 | 0.487 | -0.222 | 0.365 | -0.247 |
| | (0.154) | (0.174) | (0.404) | (0.693) | (0.343) | (0.610) |
| $w_f$ | -0.566*** | -0.519*** | -1.017*** | -0.892** | -0.950*** | -0.889*** |
| | (0.146) | (0.153) | (0.307) | (0.351) | (0.267) | (0.338) |
| Tests: | | | | | | |
| TD | 0.032 | - | 0.105 | - | 0.065 | - |
| Serial Corr. | 0.418 | 0.605 | 0.098 | 0.243 | 0.129 | 0.248 |
| Exogeneity | - | - | 0.128 | 0.374 | 0.146 | 0.378 |
| Validity | - | - | - | - | 0.740 | 0.782 |
| Adjusted $R^2$ | 0.333 | 0.351 | 0.221 | 0.268 | 0.251 | 0.267 |
| Estimator | OLS | OLS | IV1 | IV1 | IV2 | IV2 |
| TD? | no | yes | no | yes | no | yes |
| NT | 213 | 213 | 205 | 205 | 205 | 205 |

**Notes:** Robust standard errors are in parentheses. The dependent variable is the log change in the MNC's employment outside Sweden. All equations are estimated in first differences and contain a constant. The instrument set IV1 contains various exchange rates and total MNC output. The instrument set IV2 adds Swedish industry labour costs. The symbols *, **, and *** indicate significance at the ten, five, and one per cent level, respectively. The test statistics, which are all robust to heteroskedasticity, refer to the marginal significance levels (p-values) of the following null hypotheses:

- TD: time dummies are jointly insignificant.
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- Exogeneity: Swedish and foreign labour costs are jointly exogenous.
- Validity: Swedish industry-level labour costs are valid instruments, given instrument set IV1.

## TABLE 4
## Country-by-Country Labour Demand ($w_{SVE}$, $w_c$)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $y$ | 0.469*** | 0.452*** | 0.477*** | 0.423*** | 0.479*** | 0.424*** |
| | (0.113) | (0.112) | (0.119) | (0.112) | (0.120) | (0.114) |
| $w_{SVE}$ | 0.303** | 0.183 | 0.581** | 0.070 | 0.650** | 0.313 |
| | (0.153) | (0.182) | (0.258) | (0.421) | (0.263) | (0.422) |
| $w_c$ | -0.614*** | -0.592*** | -0.453*** | -0.226* | -0.462*** | -0.229* |
| | (0.105) | (0.120) | (0.113) | (0.129) | (0.114) | (0.130) |
| Tests: | | | | | | |
| TD | 0.064 | - | 0.028 | - | 0.084 | - |
| Serial corr. | 0.049 | 0.055 | 0.056 | 0.097 | 0.052 | 0.097 |
| Exogeneity | - | - | 0.165 | 0.040 | 0.110 | 0.045 |
| Validity | - | - | - | - | 0.035 | 0.190 |
| Adjusted $R^2$ | 0.104 | 0.109 | 0.094 | 0.086 | 0.092 | 0.086 |
| Estimator | OLS | OLS | IV1 | IV1 | IV2 | IV2 |
| TD? | no | yes | no | yes | no | yes |
| NT | 861 | 861 | 861 | 861 | 861 | 861 |

**Notes:** Robust standard errors are in parentheses. The dependent variable is the log change in the MNC's employment in country *c*. All equations are estimated in first differences and contain a constant. The instrument set IV1 contains various exchange rates and total MNC output. The instrument set IV2 adds Swedish industry labour costs. The symbols *, **, and *** indicate significance at the ten, five, and one per cent level, respectively. The test statistics, which are all robust to heteroskedasticity, refer to the marginal significance levels (p-values) of the following null hypotheses:

- TD: time dummies are jointly insignificant.
- Serial corr.: absence of first order serial correlation in the residuals.
- Exogeneity: Swedish and foreign labour costs are jointly exogenous.
- Validity: Swedish industry-level labour costs are valid instruments, given instrument set IV1.

## TABLE 5
## Country-by-Country Labour Demand ($w_{SVE}$, $w_c$, $w_o$)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| $y$ | 0.464*** | 0.439*** | 0.535*** | 0.486*** | 0.546*** | 0.512*** |
| | (0.113) | (0.112) | (0.123) | (0.109) | (0.125) | (0.112) |
| $w_{SVE}$ | 0.296* | 0.180 | 0.686** | -0.015 | 0.753*** | 0.156 |
| | (0.154) | (0.181) | (0.269) | (0.430) | (0.278) | (0.437) |
| $w_c$ | -0.616*** | -0.590*** | -0.341*** | -0.232* | -0.329*** | -0.236* |
| | (0.104) | (0.121) | (0.123) | (0.131) | (0.124) | (0.133) |
| $w_o$ | 0.052 | 0.081 | -0.560** | -0.415 | -0.653** | -0.582 |
| | (0.070) | (0.070) | (0.275) | (0.342) | (0.286) | (0.356) |
| Tests: | | | | | | |
| TD | 0.055 | - | 0.125 | - | 0.254 | - |
| Serial corr. | 0.042 | 0.048 | 0.035 | 0.061 | 0.028 | 0.050 |
| Exogeneity | - | - | 0.011 | 0.050 | 0.004 | 0.024 |
| Validity | - | - | - | - | 0.319 | 0.285 |
| Adjusted $R^2$ | 0.103 | 0.109 | 0.027 | 0.047 | 0.005 | 0.021 |
| Estimator | OLS | OLS | IV1 | IV1 | IV2 | IV2 |
| TD? | no | yes | no | yes | no | yes |
| NT | 861 | 861 | 861 | 861 | 861 | 861 |

**Notes:** Robust standard errors are in parentheses. The dependent variable is the log change in the MNC's employment in country *c*. All equations are estimated in first differences and contain a constant. The instrument set IV1 contains various exchange rates and total MNC output. The instrument set IV2 adds Swedish industry labour costs. The symbols *, **, and *** indicate significance at the ten, five, and one per cent level, respectively. The test statistics, which are all robust to heteroskedasticity, refer to the marginal significance levels (p-values) of the following null hypotheses:

- TD: time dummies are jointly insignificant.
- Serial corr.: absence of first order serial correlation in the residuals.
- Exogeneity: Swedish, country *c*, and country *o* labour costs are jointly exogenous.
- Validity: Swedish industry-level labour costs are valid instruments, given instrument set IV1.

## REFERENCES


Braunerhjelm, Pontus, Karolina Ekholm, Lennart Gundberg, and Patrik Karpaty (1996), "Swedish multinational corporations: recent trends in foreign activities", mimeo, IUI.

Godfrey, Leslie (1988), *Misspecification Tests in Econometrics*, Cambridge University Press: Cambridge.

Grossman, Gene (1986), "Imports as a cause of injury: the case of the US steel industry", Journal of International Economics, 20, pp. 201-223.

Goldberger, Arthur (1991), *A Course in Econometrics*, Harvard University Press: Cambridge, Mass.

Hamermesh, David (1993), *Labor Demand*, Princeton University Press: Princeton, N. J.

Hatzius, Jan (1996), "Foreign direct investment, capital formation, and labour costs: evidence from Britain and Germany", Discussion Paper No. 336, Centre for Economic Performance.

Konings, Jozef, and Hylke Vandenbussche (1995), "The effect of foreign competition on UK employment and wages: evidence from firm-level panel data", Weltwirtschaftliches Archiv, 131, pp.655-672.

Lipsey, Robert, Irving Kravis, and Romualdo Roldan (1982), 'Do multinational firms adapt factor proportions to relative factor prices?', *Trade and employment in developing countries: Factor supply and substitution*, Anne Krueger (ed), pp.215-55, University of Chicago Press: Chicago.

OECD (1995), *International Direct Investment Statistics Yearbook*, Paris.

Revenga, Ana (1992), "Exporting jobs? The impact of import competition on employment and wages in US manufacturing", Quarterly Journal of Economics, 107, pp. 255-284.