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Home Employment Effects of EU Firms' Activities in Central and Eastern European Countries

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Abstract

We examine whether or not affiliate production in Central and Eastern Europe (CEEC) affects factor demand in the EU, at the investing firm and sector levels. Using firm level data, we estimate parent labor demand elasticities for a number of manufacturing sectors, following a flexible cost function approach. We find evidence of inter-sector heterogeneity, but not of a substantially greater impact in "low-skilled" intensive sectors. Labor demand in the EU is affected by FDI in the CEEC, both at the investing firm and sector levels. It has a significant sector and non-sector component.

During the past decade, concern has risen in the industrialized countries about the impact of globalization on wages and employment, in particular for lower-skilled workers. According to the Heckscher-Ohlin-Samuelson (HOS) model, international trade lowers the reward of the relatively scarce production factor(s) in a country. Most existing studies do not find much evidence in favor of the HOS trade hypothesis (see e.g. Brenton, 1998; Haskel and Slaughter, 2000). On this basis, an academic consensus has been established on the, at most, limited effect of globalization on the wage inequality between the high- and

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lower-skilled. In Cuyvers et al. (2003), we confirm the absence of a significant effect on wage inequality from trade with the Newly Industrialized Countries (NICs) in the EU member states, but do find a non-negligible effect on relative labor demand in favor of the high-skilled.

However, the much-discussed trend of globalization is, if anything, more prominently reflected in a surge of foreign direct investment (FDI) than in increased international trade. Outward FDI from developed countries towards the NICs increased significantly and more rapidly than trade between developed and developing countries in recent decades (UNCTAD, 2001). This phenomenon follows to a very large extent the increasing activities of multinational enterprises (MNE), which adopt a strategy of global production and distribution. Hence, it is possible that workers' incomes or employment opportunities could equally be affected by the investment and location decisions of MNEs and that the impact of globalization on income (wage) inequality or (relative) labor demand shows up in a different way than is represented in the HOS framework.

What do we know about the influence of FDI on employment and wages in the home country? The most thorough analyses of the employment effects of FDI use data on a cross-section or panel of investing multinational firms. Unfortunately, these are only available for a relatively small number of countries.

Using the Annual Surveys of US Direct Investment Abroad by the Bureau of Economic Analysis (BEA), Kravis and Lipsey (1988) found for the manufacturing sector that investment in foreign affiliates reduces home employment in the parent company. It has a positive effect on parent compensation, albeit only significant for minority-owned affiliates. Slaughter (1995) estimates production labor cost shares from a panel from the BEA data of 32 US manufacturing industries. His results are sensitive to the assumptions concerning the flexibility of capital, but seem to be more in line with price complementarity between domestic and foreign affiliates' labor than with substitution. Brainard and Riker (1997) and Riker and Brainard (1997) further elaborate the flexible cost function approach introduced by Slaughter (1995). Assuming capital to be fixed in the short term, they find evidence of labor substitution between parent companies and affiliates. However, labor substitution seems stronger between affiliates, especially in developing countries. Bruno and Falzoni (2000) stress the importance of employment adjustment costs by finding that the substitution relationship between US parent employment and Latin American subsidiaries reverses into a complementary relationship. Slaughter (2000) considers direct evidence of the effect of FDI on skill-upgrading. He finds only small and imprecisely estimated effects of affiliate activity on parent unskilled-labor demand.

Blomström, Fors, and Lipsey (1997a, b) compare the impact of FDI by American and Swedish MNE on home country employment. For the US, higher foreign affiliate production was associated with increased allocation of labor-intensive activities abroad. For Sweden, increased activities of foreign affiliates of Swedish companies had a positive effect on parent employment. Contrary to a priori expectations, Swedish MNEs preferred to relocate high-skilled rather

than low-wage activities (see also Blomström and Kokko, 2000). Their results are challenged by Hansson (2000) and Hatzius (1998), who support the hypothesis that Swedish parent companies relocate home employment in response to relative cost changes. With regard to Swedish MNEs, Braconier and Ekholm (2000) find some evidence of substitution between parent employment and employment in high-income countries affiliates, but no evidence of any relationship between parent employment and affiliate employment in low-income countries.

For Italy, Faini et al. (1999) find that the bargaining position of Italian workers is weakened as Italian MNEs locate production abroad. With regard to a panel of EU MNEs, Konings and Murphy (2001) find evidence for a substitution effect between parent and foreign employment in Europe, but mainly between EU parents and EU affiliates, i.e., primarily between countries with comparable factor endowments. As regards the possible diversion of FDI from other EU countries to the new EU member states, i.e., the so-called domino effect, Brenton, Di Mauro and Lücke (1999) found no evidence that increased FDI to Spain and Portugal in the late 1980s significantly reduced investment flows to other European countries. Di Mauro (2001) found no evidence that the increased FDI in CEEC in the mid-1990s happened at the expense of Spain and Portugal, nor did Buch, Kokta, and Piazolo (2003).[1]

In our research, we focus on the parent country employment effect of FDI induced by international differences in factor endowments, since this may especially affect the relative wage or employment position of (lower-skilled) labor. Using the same source of internationally comparable data as Konings and Murphy (2001), we estimate the effect of FDI of EU MNEs in Central and Eastern Europe on labor demand in the EU home countries.

Our contribution to the existing literature is twofold. First, by pooling the data at the EU level, we obtain sufficient degrees of freedom to allow for intersector heterogeneity of the parent employment effect of FDI. In this way, we can also deal more explicitly with the effect of FDI on parent labor demand by skill level, given the absence of the wage and employment data required for a direct estimation of the latter. Second, we point to the importance of the distinction between the direct and indirect effects of foreign investment on home country labor demand. This explains why an analysis of the employment effect at the firm as well as the sector level is required.

The next section provides the theoretical framework, while in the third section we derive the empirical specification and discuss our data and estimation strategy. In the fourth section we report and comment on the results. Our conclusions follow in the fifth section.

1. Theoretical framework

Helpman (1984) and Helpman and Krugman (1985) offer a standard general equilibrium framework in which international factor-price differences that are not eliminated by international trade explain multinational production. The

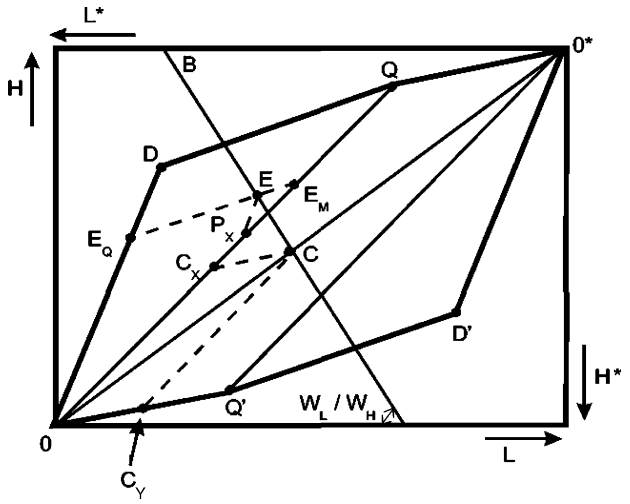

Figure 1. FDI and the integrated world equilibrium.

international trade equilibrium is determined on the basis of the integrated world equilibrium. This approach starts from a single undivided economy. Samuelson's angel then descends from economic heaven to break up the unified economy by assigning production factors to separate economies (Krugman, 1995). Two kinds of equilibrium may arise. The first reproduces the equilibrium of the unified economy, in which factor prices are equalized. This is shown in the Edgeworth box in Figure 1 in which high-skilled labor (H) and low-skilled labor (L) are the factors needed to produce high-skilled labor-intensive commodity X and low-skilled labor-intensive commodity Y. The situation of country A is given from origin O and the situation of country B from origin O*. The integrated world equilibrium can be replicated through specialization and international trade if the endowment point falls within parallelogram OQO*Q′.

If, however, Samuelson's angel is more vigorous in sowing discord, international trade in commodities alone will not be able to reproduce the integrated world equilibrium with equal factor prices. This would be the case for an endowment point like E, outside the original parallelogram OQO*Q′. However, let us assume that, in addition to high-skilled and low-skilled labor, the production of the skill-intensive commodity X requires a third input—headquarter services (Helpman and Krugman, 1985). Headquarter services are considered as a firm-specific (and hence non-tradable) asset that creates a firm-specific (ownership) advantage, which is most profitably exploited internally. In addition, it is tied to the entrepreneurial unit but not to a specific plant and thus can it serve plants at different locations.

This enables a geographical division of the production process of X in an assembly stage (of which the technology in the integrated world equilibrium is

given by the slope of DQ in Figure 1) and the provision of headquarter services (which in the integrated world equilibrium is determined by the slope of the sector factor allocation vector OD in Figure 1). If multinational organization of production is possible, the skilled-labor abundant country will allocate, at an endowment point such as E, OE_Q of skilled and unskilled labor to the production of headquarter services. At integrated world equilibrium techniques, this must be linked to a level of assembly activity given by the allocation of $E_Q E_M$ of high-skilled and low-skilled labor. This exceeds the assembly capacity of country A, even if it allocates all of its remaining factors of production to assembly. However, as headquarter services are not plant-specific, part of them can be used for assembly of X in country B. More specifically, for assembly activities in country B given by EE_M, EP_X production factors in headquarter services are allocated in country A. This results in an extension of the factor price equalization space to ODQO*D′Q′.

Companies in the skilled-labor abundant country will have an incentive to locate the production (or assembly) of commodities abroad, in order to benefit from lower wages, and to allocate more skilled labor to the production of headquarter services, where marginal returns are the highest. As headquarter services can better be exploited internally instead of being traded, the process of taking advantage of relative factor reward differences between the countries will typically take the form of multinational production.

In this model, labor demand in the X sector as well as in the economy overall is affected in two ways. Demand of high-skilled and low-skilled labor falls because of the displacement of assembly activity to the unskilled-labor abundant country, but increases as a consequence of the higher production of headquarter services. Hence, labor demand is influenced by a negative *direct* effect but also by a positive *indirect* effect. In the Helpman and Krugman (1985) model, which assumes perfect competitive factor markets, this results in an increase of the relative wage of skilled labor at a constant overall employment level of skilled and unskilled labor, to offset the increase in relative demand of skilled labor at the initial factor rewards. In a more general context though, where factor markets do not necessarily clear, production relocation abroad may have a net nonzero employment effect, which is a priori undetermined, depending on which of the two opposing effects prevails.

In addition, the home employment effects of FDI may occur at *two* levels: within the parent company or at the entire sector level. The provision of headquarter services effect will most probably have an important intra-firm component, but it may also influence labor demand outside the firm (e.g. the provision of equipment or components to the foreign subsidiary, or accounting, banking or consulting services). There is no reason for the employment effect at the two levels to be equal: for example, it could be negative at the level of the investing firm but positive at the sector level or *vice versa.* This means that, in order to obtain a complete view of the parent country employment effect of FDI, a two-level consideration is necessary.

2. Methodology and data

To assess the labor demand effect of foreign affiliate activity in the parent country, we specify a cost function from which, invoking Shephard's lemma, an expression for factor demand can be derived and factor demand elasticity can be estimated.[2]

Consider a *multinational firm* whose global production function is given by:

$$C = F(v_p, v_s, v_k, Y), \tag{1}$$

with Y denoting real output produced at total cost C that is determined by three input factors: parent employment (v_p), subsidiary employment (v_s) and capital (v_k).

We use a flexible form to represent the cost function F, i.e., without making any a priori assumption with respect to the elasticity of substitution between the production factors, nor with respect to returns to scale, to reduce the risk of model misspecification.

The two most popular flexible functional specifications are the translog cost function (e.g. Berndt and Hesse, 1986) and the Generalized Leontief (GL) cost function (Morrison, 1988). We have opted for the latter because it allows a closed form solution of the long run equilibrium in the presence of the quasi-fixity of certain production factors and of adjustment costs. As such, it is somewhat more general and easier to handle than the translog specification. If not all the production factors are fully flexible in the short run, the total cost function of the multinational firm can be expressed as:

$$C = VC + \sum_f w_f v_f, \tag{2}$$

where v_f is the stock of the fixed production factors f, rewarded at a price w_f. VC is the variable cost function, given by:

$$\begin{aligned} VC = Y & \left[\sum_i \sum_j \alpha_{ij} \sqrt{w_i} \sqrt{w_j} + \sum_i \delta_{iY} w_i \sqrt{Y} + \sum_i w_i \gamma_{YY} Y \right] \\ & + \sqrt{Y} \left[\sum_i \sum_j \delta_{if} w_i \sqrt{v_f} + \sum_i w_i \sum_f \gamma_{Yf} \sqrt{Y} \sqrt{v_f} \right] \\ & + \sum_i w_i \sum_f \sum_g \gamma_{f_g} \sqrt{v_f} \sqrt{v_g}, \end{aligned} \tag{3}$$

where w_i is the price of the variable input; i and j range over the domain of the variable inputs; f and g range over the domain of the fixed inputs. Real output Y is included in the expression of unit production cost because we do not necessarily assume constant returns to scale at the firm level. From (3), we

derive a demand equation for the variable production factor i by differentiating with respect to w_i:

$$v_i = \frac{\partial VC}{\partial w_i} = Y\left[\sum_i \alpha_{ij}\sqrt{\frac{w_j}{w_i}} + \delta_{iY}\sqrt{Y} + \gamma_{YY}Y\right] + \sqrt{Y}\sum_f(\delta_{if}\sqrt{v_f} + \gamma_{Yf}\sqrt{Y}\sqrt{v_f}) + \sum_f\sum_g \gamma_{fg}\sqrt{v_f}\sqrt{v_g}. \quad (4)$$

Log differentiating (4) with respect to the prices of the variable production factors, gives the *short-run* price elasticities of the demand of the variable factor inputs, i.e., given $v_f = \bar{v}_f$ for all f:

$$\varepsilon^s_{ii} = \frac{\partial \ln v_i}{\partial \ln w_i} = -\frac{Y}{2v_i\sqrt{w_i}}\left[\sum_j \alpha_{ij}\sqrt{w_j}\right];$$
$$\varepsilon^s_{ij} = \frac{\partial \ln v_i}{\partial \ln w_j} = \frac{Y}{2v_i}\alpha_{ij}\sqrt{\frac{w_j}{w_i}}. \quad (5)$$

The short-run price elasticities of factor demand are different from the *long-run* elasticities, which need to be evaluated at the equilibrium value of the quasi-fixed inputs. An analytical expression for the latter is derived by equating the price of the quasi-fixed input and its shadow value z_f. This must apply in equilibrium, since, if they differ, the stock of the quasi-fixed input factor will be adjusted until equality is reached. The shadow price reflects the potential reduction in variable costs of having one more unit of v_f:

$$z_f = -\frac{\partial VC}{\partial v_f} = -0.5\frac{1}{v_f}\left[\sum_i w_i\sum_g \gamma_{fg}\sqrt{v_g} + \sqrt{Y}\sum_i \delta_{if}w_i + \gamma_{Yf}Y\sum_i w_i\right]. \quad (6)$$

By equating w_f and z_f, we can derive from (6) an expression for the long-run equilibrium level v^*_f of the stock of the production factor f. Long-run production costs and factor demand follow from evaluating C and v_i at v^*_f. Long-run demand elasticities are then given by:

$$\varepsilon^L_{ij} = \frac{\partial \ln v_i}{\partial \ln w_j} + \sum_f \frac{\partial \ln v_i}{\partial \ln v^*_f}\frac{\partial \ln v^*_f}{\partial \ln w_j}. \quad (7)$$

Hence, the difference between the long-run and short-run price elasticity of demand is equal to the effect of the price change on the equilibrium stock of the quasi-fixed input factor times the effect of the latter on factor demand. If we may consider parent and subsidiary employment as flexible production factors, then, from (5) and (7), we can determine the short- and long-run employment

effect of foreign production activity at the firm level and to what extent parent firm and subsidiary employment are substitutes or complements.[3] Since we expect $\varepsilon_{ii}^{S} < 0$ and $\varepsilon_{ii}^{L} < 0$, the computation of (5) and (7) for $i = j$ allows us to check the consistency of our estimations.

A simple extension of this framework allows us to include the parent country labor demand effect from FDI that is external to the investing firm. Assuming that *sector* production is characterized by an aggregate cost function, we may, following the same reasoning as above, derive an expression for the factor demand of each sector in the economy, from which we can determine the impact of FDI on sector labor demand in the parent country. However, sector output refers to *domestic* production and is evidently not consolidated with production of domestic firms abroad. Hence, the associated dual sector cost function is defined for the costs of *domestic* production, for which *domestic* labor and capital are used as production factors and in which foreign production possibilities are included as a pre-determined outside option.

We may distinguish an intra-sector from an inter-sector impact of foreign production possibilities on domestic output and domestic factor demand, which we do not expect a priori to be equal. This implies that the sector variable cost (VC^{S}) would be a function of the sector variable and quasi-fixed production factor(s), real output (Y^{S}), a *sector* foreign production impact variable (o^{S}) as well as a *non-sector* foreign production impact variable (o^{NS}) in the following way:

$$\begin{aligned} VC^{S} = {} & Y^{S}\left[\sum_{i}\sum_{j}\alpha_{ij}\sqrt{w_i w_j} + \sum_{i}\sum_{s}\delta_{is}w_i\sqrt{s} + \sum_{i}w_i\sum_{s}\sum_{r}\gamma_{sr}\sqrt{sr}\right] \\ & + \sqrt{Y^{S}}\left[\sum_{i}\sum_{f}\delta_{if}w_i\sqrt{v_f} + \sum_{i}w_i\sum_{s}\sum_{f}\gamma_{sf}\sqrt{sv_f}\right] \\ & + \sum_{i}w_i\sum_{f}\sum_{g}\gamma_{f_g}\sqrt{v_f v_g} \quad (s, r = Y^{S}, o^{S}, o^{NS}), \end{aligned} \tag{8}$$

resulting in an expression for variable factor demand:

$$\begin{aligned} v_i^{S} = \frac{\partial VC^{S}}{\partial w_i} = {} & Y^{S}\left[\sum_{j}\alpha_{ij}\sqrt{\frac{w_j}{w_i}} + \sum_{s}\delta_{is}\sqrt{s} + \sum_{s}\sum_{r}\gamma_{sr}\sqrt{sr}\right] \\ & + \sqrt{Y^{S}}\sum_{f}\left(\delta_{if}\sqrt{v_f} + \sum_{s}\sum_{f}\gamma_{sf}\sqrt{sv_f}\right) \\ & + \sum_{f}\sum_{g}\gamma_{fg}\sqrt{v_f v_g} \quad (s, r = Y^{S}, o^{S}, o^{NS}). \end{aligned} \tag{9}$$

The impact of sector and non-sector foreign production activity in the short and in the long-run is defined as:

$$\varepsilon_{is}^{S} = \frac{\partial \ln v_i}{\partial \ln o^S}; \tag{10a}$$

$$\varepsilon_{is}^{L} = \frac{\partial \ln v_i}{\partial \ln o^S} + \sum_f \frac{\partial \ln v_i}{\partial \ln v_f^*} \frac{\partial \ln v_f^*}{\partial \ln o^S}. \tag{10b}$$

At the firm level, if one wants to analyze the employment effects of FDI at the EU scale, the main problem is the need for a data source that meets the following two requirements:

- Sufficiently global in reach so that information on companies of all the EU member states and, at least, the most important emerging countries is available;
- The format and the content of the data for companies of different nationality should be compatible to a sufficient degree, if not identical.

A data source that seems to meet these two basic requirements reasonably well is the Amadeus (Analyse MAjor Databases from EUropean Sources) database. In its most concise version, it contains detailed reports on the 200,000 largest European companies including Eastern European ones (turnover exceeding 15 million Euros). Each company report contains descriptive information and consolidated and unconsolidated annual accounts, presented in a standard format, which cover the major items of profit and loss and balance sheet accounts (assets, turnover, labor costs ...). In addition, information is provided on company employment. Participation in foreign affiliates is given when available, as well as information on the affiliates in the mentioned standard format, except if the affiliate does not meet the sample selection criteria. In the latter case, only information on the affiliate's turnover is provided. The data are compiled from national firm-level sources.

We extracted from the Amadeus database (Spring 2000 edition) the sample of EU companies (i.e., companies according to the law of one of the EU member states) with subsidiaries in Central and Eastern European countries (except in the former Republic of Yugoslavia, but including Slovenia). Following the practice of the IMF and the OECD, we adopted the 10% participation rate benchmark to determine a subsidiary. We categorized the companies by ISIC two-digit category according to their main economic activity (machinery by the three digit ISIC category). In most cases, the ISIC two-digit level was detailed enough to allow an unambiguous classification of the companies.[4]

For the selected companies, we retrieved data on their country of origin, turnover (operational revenue), number of employees, cost of employees, costs of goods sold, gross profits, interest paid, depreciation, tangible assets, fixed

assets and shareholders' funds. With regard to their subsidiaries in the CEEC, we retrieved data on their nationality, turnover (operational revenue), number of employees, cost of employees, costs of goods sold and shareholders' funds. From these data, we obtain an idea of the firms' real output (proxied by turnover, deflated by a sector specific price index taken from the STAN or ISDB databases of the OECD), employment, average labor cost (cost of employees divided by employment), capital cost (the ratio of interest paid and depreciation to fixed assets), and, similarly, of average subsidiary labor cost, subsidiary output, subsidiary employment and OFDI (subsidiary shareholders' funds and parent participation rate). We were able to retrieve data for 5 years, i.e., the period 1994–1998. Di Mauro (2001) pointed out that FDI in the Central and Eastern European Countries was negligible before 1992. With the European Summits of Essen in 1994 and Madrid in 1995 negotiations with candidate EU member states were launched, such that the beginning of the period we consider coincides with the preparation and expectation of the EU enlargement. As in Brainard and Riker (1997), the subsidiary companies were assumed to be homogeneous (also because of a similar development level and common socio-economic and political past in the case of the CEEC) and were aggregated at the parent firm level. Hence, each parent company is mapped on one record of data on foreign (i.e., CEEC) activity, which refers to the total of its subsidiaries in the CEEC.

The unique feature of Amadeus is its extended geographical coverage of European firms. However, its strength is simultaneously its major drawback, as it provides no information on the *non-European* affiliates of the EU companies. However, if we may assume that the parent country employment effect of FDI in different continents is independent and additive, the consistency of the estimates is not compromised by the use of partial data. In addition, information concerning non-European affiliates is only available for a limited number of individual countries (e.g. Sweden) that are not necessarily representative for the whole of the EU. On the other hand, if FDI from EU companies to European and non-European NIC is induced by a common motive (i.e., differences in factor costs), the results of an analysis limited to one region can give an indication with regard to the entire group and may allow us to draw some more general conclusions, provided we remain cautious because of the possibility of regional disparities that cannot be excluded a priori.

For the five years for which the Amadeus database is reasonably complete, the number of records was fairly stable, as well as their sector and parent country distribution. The variance of the sector distribution of the parent firms is rather important. We note that the chemical sector and the food, beverages and tobacco sector are fairly well represented among the EU firms with subsidiaries in the CEEC, as well as the machinery sector (through its three digit components), non-metallic mineral industries textiles and paper, paper products and printing. The other sectors of the manufacturing industry are rather marginal in the sample. However, for the former sectors, sufficient degrees of

freedom are present for an analysis at the ISIC two-digit sector level. This allows us to take account of sector heterogeneity, which Slaughter (2000) qualified as "significant".

The country distribution of parent firms shows a clear-cut distinction between Germany that represents a share of one third of all firms in the sample and the other EU member states. In mere numbers, the difference between the other member states is rather small, especially between the other large EU nations (such as France, Italy and the United Kingdom) and some of the smaller EU member states (the Netherlands, Belgium and Finland). This confirms the general impression that investment of the EU in Central and Eastern Europe is mainly a "German affair". Perhaps not surprisingly, more than 80 percent of the records concern companies from North-West European countries, which are to a large extent comparable in terms of economic development, wage level and institutional structure. Hence, a priori we may suspect that the *sector* dimension of the database dominates the *country* dimension as a source of data heterogeneity.

For the estimation of the aggregate parent country employment effect of FDI, i.e., including the indirect effect external to the investing MNE, data on labor and capital cost, output and production costs were taken from the sector databases of the OECD (STAN or ISDB).

Capital cost was proxied by the price of investment goods (from ISDB), adjusted with the long-term government bond rate and the sector depreciation rate. Production costs was proxied by value-added as we did not include intermediate goods in our specification. Hence, real output was determined by value added at constant 1990 prices, converted at 1990 US dollar rates. From ISDB we also took data on the real value of the capital stock, employment and average wage (obtained from total labor costs and total employment).

With regard to the factor demand effect of affiliate production abroad, we distinguish the impact of intra-*sector* foreign activity from the impact of national, *inter-sector* foreign activity as we do not impose a priori that the spillover effects of different kinds of foreign activity are identical. The distinction between inside and outside sector foreign activity seems an easy and straightforward manner to take this into account. The non-sector foreign activity level of domestic firms is weighted with the GDP share of each included sector, which we took as a proxy of its economic importance in the absence of input/output tables for a sufficient number of countries.

Most EU countries provide a sector or a geographical breakdown of macroeconomic indicators of foreign activity of the domestic economy (like FDI), but only a few countries can provide cross-tabulations of both geographical and industrial breakdowns (Braunerhjelm and Oxelheim, 1998; IMF and OECD, 1999). This compels us to proxy the latter by sector aggregates of the data at the firm level provided by Amadeus. Since the Amadeus database consists of the 200,000 largest European companies, we may expect the data on foreign activity level which we obtain in this way, to be rather well correlated with the "true"

sector aggregates, at least insofar as production in Central and Eastern Europe is concerned. However, our analysis at the sector level is subject to the same geographical limitations as the analysis at the firm level. From the Amadeus database we extracted two variables that may proxy the foreign activity level of domestic firms: subsidiary employment and subsidiary operational revenue, which we used alternatively in our estimates. They were taken in value added terms in order to make a correction for dimension.

3. Estimation and results

The effect of FDI in the CEEC on the EU labor demand *at the level of the investing firm,* was determined by estimating the system of equations, consisting of (3), (4), for lower-skilled and high-skilled labor respectively, and (6), after allowing for normally and independently distributed error terms in each of the four equations. Following the literature in this field (e.g. Berndt and Hesse, 1986; Morrison, 1988; Morrison Paul and Siegel, 1999, 2001) we considered capital as a quasi-fixed production factor in the cost function (1). Bruno and Falzoni (2000) assume that a multinational firm has to incur adjustment costs in subsidiary employment because of the uneven distribution of skills between the home country and the foreign country. However, it seems a priori unlikely that for the period and FDI destination considered here, multinational firms faced labor shortages. The CEEC are endowed with a fairly well-trained labor force, which was amply available in the second half of the 1990s when economic restructuring and the transition to a market economy led to massive lay-offs. Hence, we considered parent as well as subsidiary employment as variable inputs.

The system of equations was estimated at the level of each ISIC 2-digit sector, for which the sample was sufficiently large (i.e., a total number of observations of 30 or more). Like Morrison Paul and Siegel (2001) we used iterative three-stage least squares (3SLS) to take account for cross-equation parameter constraints. 3SLS consists in the joint estimation of the entire system of equations, using the 2SLS estimate of the asymptotic covariance matrix of the equations' error terms to provide more efficient full-information generalized least squares estimates. It can be shown that a 3SLS estimator is asymptotically efficient and that, given that the error terms are normally distributed, the estimator has the same asymptotic distribution as the most efficient full-information maximum likelihood estimator (Greene, 2000, pp. 682–693). Sector-specific estimates permit to control for sector heterogeneity of the labor demand effect in the EU of FDI. In addition, if we categorize the ISIC 2-digit sectors according to skill intensity, the sector differences in the impact of FDI on parent country labor demand also provide us some, admittedly rough and merely qualitative, indications of differences by skill level, given the absence of data required for the estimation of a separate labor demand function by skill level. From the Labor Force Surveys of Eurostat and the Industrial Structure

Table 1. Sector Categorization according to Skill Intensity (ISIC Revision 2 code in brackets).

'Low-skill' intensive sectors	'High-skill' intensive sectors
Food, Beverages & Tobacco (31)	Paper, Paper Products and Printing (34)
Textiles, Apparel & Leather (32)	Chemical Products (35)
Wood Products & Furniture (33)	Non-Electrical Machinery (382)
Non-Metallic Mineral Products (36)	Electrical Machinery (383)
Basic Metal Products (37)	Transport Equipment (384)
Metal Products (381)	Professional Goods (385)

Statistics of the OECD, we computed the sector average value added share of production workers, which we used for dividing the manufacturing industry into relatively 'lower-skill' intensive and relatively 'high-skill' intensive sectors. Table 1 shows the composition of the two categories, based on a median split.

Short-run and long-run factor demand elasticities are given in Table 2. We will dicuss these elasticities rather than the original parameter estimates, which have not a straightforward economic interpretation as elasticities do. The parameter estimates *at the firm level* from which the elasticities were computed,

Table 2. Estimated labor demand elasticities at the firm level.

	Food, beverages and tobacco	Textiles, apparel and leather	Paper, paper products and printing	Chemical products	Non-metallic mineral products	Machinery, transport equipment and professional goods
ε^{ST}_{p,w_p}	$-0{,}003^{*}$	$-0{,}062^{***}$	$-0{,}442^{***}$	$-0{,}282^{**}$	$0{,}062^{*}$	$-0{,}072^{*}$
ε^{ST}_{p,w_s}	$0{,}003^{*}$	$0{,}062^{***}$	$0{,}442^{***}$	$0{,}282^{**}$	$-0{,}062^{*}$	$0{,}072^{*}$
ε^{ST}_{s,w_p}	$0{,}12^{*}$	$0{,}313^{***}$	$1{,}0{*}10^{-4***}$	$1{,}0{*}10^{-5**}$	$-1{,}0{*}10^{-5*}$	$1{,}0{*}10^{-6}$
ε^{ST}_{s,w_s}	$-0{,}12^{*}$	$-0{,}313^{***}$	$-1{,}0{*}10^{-4***}$	$-1{,}0{*}10^{-5**}$	$1{,}0{*}10^{-5*}$	$-1{,}0{*}10^{-6}$
ε^{LT}_{p,w_p}	$-0{,}16$	$-0{,}084^{***}$	$-0{,}448^{***}$	$-0{,}285^{**}$	$-0{,}036$	$-0{,}21^{***}$
ε^{LT}_{p,w_s}	$-0{,}002$	$0{,}058^{***}$	$0{,}435^{***}$	$0{,}285^{**}$	$-0{,}059^{*}$	$0{,}12^{**}$
ε^{LT}_{s,w_p}	$-0{,}07$	$0{,}224^{***}$	$1{,}0{*}10^{-4***}$	$1{,}0{*}10^{-5**}$	$-1{,}0{*}10^{-5*}$	$3{,}0{*}\ 10^{-6}$
ε^{LT}_{s,w_s}	$-0{,}13^{*}$	$-0{,}327^{***}$	$-1{,}0{*}10^{-4}$	$-1{,}0{*}10^{-5*}$	$-1{,}0{*}10^{-5*}$	$-2{,}0{*}10^{-6}$
$\varepsilon^{ST}_{p,w_p} - \varepsilon^{LT}_{p,w_p}$	0,07	0,01	0,001	0,01	0,07*	0,12
$\varepsilon^{ST}_{p,w_s} - \varepsilon^{LT}_{p,w_s}$	0,002	0,002	$-0{,}001$	0,004	$-0{,}003$	$-0{,}05$
$\varepsilon^{ST}_{s,w_p} - \varepsilon^{LT}_{s,w_p}$	0,06	0,04	$-1{,}0{*}10^{-8}$	$-1{,}0{*}10^{-8}$	$-4{,}0{*}\ 10^{-8}$	$-2{,}0{*}10^{-5*}$
$\varepsilon^{ST}_{s,w_s} - \varepsilon^{LT}_{s,w_s}$	0,002	0,01	$1{,}0{*}\ 10^{-8}$	$-1{,}0{*}10^{-9}$	$1{,}0{*}10^{-9}$	$7{,}0{*}10^{-7}$

Note: *Indicates significance at 10 percent, **At 5 percent and ***At 1 percent.

are reported in the appendix (Table A.I). For each sector, we report two measures of goodness-of-fit of the system. First, a system-weighted R^2 that is computed by performing a single regression on the system of stacked equations, with the observations being weighted by the covariance matrix of the errors (e.g. Judge et al., 1985, p. 477). Second, the error level of the log-likelihood ratio test of the hypothesis that the slope coefficients are jointly zero. In addition, we checked for potential endogeneity of the explanatory variables, instrumenting the factor prices of each firm by a random draw from the sample factor price series of the corresponding year. The parameter estimates obtained this way are fairly similar to the original estimates.[5]

The elasticities and their standard errors were determined using the ANALYZ procedure in TSP. This applies the delta method to compute the estimated covariance matrix for a set of functions of estimated parameters, i.e., by linearizing nonlinear functions around the estimated parameter values and then applying the formulas for the (co)variance of linear functions of random variables (see e.g. TSP Reference Manual Version 4.5 and Greene, 2000, p. 118).

As a consistency check of our estimates, we notice that the short and long term own-price elasticities of parent country and foreign subsidiary labor demand are all negative except in the short run in the sector non-metallic mineral, though only significantly different from zero at the 10% error level. Next, as an additional consistency check, the comparison of the short and long run own-price elasticities estimates shows that the long-run elasticities are never inferior to the short-run ones. As Table 2 indicates, the differences between the estimated short and long run own- and cross-price elasticities are not significantly different from zero in all cases except two (at the 10% error level). This would suggest that the capital stock adjustment of the multinational firms following an exogenous shock in the price of parent firm or subsidiary employment would occur to a large extent within one year. Hence, within this time horizon capital stock seems rather close to its equilibrium value and adjustment costs and factor rigidity would be of minor importance.

Allowing for inter-sector heterogeneity in the EU labor demand effects of affiliate production in our estimates justified? We are aware of the fact that results can indeed vary considerably across sectors, as regards the significance and the level of the own-price and the cross-price elasticity of parent country and subsidiary labor demand. However, our results do not indicate a clear pattern along skill-intensity lines. The six sectors of the manufacturing industry for which we could obtain meaningful estimates are evenly divided between the 'lower-skill' and the 'high-skill' categories (see Table 3). However, the estimates for the first, particularly those regarding cross-price elasticities, are not systematically higher and do not systematically have a different sign from the latter, neither in the short nor the long term. In addition, when significantly different from zero, the estimated cross-price elasticities are positive for all sectors except one (where caution is required, in view of the wrong sign of the own-price

Table 3. Estimated factor demand elasticities at the sector level. (Foreign affiliate employment to value added ratio as proxy for foreign affiliate activity level).

	"Low-skill" sectors	"High-skill" sectors	All sectors
ε_{p,w_p}	−0,052**	0,004	−0,049
ε_{p,w_k}	0,052**	−0,004	0,049
$\varepsilon_{p,S}$	−0,094	−0,142**	−0,157***
$\varepsilon_{p,NS}$	−0,170***	−0,220*	−0,221***
ε_{k,w_p}	0,003**	−0,0002	0,003
ε_{k,w_k}	−0,003**	0,0002	−0,003
$\varepsilon_{k,S}$	0,077***	0,126	0,102***
$\varepsilon_{k,NS}$	−0,053	−0,099	−0,073

Note: *Indicates significance at 10 percent, **At 5 percent and ***At 1 percent.

elasticity). This would point to substitution between parent country and subsidiary employment in multinational firms in a substantial number of sectors of manufacturing. Hence, our results seem *qualitatively* fairly homogenous across sectors and would suggest that, in most cases, the negative direct labor effect of FDI dominates the compensating indirect labor effect at the multinational firm level.[6]

Are these observations concerning the elasticities of parent country labor demand confirmed at the *sector* level ? In order to answer this, we estimate the system that consists of the equations (8) and (9). Since we noticed from the firm level estimates that adjustment costs in the capital stock affect the estimated elasticities only to a limited extent, we dropped the assumption of the quasi-fixity of capital in order to win degrees of freedom in our estimates. Hence, in the estimation of (8) and (9), we imposed $\delta_{if} = 0$, $\gamma_{sf} = 0$ and $\gamma_{fg} = 0$, for all i, s, f and g (which only consist of capital $-k$) and let i and j range over p and k (parent employment and capital respectively). Yet even then we face a degree of freedom problem if we try to perform the estimates at the individual (ISIC two digit) sector level. In order to take account of sector heterogeneity insofar as data availability allows, we estimated the system of equations at the level of all the sectors of manufacturing, as well as of the 'lower-skill' and the 'high-skill' aggregates separately. With regard to the domestic sector cost function, foreign affiliate activity is considered as an exogenous outside option, which has a sector as well as a non-sector dimension. It was proxied by either the sector and non-sector employment to value added ratio or the ratio of sector and non-sector operational revenue to value added. Domestic wages and capital costs were lagged one year, in order to avoid an endogeneity bias.

Table 4. Estimated factor demand elasticities at the sector level. (Foreign affiliate operational revenue to value added ratio as proxy for foreign affiliate activity level)

	"Low-skill " sectors	"High-skill" sectors	All sectors
ε_{p,w_p}	−0,054**	−0,061	−0,083**
ε_{p,w_k}	0,054**	0,061	0,083**
$\varepsilon_{p,S}$	−0,117***	−0,253***	−0,146***
$\varepsilon_{p,NS}$	−0,050	−0,048	−0,108***
ε_{k,w_p}	0,003**	0,003	0,005**
ε_{k,w_k}	−0,003**	−0,003	−0,005**
$\varepsilon_{k,S}$	0,104***	−0,037	0,054**
$\varepsilon_{k,NS}$	−0,047	−0,123	−0,067

Note: *Indicates significance at 10 percent, **At 5 percent and ***At 1 percent.

Our results are summarized in Tables 3 and 4. They report the estimated labor demand elasticities with respect to factor prices as well as foreign affiliate activity, in terms of subsidiary employment and subsidiary operational revenue. The parameter estimates of the cost function and factor demand function, when the foreign affiliate employment to value added ratio is used as proxy, are given in Appendix (Table A.2).[7]

We again concentrate our discussion on the estimated elasticities, especially of parent country labor demand (the first four rows of Tables 3 and 4). Because we dropped the assumption of adjustment costs in the capital stock, there is of course no distinction between short run and long run elasticity estimates. The own-price factor demand elasticities have the correct negative sign in five out of six estimates, but not for the "high-skill" aggregate, when the foreign affiliate employment to value added ratio is used as proxy for the intensity of foreign affiliate activity. From the estimated cross-price elasticities we see that, in all cases where they are significantly different from zero, parent labor and capital are indeed factor substitutes.

Our estimates are apparently of a better quality when we use the foreign affiliate operational revenue to value added ratio as proxy. However, with regard to the effect of foreign affiliate activity on parent country labor demand, this does not make much difference as far as its sign and its extent are concerned. For both proxies, sector as well as non-sector foreign affiliate activity have a negative effect on home country labor demand, overall as well as for the two skill aggregates. The estimates, including all sectors, seem the most robust for the alternative proxies. At the level of the two skill aggregates, we notice important fluctuation in the significance of the estimates. This may point to a problem of multicollinearity (which would be typically weakened when

all the sectors are included in the estimates, due to the merging of the two samples), which does not, however, affect the consistency of the parameter estimates.

The results of our estimations at the sector level apparently confirm the estimated parent firm factor demand effect at the level of the investing MNE. The effect in the "lower-skill" aggregate is not substantially higher than that in the "high-skill" aggregate. This implies that the two sector aggregates would be more or less similarly affected by affiliate production activity abroad (in the CEEC) of national firms. Hence, we would confirm Slaughter's conclusion of the absence of an effect of FDI on *relative* labor demand (Slaughter, 2000). However, this does not imply the absence of an effect of foreign affiliate production on factor (labor) demand overall. Apparently, FDI in the CEEC did negatively influence labor demand in the EU parent countries. The effect consists of a sector and a national, non-sector component of foreign affiliate production. This would imply that existing studies, in which the latter is commonly omitted, tend to underestimate the effect of FDI on home country labor demand.[8]

At first sight, the negative indirect effect of foreign affiliate activity in all sectors does not fit into the Helpman and Krugman (1985) model. However, because of data availability, our estimates were limited to the manufacturing sector. Apart from the negative effect on home manufacturing employment, affiliate production activity (in the CEEC) can have a significant positive effect on factor demand related to administration, research and development, etc. in the services sector. Hence, part of the rise in home country headquarter services, predicted by Helpman and Krugman (1985), may not have been captured by the estimates.

The predictions of the Helpman and Krugman (1985) model would be contradicted if the increase in services employment from FDI falls short from the fall in labor demand in manufacturing in the home country. This however also depends on the structural characteristics of the labor market, in particular whether supply side adjustments allow the home country to specialize according to its comparative advantage. If the labor markets are fully flexible (as assumed by Helpman and Krugman, 1985) there will no negative employment effect of FDI.

4. Conclusions

We have examined to what extent factor demand in EU parent firms and countries is affected by affiliate activities in Central and Eastern European countries and whether these activities could explain a part of the increase of wage or employment inequality between high- and lower-skilled workers in the EU. The Helpman and Krugman (1985) model predicts that FDI may exert a direct as

well as an indirect influence on factor demand. This explains why the effect on the investing firm level and the sector level may differ and hence why we have estimated both. Using the Amadeus database, we were able to construct a dataset for a large number of EU countries. This has enabled us to perform the estimates at the firm level for a number of manufacturing sectors separately. In this way, we have been able to check for sector heterogeneity of the effects of FDI and foreign affiliate production in the CEEC and in addition to obtain some indications on the potential skill heterogeneity of the effect on factor demand.

We find evidence of inter-sector heterogeneity as regards the significance and the extent of the effect of FDI on parent firm labor demand. However, we do not observe substantial differences in the factor demand effect between sectors that differ in skill intensity, in particular a substantially higher impact of FDI on parent firm labor demand in the "low-skilled" intensive sectors. In addition, in most sectors parent firm labor demand is negatively affected by production in plants abroad. Our estimates of the factor demand effect of foreign affiliate activity at the sector level confirm these observations at the investing firm level. Though not fully robust at a more detailed level, especially as regards the significance of the estimates (but less so their sign or value), we find for the manufacturing sectors a negative effect of foreign affiliate production on parent country labor demand, which does not vary by sector skill intensity. Hence, the absence of an effect of FDI and foreign affiliate activity on *relative* labor demand does not imply that labor demand in the EU has remained unaffected by investment in the CEEC. This effect has both a significant sector and a non-sector component. The omission of the non-sector component may consequently result in the underestimation of the impact of FDI on home country employment.

However, since our estimates are limited to the manufacturing sector (i.e., omitting the services sector) the negative employment effect of FDI does not necessarily imply a negative overall employment effect. A negative aggregate employment effect is less likely if the necessary labor market adjustments in the original EU member states allow them to specialize in line with their comparative advantage.

Finally, the finding of an impact on labor demand for the period 1994–1998 does not necessarily suggest even more substantial employment effects in the future. Gravity models by Brenton, Di Mauro, and Lücke (1999) and Di Mauro (2001) indicate that the anticipation of the enlargement may already have resulted in FDI flows and stocks in the CEEC that are in line with what one would expect when controlling for the usual determinants of FDI. FDI flows from the original EU countries to the new EU member states will therefore not unavoidably be as substantial after the enlargement in May 2004 as they have been in the recent past.

Appendix

Table A.1. Parameter estimates at the firm level.

	Food, beverages and tobacco		Textiles, apparel and leather		Paper, paper products and printing		Chemical products		Non-metallic mineral products		Machinery, transport equipment and professional goods	
α_{pp}	$0{,}50*10^{-2}$	(6,22)	$0{,}12*10^{-1}$	(8,87)	$0{,}12*10^{-2}$	(0,56)	$0{,}41*10^{-2}$	(7,93)	$0{,}55*10^{-2}$	(7,98)	$0{,}79*10^{-2}$	(6,96)
α_{ps}	$0{,}40*10^{-4}$	(1,88)	$0{,}91*10^{-3}$	(4,76)	$0{,}73*10^{-4}$	(2,76)	$0{,}34*10^{-4}$	(2,17)	$-0{,}93*10^{-5}$	(−1,71)	$0{,}78*10^{-5}$	(1,70)
α_{ss}	$0{,}27*10^{-2}$	(5,10)	$0{,}14*10^{-1}$	(3,36)	$0{,}83*10^{-1}$	(3,85)	$0{,}48*10^{-1}$	(4,61)	$1{,}51*10^{-1}$	(3,04)	$0{,}82*10^{-1}$	(9,80)
δ_{pY}	$-0{,}52*10^{-6}$	(−1,59)	$-0{,}33*10^{-4}$	(−3,93)	$0{,}37*10^{-6}$	(0,84)	$-0{,}11*10^{-5}$	(−3,67)	$-0{,}28*10^{-6}$	(−0,37)	$-0{,}36*10^{-5}$	(−3,41)
δ_{sY}	$-0{,}11*10^{-5}$	(−3,75)	$-0{,}21*10^{-4}$	(−1,57)	$-0{,}43*10^{-4}$	(−3,33)	$-0{,}11*10^{-4}$	(−3,76)	$-0{,}74*10^{-4}$	(−2,57)	$-0{,}16*10^{-4}$	(−8,77)
δ_{pk}	$-0{,}57*10^{-2}$	(−6,10)	$-0{,}28*10^{-1}$	(−1,86)	$-0{,}79*10^{-3}$	(−0,47)	$-0{,}10*10^{-2}$	(−2,29)	$-0{,}13*10^{-2}$	(−11,59)	$-0{,}29*10^{-2}$	(−4,13)
δ_{sk}	$-0{,}24*10^{-2}$	(−2,60)	$-0{,}72*10^{-1}$	(−2,88)	$-0{,}30*10^{-5}$	(−0,80)	$0{,}16*10^{-6}$	(0,51)	$0{,}22*10^{-6}$	(1,90)	$0{,}17*10^{-6}$	(0,22)
γ_{YY}	$0{,}12*10^{-9}$	(4,59)	$0{,}36*10^{-7}$	(4,70)	$-0{,}44*10^{-9}$	(−0,81)	$0{,}53*10^{-10}$	(2,75)	$0{,}12*10^{-9}$	(0,51)	$0{,}49*10^{-9}$	(3,50)
γ_{Yk}	$-0{,}33*10^{-6}$	(−1,03)	$-0{,}13*10^{-4}$	(−1,70)	$0{,}29*10^{-9}$	(0,78)	$0{,}19*10^{-11}$	(0,17)	$-0{,}32*10^{-10}$	(−1,09)	$-0{,}70*10^{-1}$	(−1,61)
γ_{Yk}	$0{,}23*10^{-2}$	(7,37)	$0{,}82*10^{-1}$	(2,28)	$0{,}11*10^{-5}$	(0,55)	$-0{,}42*10^{-4}$	(−1,85)	$-0{,}11*10^{-6}$	(−1,76)	$0{,}15*10^{-5}$	(1,37)
N	75		60		32		132		54		79	
System-weighted R^2	0,58		0,70		0,93		0,99		0,90		0,62	
p-value (zero slopes)	0,0000		0,0000		0,0000		0,0000		0,0000		0,00006	

Note: heteroskedastic-consistent t-statistics in brackets. The p-values are the error levels of the log likelihood ratio test of the hypothesis that the slope coefficients are jointly zero.

Table A.2. Parameter estimates at the sector level (Foreign affiliate employment to value added ratio as proxy for the foreign activity level).

	"Low-skill" sectors		"High-skill" sectors		All sectors	
α_{pp}	$0{,}31{*}10^{-4}$	(1,95)	$0{,}49{*}10^{-4}$	(2,17)	$0{,}31{*}10^{-4}$	(2,48)
α_{pk}	$0{,}15{*}10^{-3}$	(2,09)	$-0{,}94{*}10^{-5}$	(−0,06)	$0{,}13{*}10^{-3}$	(1,27)
α_{kk}	$0{,}19{*}10^{1}$	(8,22)	$0{,}17{*}10^{1}$	(4,15)	$0{,}18{*}10^{1}$	(7,59)
δ_{PY}	$0{,}37{*}10^{-10}$	(0,26)	$-0{,}30{*}10^{-11}$	(−0,02)	$0{,}70{*}10^{-10}$	(0,94)
δ_{PS}	$-0{,}17{*}10^{-2}$	(−0,09)	$-0{,}69{*}10^{-2}$	(−0,25)	$0{,}13{*}10^{-1}$	(1,02)
δ_{PNS}	$-0{,}45{*}10^{-1}$	(−1,08)	$-1{,}32{*}10^{-1}$	(−2,15)	$-0{,}76{*}10^{-1}$	(−2,07)
δ_{kY}	$-0{,}30{*}10^{-5}$	(−3,49)	$-0{,}23{*}10^{-5}$	(−1,85)	$-0{,}24{*}10^{-5}$	(−2,84)
δ_{kS}	398	(2,99)	1127	(1,77)	615	(3,11)
δ_{kNS}	−405	(−1,20)	−726	(−0,96)	−544	(−1,34)
γ_{yy}	$-0{,}80{*}10^{-18}$	(3,23)	$-0{,}78{*}10^{-16}$	(−0,46)	$-0{,}68{*}10^{-16}$	(−0,51)
γ_{s}	$-5{,}67{*}10^{-1}$	(−0,09)	$7{,}22{*}10^{-1}$	(0,06)	$-0{,}54{*}10^{1}$	(−1,05)
γ_{ns}	55	(1,52)	78	(1,76)	76	(2,66)
γ_{ys}	$-0{,}31{*}10^{-7}$	(−0,29)	$-0{,}19{*}10^{-6}$	(−1,80)	$-0{,}16{*}10^{-6}$	(−2,76)
γ_{yns}	$-016{*}10^{-6}$	(−1,33)	$0{,}23{*}10^{-6}$	(1,17)	$-0{,}82{*}10^{-7}$	(−0,69)
γ_{sns}	$-0{,}12{*}10^{1}$	(−0,10)	48	(1,58)	$0{,}27{*}10^{1}$	(0,19)
N	83		69		152	
System-weighted R^2	0,85		0,73		0,71	
p-value (zero slopes)	0,0000		0,0000		0,0000	

Note: heteroskedastic-consistent t-statistics in brackets. The p-values are the error levels of the log likelihood ratio test of the hypothesis that the slope coefficients are jointly zero.

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Notes

1. We would like to thank an anonymous referee for pointing out the possibility of this domino effect of FDI.
2. Cuyvers et al. (2003) used this framework to estimate the impact of international trade with the NICs on the demand for lower-skilled and high-skilled labor in the European Union in the period 1985–1996. Several points differentiate the methodology in this paper from our previous study.

   First of all, rather than assessing the impact of international trade competition we consider the impact of another aspect of globalization, i.e., FDI flows. In addition, we start with firm level data instead of sector level data. This permits to consider foreign affiliate employment as an internal input factor of the *global* production of the parent company and not as an exogenous

determinant, as international trade in Cuyvers et al. (2003). In contrast with sector level imports, FDI and affiliate activities are subject to decisions of the parent company and should therefore be internalized as a parameter in the company's cost function.

Furthermore, we consider the labor demand effect of FDI at the firm as well as at the sector level. This two-level approach seems appropriate for a full assessment of the impact of FDI on labor demand. Finally, we do not impose quasi-instantaneous adjustment of the production factors to their long-run equilibrium levels.

3. If subsidiary employment is considered as a quasi-fixed input, its effect on the firm labor demand in the parent country will be given by $\varepsilon_{ps} = \frac{\partial \ln v_p}{\partial \ln v_s}$, evaluated in $\bar{v}_s$ and in v_s^* for the short and long-run impact, respectively.
4. We proceeded to a case-by-case correction in order to avoid some obvious cases of misclassification.
5. The results are not reported but available from the authors upon request. We checked also the robustness of our estimates by restricting the sample to the firms with average costs within an interval of two standard errors around the sector mean and re-estimating the system of equations. Again, we obtained very similar estimates (results not reported but available from the authors upon request).
6. From an estimate of the system of equations overall, i.e., including all firms, we also obtained a significant positive elasticity of parent (subsidiary) labor demand for the subsidiary (parent) wage, in the short as well as in the long run.
7. The parameter estimates of the cost and factor demand functions for the foreign affiliate operational revenue to value added ratio as proxy were similar and are not reported. They are available from the authors upon request.
8. Which is confirmed when repeating the estimates with only the sector proxies in the cost and factor demand functions (results not reported but available upon request).

References

Berndt, Ernst R. and Dieter M. Hesse (1986) "Measuring and Assessing Capacity Utilization in the Manufacturing Sectors of Nine OECD Countries." *European Economic Review* 30:961–989.

Blomström, Magnus, Gunnar Fors, and Robert E. Lipsey (1997a) "Foreign Direct Investment and Employment: Home Country Experience in the United States and Sweden." Cambridge: NBER Working Paper 6205.

———— (1997b) "Foreign Direct Investment and Employment: Home Country Experience in the United States and Sweden" *Economic Journal* 107:1787–1797.

Blomström, Magnus and Ari Kokko (2000) *Outward Investment, Employment and Wages in Swedish Multinationals.* Stockholm: Stockholm School of Economics.

Braconier, Henrik and Karolina Ekholm (2000) "Swedish Multinationals and Competition from High- and Low-wage Locations." *Review of International Economics* 8(3):448–461.

Brainard, S. Lael and David A. Riker (1997) "Are US Multinationals Exporting US Jobs!" Cambridge: NBER Working Paper 5958.

Braunerhjelm, Pontus and Lars Oxelheim (1998) "Does Foreign Direct Investment Replace Home Country Investments? The Effect of European Integration on the Distribution of Swedish Investments." Stockholm: IUI Working Paper 522.

Brenton Paul (1998) "Rising Trade and Falling Wages: A Review of the Theory and the Empirics." In Paul Brenton and Jacques Pelkmans (eds.), *Global Trade and European Workers.* Basingstoke: Macmillan, pp. 18–38.

Brenton, Paul, Francesca Di Mauro, and Matthias Lücke (1999) "Economic Integration and FDI: An Empirical Analysis of Foreign Investment in the EU and in Central and Eastern Europe." "*Empirica*" 26:95–121.

Bruno, Giovanni and Anna M. Falzoni (2000) "Multinational Corporations, Wages and Employment: Do Adjustment Costs Matter ?" London: CEPR Discussion Paper 2471.

Buch, Claudia M., Robert M. Kokta, and Daniel Piazolo (2003), "Does the East Get What Would Otherwise Flow to the South? FDI Diversion in Europe." *Journal of Comparative Economics* 31(1):94–109.

Cuyvers, Ludo, Michel Dumont, Glenn Rayp, and Katrien Stevens (2003) "Wage and Employment Effects in the EU of International Trade with the Emerging Economies." *Review of World Economics* (Weltwirtschaftliches Archiv) 139:248–275.

Di Mauro, Francesca (2001), "Economic Integration between the EU and the CEECs: A Sectoral Study," LICOS Discussion Paper 105/2001, LICOS Centre for Transition Economics, Leuven.

Faini, Ricardo, Anna M. Falzoni, Marzio Galeotti, Rodolfo Helg, and Alessandro Turini (1999) "Importing Jobs and Exporting Firms? On the Wage and Employment Implications of Italian Trade and Foreign Direct Investment Flows." *Giornali degli Economisti e Annali di Economia* 58:95–135.

Greene, W.H. (2000) *Econometric Analysis*. Upper Saddle River (NJ): Prentice Hall.

Hansson, Pär (2000) "Skill Upgrading and Production Transfer within Swedish Multinationals in the 1990s," Paper Presented at the Centre for European Policy Studies conference "Globalisation and Social Exclusion", Brussels, 1–2 December 2000.

Haskel, Jonathan E. and Matthew J. Slaughter (2000) "Have Falling Tariffs and Transportation Costs Raised U.S. Wage Inequality"? " Cambridge: NBER Working Paper 7539.

Hatzius, Jan (1998) "Domestic Jobs and Foreign Wages." *Scandinavian Journal of Economics* 100:733–746.

Helpman, Elhanan (1984) "A Simple Theory of International Trade with Multinational Corporations." Journal of Political Economy 92:451–472.

Helpman, Elhanan and Paul Krugman (1985) *Market Structure and Foreign Trade, Increasing Returns, Imperfect Competition and the International Economy.* Cambridge: MIT Press.

IMF and OECD (1999) *Report on the Survey of Implementation of Methodological Standards for Direct Investment.* Paris: OECD.

Judge, George G., William E. Griffiths, R. Carter Hill, Helmut Lutkepohl, and Tsoung-Chao Lee (1985) *The Theory and Practice of Econometrics*, 2nd edition, New York: John Wiley & Sons.

Konings, Jozef and Alan Murphy (2001) "Do Multinational Enterprises Substitute Parent Jobs for Foreign Ones? Evidence from European Firm-Level Panel Data." London: CEPR Discussion Paper 2972.

Kravis, Irving B. and Robert E. Lipsey (1988) "The Effect of Multinational Firms' Foreign Operations on Their Domestic Employment." Cambridge: NBER Working Paper 2760.

Krugman, Paul R. (1995) "Increasing Returns, Imperfect Competition and the Positive Theory of International Trade." In Gene M. Grossman and Kenneth Rogoff (eds.), *Handbook of International Economics* (Volume 3). Amsterdam: Elsevier Science, pp. 1243–1277.

Morrison, Catherine (1988) "Quasi-Fixed Inputs in U.S. and Japanese Manufacturing: A Generalized Leontief Restricted Cost Function Approach." *Review of Economics and Statistics* 70:275–287.

Morrison Paul, Catherine J. and Donald Siegel (1999) "Scale Economies and Industry Agglomeration Externalities: A Dynamic Cost Function Approach." *American Economic Review* 89:272–290.

Morrison Paul, Catherine and Donald Siegel (2001) "The Impacts of Technology, Trade and Outsourcing on Employment and Labour Composition." *Scandinavian Journal of Economics* 103:241–264.

Riker, David A. and S. Lael Brainard (1997) "US Multinationals and Competition from Low Wage Countries." Cambridge: NBER Working Paper 5959.

Slaughter, Matthew J. (1995) "Multinational Corporations, Outsourcing, and American Wage Divergence." Cambridge: NBER Working Paper 5253.

—— (2000) "Production Transfer Within Multinational Enterprises and American Wages." *Journal of International Economics* 50:449–472.

TSP International (1999), Reference Manual (Version 4.5).

UNCTAD (2001) *World Investment Report: Promoting Linkages.* New York-Geneva: United Nations.