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ORIGINAL PAPER

Multinationals, skills, and wage elasticities

Katariina Nilsson Hakkala · Fredrik Heyman · Fredrik Sjöholm

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Abstract The increase in foreign direct investments raises concerns about labor market consequences in many countries. It is feared that multinational firms are inclined to shift jobs abroad and increase job volatility. We use firm-level data to examine if multinationality and foreign ownership affect the wage elasticity of labor demand. Unlike previous studies, we distinguish the effect on different skill groups of employees. We find no general difference in wage elasticity between foreign and domestic firms but the wage elasticity is higher in multinational firms than in national firms, in particular for medium-skilled workers.

Keywords FDI · Cross-border acquisitions · Multinational enterprises · Foreign ownership · Labor demand · Skill groups

JEL Classification J23 · F16 · F21 · F23

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1 Introduction

Foreign direct investment (FDI) plays a key role in international economic integration. The growth in FDI has implied that an increasing number of workers are employed in affiliates of foreign-owned multinational enterprises (MNEs) worldwide (Jungnickel 2002, p. 2), and the "footloose" nature of multinationals is sometimes regarded as a threat to domestic jobs. Multinationals are believed to be more inclined to shift jobs abroad as a response to negative shocks, and inward FDI may therefore be associated with higher job insecurity.

We use detailed Swedish firm- and plant-level data, spanning the period 1990–2002, to examine the effect of foreign ownership, inward FDI and multinationality on volatility of employment, captured in terms of wage elasticity of labor demand. This issue has attracted a great deal of attention in the public debate but there is relatively little research on the effects of multinational and foreign ownership on the elasticity of labor demand.

Foreign ownership or multinationality could impact the elasticity of labor demand for several reasons. Vertically integrated production stages can be moved abroad by MNEs, either within firms (Helpman 1984) or to external suppliers (Feenstra and Hanson 1997). International production networks enable multinational firms to reorganize and relocate parts of the production chain to counter changes in the costs of production, including wages. Moreover, multinationals, and foreign multinationals in particular, could have larger bargaining power towards labor unions and local authorities due to a weaker commitment, or a weaker "loyalty" to the host country. Lommerud et al. (2006) suggest that international acquisitions therefore affect the relationship between wages and employment.

Our paper contributes to the literature in several respects. Previous empirical studies examine the difference between foreign and national firms but economic theory suggests that important employment aspects differ between MNEs and non-MNEs. We compare wage elasticities of labor demand in multinational and non-multinational firms, and in foreign-owned and domestic firms.[1] Moreover, we examine different types of acquisitions where ownership changes from, for instance, domestic to foreign ownership or from non-MNE to MNE. Finally, we distinguish between different skill groups to examine if aggregate differences in wage elasticities may be caused by firm-level differences in the labor force.

The rest of the paper is organized as follows. In the next section, we discuss the background to this paper and related empirical literature, Sect. 3 describes data, Sect. 4 presents the model and the empirical approach, Sect. 5 presents the results and Sect. 6 concludes the paper.

2 Background and related literature

The effect of international trade or trade liberalization on wage elasticities of labor demand has been examined in a number of studies (e.g., Faini et al. 1999; Krishna

[1] Related studies show that the important distinction is between MNEs and non-MNEs rather than between foreign and domestic firms (Bellak 2004; Heyman et al. 2007).

et al. 2001; Slaughter 2001). The issue of how multinational activity, foreign ownership and cross-border acquisitions affect wage elasticities is less explored although economic literature suggests different mechanisms.

As previously mentioned, the international production networks enable multinational firms to react to changes in wage costs in a more flexible way than domestic firms by relocating parts of the production chain either within firms (Helpman 1984) or to external suppliers (Feenstra and Hanson 1997). Ultimately, the impact of foreign activities on wage elasticity of labor demand in the home country depends on the degree of substitutability of employees in different countries (Brainard and Riker 1997, 2001; Braconier and Ekholm 2000; Konings and Murphy 2001). If foreign operations substitute rather than complement for the home country activities, then the wage elasticity of labor demand may get higher in the home country operations.

Wage elasticities between multinational and non-multinational firms may differ also due to other firm characteristics. Barba Navaretti and Falzoni (2004) argue that MNEs are capital-intensive, with skilled labor force, and with large market shares. In capital-intensive firms, wages make a relatively small share of the total production cost and therefore a wage change has a smaller impact on employment. Moreover, labor demand is typically less elastic for high-skilled workers than for low-skilled workers which will also affect the aggregate wage elasticities (Hamermesh 1993). MNEs producing differentiated goods and with some monopolistic market power tend to have lower wage elasticity because lower product demand elasticities translate into lower wage elasticities. Thus, several typical characteristics of multinational firms imply a lower rather than a higher elasticity of labor demand.

There are also political economy factors explaining why the wage elasticity of labor demand could differ between domestic and multinational firms, or between domestic and foreign firms. Lommerud et al. (2006) suggest that international acquisitions weaken the bargaining power of trade unions, leading to a downward shift in wages which will, again, change the relationship between wages and employment.

Previous empirical studies on FDI and wage elasticity of labor demand provide mixed evidence. Fabbri et al. (2003) examine wage elasticities of labor demand in the UK and US manufacturing for about 30 years since the early 1960s. They find increasingly elastic labor demand in both countries: elasticities have increased in absolute values from about −0.5 to −1.0. The authors argue that this is likely to be related to FDI, which has also grown over the examined period but they do not provide any analysis that can shed light on a possible causation.

Barba Navaretti et al. (2003) examine wage elasticities in domestic-owned (including both multinational and non-multinational firms) and foreign-owned firms in 11 European countries between 1993 and 2000. Wage elasticities vary between about −0.31 (Sweden) and −1.06 (Spain). They tend to be lower in foreign-owned firms than in domestic firms but the differences are statistically significant only in Denmark, Spain and France.[2] Long-run wage elasticities are also reported and are

[2] Wage elasticities are larger in foreign than in domestic firms in Finland and Sweden but the differences are not statistically significant.

lower in foreign firms in all countries. Barba Navaretti et al. (2003) suggest that different skill compositions of the workforce in domestic- and foreign-owned firms, in combination with differences in wage elasticities for different skill groups, could explain the results.

Görg et al. (2009) get a different result using survey data for domestic- and foreign-owned plants in Ireland over the period 1983–1998 in their study on wage elasticities and the role of backward linkages to the domestic economy. They report somewhat higher wage elasticities in foreign-owned firms than in domestic firms. The point estimates suggest the wage elasticity to be about −0.44 in domestic firms and about −0.5 in foreign-owned firms. Moreover, it is seen that the wage elasticities in foreign firms decline with the amount of linkages to the local economy.

Hence, the studies by Barba Navaretti et al. (2003) and Görg et al. (2009) give different results. A difference in the skill composition between MNEs and non-MNEs, or a difference between Ireland and other European countries, might constitute two explanations. Another possible explanation could be that the studies compare elasticities in foreign and domestic firms rather than in MNEs and non-MNEs. It might also be the case that domestic-owned MNEs are of less importance in Ireland (the study by Görg et al. 2009) than in most other European countries (the study by Barba Navaretti et al. 2003).

3 Data and descriptive statistics

The analysis is based on two large register-based data sets from Statistics Sweden spanning the period 1990–2002. Firm- and plant-level data are linked together with unique identification numbers. For the period 1996–2002, the financial statistics contain detailed firm-level information on all Swedish firms. For the period 1990–1995, we have data on all manufacturing firms with at least 20 employees and non-manufacturing firms with at least 50 employees.[3] Variables such as value added, capital stock (book value), number of employees, wages, ownership status, sales and industry affiliation are included. The plant-level statistics add detailed information at the plant level on variables such as the educational level of the labor force. It also adds data on wages for different educational groups. The plant level statistics cover all Swedish plants for the period 1990–2002.[4] A detailed description of the variables is presented in Table 5 in the appendix.

To distinguish between different types of firms, we divide our sample into three groups: foreign-owned MNEs, domestic-owned MNEs, and domestic-owned non-MNEs. A firm is a foreign-owned MNE if, according to information in the firm data, more than 50% of the equity is foreign owned. We define a domestic-owned MNE as a firm reporting positive exports to other firms within the corporation. Finally, firms reporting no such exports are classified as domestic-owned non-MNEs.

[3] We have a stratified random sample for non-manufacturing firms with <50 employees. Data on financial sector firms are not available.

[4] The plant-level data are aggregated to the firm level.

Table 1 Descriptive statistics of firms with different ownership, 1990–2002

	Domestic firms	Domestic-owned non-MNEs	Domestic-owned MNEs	Foreign-owned MNEs	MNEs
Firm size	286 (935)	173 (532)	475 (1,346)	333 (706)	408 (1,094)
Mean wage	205 (47)	201 (49)	213 (42)	226 (45)	219 (44)
Mean wage, high-skilled	264 (75)	254 (78)	281 (66)	300 (65)	290 (66)
Mean wage, medium-skilled	199 (37)	195 (37)	205 (35)	214 (36)	209 (36)
Mean wage, low-skilled	187 (38)	186 (40)	190 (35)	199 (37)	194 (37)
Value added	108 (244)	68 (158)	176 (335)	159 (251)	168 (298)
Share of high-skilled	0.14 (0.13)	0.13 (0.12)	0.16 (0.13)	0.18 (0.13)	0.17 (0.13)
Share of medium-skilled	0.53 (0.11)	0.53 (0.12)	0.53 (0.10)	0.53 (0.10)	0.53 (0.10)
Share of low-skilled	0.33 (0.14)	0.34 (0.14)	0.31 (0.14)	0.29 (0.13)	0.30 (0.13)
Number of observations	15,509	9,739	5,770	5,150	10,920

Means and standard deviations within parentheses

Figures are based on firms in the entire manufacturing industry with at least 50 employees. No sample restrictions

Information on export and some other variables is slightly more likely to be missing for firms with <50 employees in our data set. As a consequence, there might exist a few small multinationals that are classified as local firms. We therefore restrict our sample to firms with at least 50 employees.

Table 1 shows that if we classify firms by ownership, we find that most firms are domestic-owned non-MNEs. Approximately 50% of our sample consists of multinational corporations divided equally between foreign-owned MNEs and domestic-owned MNEs.

The major differences in firm characteristics are not between domestic and foreign firms, but rather between multinational and non-multinationals. MNEs are generally larger, have higher average wages and value added, and employ more highly educated workers than non-MNEs. For instance, the average firm size and value added are more than twice as high in MNEs than in non-MNEs.

Next, we examine acquisitions. Figure 1 shows two types of ownership changes: from domestic to foreign and from non-MNE to MNE. Foreign acquisitions of domestic firms include both domestic MNEs and non-MNEs as targets, and acquisitions of non-MNEs by MNEs include both domestic and foreign MNEs as acquirers. The number of acquisitions has increased since the early 1990s for both types and averages about 30 per year each over the sample period. Table 6 in the appendix shows descriptive statistics for the firms that are acquired by foreign MNEs during the studied period. The acquired firms are larger, pay higher wages to high-skilled employees and have a higher share of high-skilled employees. These characteristics differ from the non-acquired firms both before and after acquisitions, but the differences become larger after acquisitions.[5] This suggests that foreign

[5] The differences are statistically significant.

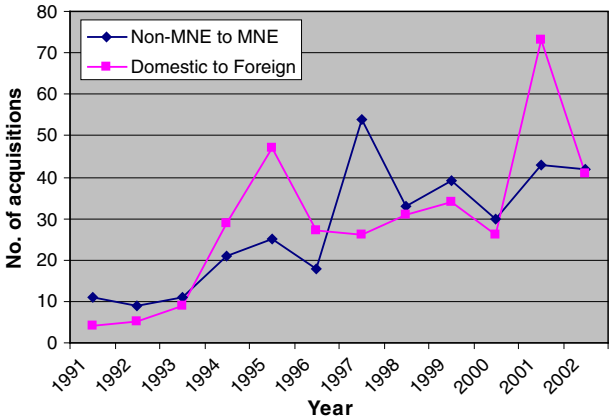

Fig. 1 The number of acquisitions in Swedish industry 1991–2002

firms acquire firms which may be regarded as "cherries", but that the foreign takeover has also a positive effect on the acquired firm, at least on average.

4 Model and econometric approach

We follow the standard approach in the literature and depart from a constant returns to scale production function with two factors of production, capital and labor. Using a Cobb–Douglas production function, we specify the following dynamic conditional labor demand function for firm i in year t,

$$l_{it} = \alpha_0 l_{it-1} + \alpha_1 l_{it-2} + \alpha_2 w_{it} + \alpha_3 y_{it} + \alpha_4 owner_{it} + \alpha_5 (w \cdot owner)_{it} + d_i + d_t + e_{it} \quad (1)$$

where l, w, and y are logarithmic values of employment, wages per employee and output, respectively.[6] Variables d_i, d_t, and e_{it} are firm-specific time-invariant effects, time-specific effects and an i.i.d. error term, respectively. We use value added as a proxy for output, y.

Our focus will be on the coefficients α_2 and α_5. The coefficient α_2 is the estimated elasticity of labor demand with respect to wages for the reference group. For instance, α_2 is, in the case of domestic versus foreign firms, interpreted as the estimated wage elasticity for domestic firms, whereas the corresponding elasticity for foreign firms is equal to $\alpha_2 + \alpha_5$. The coefficients α_0 and α_1 measure the persistence in labor demand. Finally, α_3 is as the output elasticity.

In the first step of our econometric analysis, we examine if there is an ownership effect on the elasticity of labor demand. We distinguish between foreign and

[6] Our specification excludes the cost of capital since it is difficult to measure at the firm level. We follow previous studies and assume it to be equal for all firms in the economy and, hence, captured by time dummies in our main specifications (Görg et al. 2009; Barba Navaretti et al. 2003). We test the robustness of the results by including a firm-level measure of the capital stock.

domestic firms as well as between multinational and non-multinational firms. The former distinction is comparable with the one in Barba Navaretti et al. (2003) and Görg et al. (2009). *Owner* is a dummy variable equal to one if a firm is foreign-owned, and zero otherwise, or when we compare multinationals to non-multinationals, it is equal to one if the firm is a multinational. This variable is interacted with w to allow for ownership differences in wage elasticity. In order to isolate ownership effects from other effects caused by changes in ownership, we use observations only for firms that remain in one type of ownership, that is, domestic, foreign, multinational, or non-multinational firms during the entire period.

In the second step of our analysis, we focus on ownership changes. Firms that change ownership are compared to firms that do not change ownership. We study three different types of ownership changes: (i) from domestic non-MNE to foreign ownership, (ii) from domestic MNE to foreign ownership, and (iii) from domestic non-MNE to domestic MNE.[7] We aim to distinguish whether labor demand elasticity is affected by nationality of ownership, multinational status, or acquisitions per se. We are careful to restrict our sample separately for the different ownership changes in this part of the analysis, to avoid confusing different effects and have a clearly defined reference group of firms. For instance, when we analyze ownership changes from domestic non-MNE to foreign MNEs (type (i) above) we include firms that change ownership from domestic to foreign or that are domestic non-MNE during the entire period. Similar restrictions are applied for the other types of acquisitions. Firms that change ownership more than once are excluded from this analysis.

Finally, we estimate separate labor demand equations for different types of labor to address labor heterogeneity. We are able to study if the effects on labor demand elasticity vary between different skill groups, since we have detailed information on the employees' skill composition.[8]

Hiring and firing of employees is costly and the labor force is therefore rigid. Thus, we assume a dynamic model with up to two lags of the dependent variable as regressors. OLS is not appropriate in our study since l_{it-s} is endogenous to the fixed-effects and to output, which gives rise to a "dynamic panel bias". Therefore, we apply the system generalized method of moments (GMM) approach developed by Arellano and Bover (1995) and Blundell and Bond (1998), which implies that lagged values of l_t and any other similarly endogenous variables are instrumented. The system GMM estimator, building on one equation in level and one in differences, improves efficiency by using more instruments as compared to the difference GMM developed by Arellano and Bond (1991).[9] More precisely, the system GMM estimator uses first-differenced and level versions of the estimating equation, where lagged values and lagged differences can serve as valid instruments. The differentiated instruments are assumed to be uncorrelated with

[7] The data does not allow us to examine pure domestic acquisitions other than between non-MNEs and MNEs.

[8] See Table 5 in the appendix for information on how employees are classified in skill groups.

[9] See Blundell and Bond (1998) for a discussion.

the unobserved fixed effects, implying that first differentiated variables can act as instruments for variables in levels, i.e., instrumenting levels with differences.

Results from GMM may be sensitive to the choice of instruments and the choice of variables being instrumented (Fajnzylber and Maloney 2001). We test the joint validity of the instruments with the Sargan–Hansen test. The validity of instruments depends also on the assumption that there is no second-order correlation of the residuals of the first-differenced equation. We use a test developed by Arellano and Bond (1991) to detect autocorrelation in the idiosyncratic disturbance term e_{it} that would render some lags invalid as instruments.[10]

Our default specification instruments the lagged size variables l_{it-s}, the wage elasticity variable w_{it}, the ownership dummy variable $owner_{it}$, and the interaction term between ownership and wage elasticity $(w{\cdot}owner)_{it}$. We use this specification if it passes the three specification tests described above: the Sargan–Hansen test and the tests for first- and second-order autocorrelation. If the default specification does not pass these tests, we continue by restricting the lag structure of instruments (the first choice) or use orthogonal deviations instead of first differencing (Arellano and Bover 1995). We will report if we have abandoned the default specification and used a modified specification.

Finally, we have also examined the sensitivity of our GMM results to the estimation method by estimating Eq. 1 with the classic ordinary least squares (OLS) estimator and with firm fixed-effects. As discussed in Bond (2002) and Roodman (2006), estimates of the lagged dependent variable should lie in the range between OLS and LSDV (least squares dummy variables). Unreported results show that this is the case in our estimations.

5 Results

We start in Table 2 by estimating elasticities for foreign and domestic firms as well as for multinational and non-multinational firms in a sample of firms that do not change ownership during the period.

The estimations in Table 2 indicate that there is a high persistence in employment: the coefficient on lagged employment is 0.80 (column 1). The estimated wage elasticity for all firms is −0.36. Next, we examine if wage elasticities differ between foreign- and domestic-owned firms by including an interaction variable between foreign ownership and wages (columns 2 and 3). The interaction variable is not statistically significant, suggesting that there is no significant difference in the wage elasticity between foreign- and domestic-owned firms. Our results are similar to those obtained for Sweden in the cross-country study by Barba Navaretti et al. (2003). They estimated the short-run wage elasticity to be −0.31 in Sweden and found no difference in the wage elasticity between domestic- and foreign-owned firms. Görg et al. (2009) find relatively high wage

[10] The system GMM analysis in this paper uses the algorithms provided by Roodman (2006). This algorithm takes into account that two-step standard errors are asymptotically more efficient, but have been reported to be downward biased. By implementing a Windmeijer (2005) correction to the two-step standard errors, a more efficient estimator can be reported.

Table 2 The impact of foreign ownership and multinationality on wage elasticities 1990–2002

	Total	Foreign vs. domestic		Multinational vs. non-multinational	
	1	2	3	4	5
Size ($t-1$)	0.80 (20.54)***	0.81 (23.83)***	0.80 (19.75)***	0.70 (7.06)***	0.67 (7.72)***
Size ($t-2$)	−0.08 (5.95)***	−0.08 (5.79)***	−0.07 (4.61)***	0.03 (0.40)	0.04 (0.49)
Foreign (t)	–	0.24 (0.86)	0.17 (0.51)	–	–
Multinational (t)	–	–	–	0.80 (3.09)***	0.42 (0.97)
Wage (t)	−0.36 4.01)***	−0.31 (3.89)***	−0.43 (5.31)***	−0.28 (2.82)***	−0.33 (3.56)***
(Foreign × wage) (t)	–	−0.05 (0.87)	−0.01 (0.24)	–	–
(Multinational × wage) (t)	–	–	–	−0.15 (3.05)***	−0.12 (1.79)*
Output (t)	0.25 (9.48)***	0.23 (10.18)***	0.24 (9.04)***	0.23 (7.21)***	0.24 (5.50)***
Foreign/multinational × size ($t-1$)	–	–	−0.03 (0.36)	–	−0.01 (0.09)
Foreign/multinational × size ($t-2$)	–	–	−0.02 (0.39)	–	−0.01 (0.11)
Foreign/multinational × output (t)	–	–	0.02 (0.33)	–	0.03 (0.51)
Year	Included	Included	Included	Included	Included
Industry	Included	Included	Included	Included	Included
AR (1)	0.000	0.000	0.000	0.000	0.000
AR (2)	0.292	0.380	0.347	0.362	0.218
Hansen	0.099	0.176	0.797	0.217	0.499
No. of observations	10,264	10,264	10,264	8,012	8,012

Dependent variable is log(size)

AR (1) and AR (2) test for first- and second-order autocorrelation (reported p-values). Hansen is a test for over identifying restrictions (reported p-values). The sample includes only firms with no change in ownership. Results from system GMM estimations. Absolute t-values within parentheses, based on robust Windmeijer (2005) corrected second step standard errors. The results in columns 4 and 5 are based on an alternative specification as discussed in Sect. 4. ***, **, and * indicate significance at the level of 1, 5, and 10%, respectively

elasticities in foreign firms on Ireland. However, they study plants with above 20 employees and we study firms with above 50 employees. We do not have access to plant-level data but we have estimated wage elasticities on a sample of firms with more than 20 employees (not shown). The difference in elasticities between foreign and domestic firms remained statistically insignificant. The different results in our study as compared to the results of Görg et al. (2009) may be explained by differences between Ireland and Sweden and/or by the fact that we use firm-level data instead of plant-level data.

Foreign ownership might affect the wage elasticity of labor demand through its effect on other firm characteristics such as size and output. We therefore include additional interaction variables in column 3. There is still no sign of a difference in the wage elasticity between foreign and domestic firms. This result is robust across a large number of other specifications where ownership status is interacted with a variety of explanatory variables, or when capital stocks are included in the estimations (not shown).

Theoretically, we would expect the relevant distinction to be between MNEs and non-MNEs rather than between domestic and foreign. Therefore, we examine the difference in wage elasticities between MNEs and non-MNEs in columns 4 and 5 in Table 2. The results suggest that labor demand is more elastic in MNEs than in non-MNEs. The estimated wage elasticity is about −0.3 in non-MNEs and about −0.45 in MNEs.

Barba Navaretti et al. (2003) suggest that there might be differences in the skill mix of employees in firms with different ownership and that the wage elasticities for different skill groups differ. We therefore continue in Table 3 by dividing our sample into three skill groups according to the level of education. The low-skilled group is defined as employees with lower secondary education and the medium-skilled group as employees with upper secondary education. The group of high-skilled employees consists of those with tertiary education. One additional advantage with this specification is that we can include cross-elasticities for different skill groups. In other words, we can, for instance, examine how the demand for low-skilled employees is affected by a wage increase for high-skilled employees.

The first three estimations in Table 3 are default specifications where we exclude ownership dummy variables. The estimations show that medium-skilled employees have the highest wage elasticity of labor demand (−0.61), followed by low-skilled (−0.45). The wage elasticity is not significant for high-skilled employees. The cross-elasticities indicate that a wage increase for medium-skilled employees decreases the demand for low-skilled and a wage increase for high-skilled decreases the demand for medium-skilled. This suggests that low-skilled employees complement medium-skilled and medium-skilled complement high-skilled.

In the following six columns, we examine differences between firms with different ownership status. Foreign-owned firms have a higher elasticity of labor demand for medium-skilled employees, in absolute terms, than domestic firms (see column 5). This is in contrast to the other two skill groups where we do not find any significant differences between domestic and foreign firms. As can be seen in columns 7–9, the differences between medium-skilled employees and the other two groups are similar when we compare MNEs with non-MNEs.

Table 3 The impact of foreign ownership and multinationality on wage elasticities 1990–2002

	Total			Foreign vs. domestic			Multinational vs. non-multinational		
	Low-skilled 1	Medium-skilled 2	High-skilled 3	Low-skilled 4	Medium-skilled 5	High-skilled 6	Low-skilled 7	Medium-skilled 8	High-skilled 9
Size (t–1)	0.78 (11.32)***	0.68 (15.73)***	0.75 (23.60)***	0.74 (18.06)***	0.67 (17.90)***	0.75 (23.36)***	0.78 (16.99)***	0.72 (17.50)***	0.77 (25.31)***
Size (t–2)	−0.03 (0.54)	−0.01 (0.58)	0.05 (3.49)***	0.02 (1.24)	−0.002 (0.11)	0.06 (3.60)***	0.00 (0.16)	−0.03 (2.05)	0.05 (2.83)***
Foreign (t)	–	–	–	0.04 (0.09)	1.07 (2.64)***	−0.04 (0.05)	–	–	–
Multinational (t)	–	–	–	–	–	–	−0.12 (0.31)	1.34 (3.03)***	−0.37 (0.68)
Wage low-skilled (t)	−0.45 (2.87)***	0.09 (0.51)	0.06 (0.34)	0.09 (0.77)	0.10 (0.56)	0.08 (0.54)	0.11 (0.96)	0.29 (2.31)**	0.04 (0.35)
Wage medium-skilled (t)	−0.55 (2.77)***	−0.61 (4.89)***	−0.41 (2.07)**	−0.78 (4.78)***	−0.56 (4.62)***	−0.45 (2.37)**	−0.64 (4.27)**	−0.52 (4.08)***	−0.19 (1.09)
Wage high-skilled (t)	−0.02 (0.57)	−0.12 (2.50)**	0.02 (0.30)	−0.05 (1.37)	−0.11 (2.58)**	−0.04 (0.52)	0.03 (0.56)	−0.03 (0.61)	−0.08 (0.85)
(Foreign × wage skill group) (t)	–	–	–	−0.01 (0.07)	−0.20 (2.63)***	0.01 (0.11)	–	–	–
(Multinational × wage skill group) (t)	–	–	–	–	–	–	0.02 (0.25)	−0.25 (3.03)***	0.07 (0.72)
Output (t)	0.21 (7.79)***	0.29 (9.65)***	0.21 (6.98)***	0.21 (7.75)***	0.29 (11.36)***	0.20 (6.77)***	0.18 (6.18)***	0.26 (9.17)***	0.18 (6.98)***
Year	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry	Included	Included	Included	Included	Included	Included	Included	Included	Included
AR (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.397	0.266	0.908	0.980	0.380	0.856	0.280	0.490	0.758
Hansen	0.345	0.366	0.247	0.122	0.274	0.143	0.327	0.446	0.210
No. of observations	10,172	10,181	10,119	10,172	10,181	10,119	7,954	7,960	7,917

Dependent variable is log(size)

AR (1) and AR (2) test for first- and second-order autocorrelation (reported p-values). Hansen is a test for over identifying restrictions (reported p-values)

The sample includes only firms with no change in ownership. Results from system GMM estimations. Absolute t-values within parentheses, based on robust Windmeijer (2005) corrected second step standard errors. The result in column 1 is based on alternative specifications as discussed in Sect. 4. ***, **, and * indicate significance at the level of 1, 5, and 10%, respectively

Our results indicate that foreign or multinational ownership has the largest effects on medium-skilled rather than on low-skilled employees in Sweden. As seen in Table 1, the different types of firms have on average the same share of medium-skilled. Altogether this implies that the higher wage elasticity of labor demand in multinational firms shown in columns 4 and 5 in Table 2 is driven by a higher wage elasticity of labor demand for medium-skilled in multinational firms rather than differences in firm-level skill composition. This result corresponds to effects of offshoring on labor demand in Sweden obtained by Ekholm and Hakkala (2005). They find that offshoring has a negative effect on the relative demand for employees with upper secondary education (medium-skilled), while having positive or no effects on employees with tertiary (high-skilled) or lower secondary education (low-skilled). Moreover, Acemoglu (1999) and Autor et al. (2006, 2008) provide evidence on employment polarizing into high-wage and low-wage jobs at the expense of middle-wage jobs over the past 15 years. One plausible explanation is that low-skilled employees perform supportive job tasks that are more difficult to offshore, such as maintenance, and have therefore a less elastic labor demand.

The inclusion of cross-elasticities controls for how the wage of one type of employees affects the demand for other groups of employees. There are also other production factors affecting the wage elasticities. Even if firms have the possibility to shift production abroad, there might not be much to gain from such a restructuring when wages represent a small share of total production costs. To examine how the labor intensity of the production affects our results, we divided our sample in into three equally large groups according to the wage share in value added. We found wage elasticities to be higher in firms with more labor-intensive production (high wage share), but we did not find any significant differences between foreign and domestic firms or between MNEs and non-MNEs.[11]

Another possible bias arises if MNEs and non-MNEs are distributed differently over sectors and if some sector-specific characteristics that are not controlled for by industry dummy variables affect wage elasticities. A straightforward way to examine this issue is to re-run our estimations at a sector level.[12] We have done this according to two different industry classifications. Firstly, we divided our sample into five sectors according to a taxonomy in OECD (1987, 1992): resource-intensive, labor-intensive, scale-intensive, differentiated goods and science-based goods. Secondly, we estimated separate labor demand regressions by one-digit SIC. The results remain similar to the previous ones with a difference in wage elasticity between MNEs and non-MNEs primarily for medium-skilled workers.[13]

So far, we have followed the common approach in the literature and examined the effect of ownership on wage elasticities in continuing firms. An alternative plausible response to wage increases is to close a plant and expand the activities in foreign affiliates (Bernard and Sjöholm 2003; Görg and Strobl 2003; Bernard and Jensen 2007; van Beveren 2007). Bandick (2007) uses the same data set as we to

[11] The results are available upon request.

[12] There could also be a different effect between horizontal and vertical FDI. Dividing the sample by sectors might capture some of this difference since the type of FDI is likely to be similar within sectors.

[13] The results are available upon request.

study plant closures in Sweden. He finds that foreign-owned MNEs have the highest survival rates and, hence, a relatively low tendency to close down their Swedish affiliates. This suggests that our results are not driven by a higher risk of plant closures among foreign-owned firms as a response to wage increases.

We conclude by noting that the wage elasticity of labor demand tends to be higher in multinational firms than in non-multinational firms, while there is no difference between foreign and domestic firms. Medium-skilled workers have a higher wage elasticity both in multinational and foreign-owned firms, while wage elasticity of low-skilled and high-skilled does not differ between firm types. The difference between multinational and non-multinational firms in the overall wage elasticity seems to be driven by a higher wage elasticity of labor demand for medium-skilled in multinational firms rather than differences in firm-level skill composition.

Our second approach analyzes the effect of ownership changes on wage elasticities. The main advantage of looking at acquisitions is that we thereby control for unobservable firm effects. One drawback is that the relationship between wages and employment can temporarily be disturbed around the time of acquisition if it, for instance, is followed by various structural changes of the labor force. Bearing this latter caveat in mind we show in Table 4 the results from estimations on three different skill groups for three different types of ownership changes: (i) domestic non-MNEs acquired by foreign firms, (ii) domestic MNEs acquired by foreign firms and (iii) domestic non-MNEs acquired by domestic MNEs.[14]

There is less evidence of an effect of multinational or foreign ownership effects on wage elasticities in the acquisition estimations compared to the previous ownership estimations in Tables 2 and 3. The estimations in Table 4 suggest that takeovers have no significant impact on the wage elasticities in eight out of nine cases. Note that the only significant effect on wage elasticity is again for medium-skilled workers caused by acquisitions of domestic non-MNEs by domestic MNEs.

We have also used a large number of alternative specifications and sub-samples. It could be that an acquisition affects wage elasticities with a time lag. We therefore experimented with alternative specifications where the effect of an acquisition was examined 1, 2, and 3 years after the ownership change. The coefficients for the lagged ownership dummy variables were statistically insignificant almost in all the different estimations (not shown). Thus, it was not possible to get any additional information on the effects of acquisitions on wage elasticities for different workers.

We also divided our sample into firms with high and low wage-share, as previously discussed, and into different sub-samples according to export intensity to analyze whether previous international experience in terms of exports matters for the impact of the ownership change. Moreover, we included capital stocks and used OLS and fixed-effect estimates.[15] Results from the estimations on acquisitions are mostly insignificant. This could be caused by turbulence after an acquisition.

[14] The ownership dummy variable is always insignificant in estimations on total employment (not shown).

[15] These results are available upon request.

Table 4 The impact of acquisitions on wage elasticities for different skill groups, 1990–2002

	From domestic non-MNE to foreign			From domestic MNE to foreign			From domestic non-MNE to domestic MNE		
	Low-skilled 1	Medium-skilled 2	High-skilled 3	Low-skilled 4	Medium-skilled 5	High-skilled 6	Low-skilled 7	Medium-skilled 8	High-skilled 9
Size (*t*–1)	0.81 (14.17)***	0.81 (12.08)***	0.78 (21.14)***	0.79 (11.58)***	0.70 (8.36)***	0.76 (17.18)***	0.77 (15.95)***	0.68 (10.87)***	0.77 (21.94)***
Size (*t*–2)	−0.05 (1.36)	−0.08 (2.32)	0.07 (2.72)**	0.06 (1.93)*	0.00 (0.07)	0.09 (3.16)***	0.02 (0.78)*	−0.01 (0.19)	0.06 (2.51)**
Foreign/Multinational (*t*)	−1.54 (1.58)	−1.77 (0.98)	−2.13 (1.39)	−1.00 (1.12)	−0.40 (0.59)	0.49 (0.69)	−0.54 (0.69)	1.69 (1.81)*	−2.10 (2.25)**
Wage low-skilled (*t*)	−0.53 (3.32)***	0.09 (0.67)	−0.00 (0.03)	−0.17 (0.86)	−0.01 (0.09)	0.02 (0.11)	0.00 (0.04)	0.09 (0.45)	0.03 (0.27)
Wage medium-skilled (*t*)	0.03 (0.17)	−0.31 (2.29)**	−0.13 (0.58)	−0.64 (3.48)	−0.60 (3.76)***	−0.20 (1.16)	−0.44 (2.08)**	−0.28 (2.03)**	−0.15 (0.79)
Wage high-skilled (*t*)	0.22 (1.79)*	0.21 (1.32)	−0.11 (1.10)	−0.01 (0.08)	−0.02 (0.35)	−0.10 (0.80)	−0.04 (0.82)	−0.02 (0.47)	−0.20 (1.94)*
(Foreign × wage skill group) (*t*)	0.28 (1.52)	0.33 (0.98)	0.38 (1.40)	0.20 (1.36)	0.08 (0.59)	−0.08 (0.65)	–	–	–
(Multinational × wage skill group) (*t*)	–	–	–	–	–	–	0.10 (0.64)	−0.32 (1.80)*	0.37 (0.48)
Output (*t*)	0.18 (5.17)***	0.20 (5.33)***	0.17 (5.72)***	0.15 (2.99)***	0.26 (3.99)***	0.16 (5.77)***	0.17 (7.24)***	0.26 (8.45)***	0.20 (6.78)***
Year	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry	Included	Included	Included	Included	Included	Included	Included	Included	Included
AR (1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.221	0.399	0.454	0.579	0.587	0.300	0.454	0.880	0.697
Hansen	0.890	0.884	0.991	0.887	0.918	0.948	0.814	0.902	0.947
No. of observations	4,070	4,070	4,034	2,974	2,978	2,968	4,413	4,415	4,371

Dependent variable is log(size)

AR (1) and AR (2) test for first- and second-order autocorrelation (reported *p*-values). Hansen is a test for over identifying restrictions (reported *p*-values)

Results from system GMM estimations. Absolute *t*-values within parentheses, based on robust Windmeijer (2005) corrected second step standard errors. ***, **, and * indicate significance at the level of 1, 5, and 10%, respectively

Theories of ownership change emphasize that a takeover is an opportunity to restructure the operations of the target firm (Shleifer and Summers 1988; Bertrand and Mullainathan 2003) and to reduce administrative and managerial employment (Shleifer and Vishny 1988; Lichtenberg and Siegel 1990). Firms exploiting complementarities by combining their firm-specific assets through cross-border mergers and acquisitions could also create temporary turbulence (Blonigen 1997; Nocke and Yeaple 2004, 2007). Complementarities create rents (Norbäck and Persson 2007), and the relationship between wages and employment may change temporarily when rents are shared by owners and employees.

6 Concluding remarks

Foreign direct investment has increased substantially over the last decades and large shares of employees are in most developed countries employed in foreign-owned multinational companies. We examine if this development has increased one aspect of job volatility, namely the wage elasticity of labor demand.

There are no differences in elasticities between foreign and domestic firms. However, we find that multinational firms have a more elastic labor demand, with an estimated elasticity of about −0.45 as compared to −0.3 in non-multinational firms. The result is consistent with the idea that multinational firms react to cost changes in a flexible way because of their international production networks. Moreover, our results suggest that the more elastic labor demand in multinational firms is not driven by differences in firm-level skill composition but by a higher wage elasticity for medium-skilled workers in multinational firms.

In the second step, we analyze the impact of ownership changes on wage elasticity of labor demand. The estimations suggest that takeovers have no significant impact on the wage elasticities in all cases but one. The only exception is the wage elasticity for medium-skilled employees in non-MNEs acquired by a domestic MNE. It is possible that turbulence created by the acquisitions could shade any effect of an ownership change.

The results are in line with Ekholm and Hakkala (2005) who found another form of internationalization, offshoring, to have a negative effect on the demand for medium-skilled workers in Sweden. One plausible explanation is that medium-skilled workers perform job tasks that are easier to relocate abroad than the job tasks of high- or low-skilled workers.

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Appendix

See Tables 5, 6.

Table 5 Variables

Firm variable	Description	Source
Wage	Average wage compensation per employee, including payroll taxes, 1990 year prices	FS
Size	Number of employees	FS
Output	Value added, 1990 year prices (in 100,000 SEK)	FS
High-skilled	Share of workers with at least a 3-year post-secondary education	RAMS
Medium-skilled	Share of workers with 1–2 years of upper secondary education	RAMS
Low-skilled	Share of workers with at most 9 years of elementary education	RAMS
Foreign ownership	Dummy = 1 if more than 50% of a firm's votes are foreign owned	FS
Industry affiliation	Industry classification based on 2-digit SIC	FS

Abbreviations: Financial Statistics (FS) and Plant-level statistics (RAMS)

Table 6 Descriptive statistics of domestic firms acquired by foreign-owned MNEs during 1990–2002

	Domestic firms not acquired	Domestic firms acquired by foreign-owned MNEs	Acquired domestic firms before acquisition	Acquired domestic firms after acquisition
Firm size	271 (918)	397 (1,141)	375 (1,142)	424 (1,141)
Mean wage	206 (48)	216 (44)	203 (43)	232 (40)
Mean wage, high-skilled	262 (75)	290 (65)	275 (66)	308 (59)
Mean wage, medium-skilled	199 (37)	207 (39)	195 (38)	221 (38)
Mean wage, low-skilled	188 (39)	192 (37)	180 (33)	206 (38)
Value added	108 (244)	155 (252)	129 (223)	185 (279)
Share of high-skilled	0.14 (0.13)	0.16 (0.14)	0.15 (0.13)	0.18 (0.14)
Share of medium-skilled	0.53 (0.11)	0.53 (0.10)	0.52 (0.10)	0.54 (0.10)
Share of low-skilled	0.32 (0.14)	0.31 (0.13)	0.34 (0.13)	0.28 (0.11)
Number of observations	13,260	3,010	1,625	1,385

Means and standard deviations within parentheses

Figures are based on firms in the entire manufacturing industry with at least 50 employees

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