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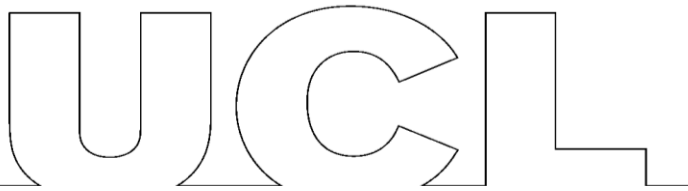

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Are Foreign-Owned Firms Different? Comparison of Employment Volatility and Elasticity of Labour Demand

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Abstract
This paper analyses differences in employment volatility in foreign-owned and domestic companies using firm-level data from 24 European countries. The presence of foreign-owned companies may lead to higher employment volatility because subsidiaries of multinational companies react more sensitively to changes in labour demand in host countries or because they are more exposed to external shocks. We assess the conditional employment volatility of firms with foreign and domestic owners using propensity score matching and find that it is higher in foreign-owned firms in about half of the countries that our study covers. In addition, we explore how and why labour demand elasticity differs between these two groups of companies. Our estimations indicate that labour demand can be either more or less elastic in subsidiaries of foreign-owned multinationals than in domestic enterprises, depending on the institutional environments of their home and host countries. When FDI originates from a region with a more flexible institutional environment then the elasticity of labour demand is smaller in absolute value in foreign-owned firms. In the opposite case the elasticity of labour demand is higher. A potential explanation for this empirical finding is that it is easier for multinational companies to substitute between factor inputs and therefore they have more flexibility than domestic firms in choosing which channels of adjustment to use.

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1. Introduction

There is a long-running debate about the potential adverse side effects of the internationalisation of ownership structures and those of globalisation in general. The increase in employment volatility is one of the side effects usually depicted in a negative light, since it lessens job security (see e.g. Scheve and Slaughter (2004) and Geishecker et al. (2012)).[1] We study differences in employment volatility between firms with domestic and foreign workers in Europe. For this purpose, we use firm-level panel data from Bureau van Dijk Amadeus database spanning the years 2001-2009. The Amadeus dataset includes a detailed description of firms' ownership structure, which enables us to disentangle companies by ownership type and to identify the number of subsidiaries for multinational and domestic enterprises.

Rodrik (1997) in his book "Has globalization gone too far?" is seen as the first to argue forcefully that the labour demand of foreign-owned companies is more elastic, contributing to higher employment volatility and lower job security. He alleges that deeper international economic integration may make domestic workers more easily substitutable by foreign workers. Consequently, labour demand would become more wage (or own-price) elastic.

Another reason why globalisation increases the elasticity of labour demand is that deepening international integration of production results in more elastic product demand. This is an often-cited finding from the empirical literature on international trade and FDI flows. According to the Hicks-Marshall laws of derived demand, more competition in the product markets (i.e. flatter product demand curves) should also lead to more elastic labour demand. Bhagwati (1996) stressed a related channel through which globalisation may have increased employment volatility when he pointed out that global economic integration has made product markets more volatile. Greater volatility of product demand should lead to greater volatility of labour demand as well, since the latter is derived from the former.

An alternative view of the relationship between the international integration of production and the elasticity of labour demand is proposed by Hijzen and Swaim (2010). They argue that the impact of FDI on the elasticity of labour demand is theoretically ambiguous and hence ultimately an empirical issue. While the internationalisation of the production process is expected to increase the ability of firms to substitute between factor inputs, the elasticity of substitution is only one of several factors determining the own-price elasticity of labour demand. Globalisation, which is associated with greater capital mobility, will also tend to lead to a reduction in the cost share of labour. Making use of a decomposition of the determinants of labour demand elasticity into substitution and scale effects along the lines of Hamermesh (1993), Hijzen and Swaim (2010) demonstrate that a simultaneous increase in the constant-output elasticity of substitution and a decrease in the cost share of labour in production will have offsetting effects on the total own-price elasticity of labour demand. The former will increase elasticity via the substitution effect, while the latter will decrease it via the scale effect. The result is that the net impact of globalisation can be either positive or negative, depending on which of the two effects dominates.

Given the arguments outlined above, it is not a priori clear that a positive association exists between foreign ownership and employment volatility. The empirical evidence is mostly in favour of the existence of this relationship, but not universally so. Some examples in favour

[1] The other effects of globalisation remain beyond the scope of this paper. In particular, the paper does not seek to undermine the positive effects of FDI (see e.g. Borensztein et al (1998) on FDI and growth).

are studies by Bergin et al. (2009) and Levasseur (2010), which compare employment volatilities in specific offshoring industries in home and host countries. In Bergin et al.'s paper, the country pair is the USA and Mexico, and in Levasseur's study, Germany is compared with the Czech Republic and Slovakia. Both of these articles focus on specific industries where the vertical integration of production is well documented and yield the result that employment is more volatile in the host country in an industry that specialises in subcontracting.

However, studies analysing a wider spectrum of industries and incorporating services in addition to manufacturing do not always yield the result that globalisation is associated with increasing labour volatility. For example, an analysis by Buch and Schlotter (2013) using German industry-level data demonstrates that unconditional volatility of employment has exhibited a downward trend. According to this study, openness to trade and employment volatility are not significantly related across industries in Germany.

Most of the research papers investigating the labour market impacts of offshoring (or FDI more particularly) focus on the elasticity of labour demand. As explained above, the flattening of the demand curve is one factor that can contribute to an increase in employment volatility. The results of these studies are inconclusive. The evidence in support of the hypothesis that an increase in offshoring leads to more elastic labour demand is provided by several studies.[2] On the other hand, research which has used data from various European countries mostly does not support this hypothesis.[3] Among studies using plant-level or firm-level data, the only case where the higher labour demand elasticity of foreign multinationals has found empirical support is in Ireland (Görg et al., 2009).

The purpose of our study is to assess the differences in employment volatility between firms with domestic and foreign owners. Using the standard framework of labour demand and supply, we show that the differences in total employment volatility can be caused either by the foreign-owned firms' different elasticity of labour demand or by their different exposure to economic shocks. We assess the conditional employment volatilities of firms with foreign and domestic owners using propensity score matching, which enables us to control for differences in firm characteristics such as age, size, capital intensity, labour productivity, ownership concentration, and number of subsidiaries. A comparison of conditional employment volatilities implies that foreign-owned firms tend to have systematically higher employment volatility than domestically owned counterparts with similar characteristics, although this difference is not statistically significant for all the countries that our study covers.

Regarding the elasticity of labour demand, we do not find evidence to support Rodrik's (1997) conjecture described above. The system GMM estimations of labour demand functions across 18 European countries indicate that the wage elasticity of labour demand is mostly not significantly different between foreign and domestically owned enterprises. For the few countries where the differences are significant the elasticity is not always larger in foreign-owned firms. The main focus of our analysis is on assessing the role that labour market institutions play in this context.

[2] Supporting evidence can be found in Slaughter (2001) on the US data; Fabbri et al (2003) for the UK; and Görg et al. (2009) for Ireland.
[3] Examples include Barba Navaretti et al. (2003); Buch and Lipponer (2010); and Hakkala et al. (2010)

The results of two earlier studies indicate that the effect of offshoring or foreign ownership on the elasticity of labour demand is dependent on labour market institutions. Barba Navaretti et al. (2003) show that long-term wage elasticity of labour demand is lower in multinational enterprises (MNEs) than in domestic firms and the ratio of the elasticities of MNEs and NEs is larger in countries with a stricter institutional environment. They argue that MNEs manage to bypass the regulations in a strict regulatory environment and conclude that "labour market regulations are quite irrelevant to the labour market behaviour of MNEs" (Barba Navaretti et al. (2003), p. 718). The analysis of Hijzen and Swaim (2010) indicates that offshoring is associated with higher labour demand elasticity only in countries with relatively weak employment protection legislation, whereas they detect no significant effects for countries with more regulated labour markets.

In comparison to the earlier research, we take a step further and investigate the role of labour market institutions in a bilateral context by assessing the effects of differences in the institutional environment in the home and host countries of MNEs. We find that labour demand can be either more or less elastic in subsidiaries of foreign-owned multinationals than in domestic enterprises, depending on these institutional differences. When FDI originates from a region with more flexible institutions then the elasticity of labour demand is smaller in absolute value in foreign-owned firms. In the opposite case the elasticity of labour demand is higher. A potential explanation for this empirical finding is that it is easier for multinational companies to substitute between factor inputs and so they have more flexibility than domestic firms in choosing which channels of adjustment to use.

When MNEs need to adjust costs in response to economic shocks, then in the presence of strong restrictions on the adjustment of employment it is easier for them to alter other production costs or output prices and leave labour costs unadjusted. A multinational production network should be associated with easier adjustment via other margins than is the case for companies that have only domestic operations. In addition, MNEs can respond to shocks by adjusting employment in other locations abroad. If it is necessary to change employment in response to economic shocks then they can shift adjustments to countries or regions where it is easier to adjust. They can change employment mostly at home when the labour market there is more flexible or shift the main bulk of adjustment to foreign affiliates when the local institutions in the host countries favour this.

It is worth noting that we use a similar explanation for our empirical findings to that evoked by Rodrik (1997). He asserted that multinational enterprises have larger elasticity of substitution between production factors and this should increase their elasticity of labour demand. We add another layer to this argument as our empirical estimates imply that this greater ease of substituting between different inputs can also result in smaller elasticity of labour demand, depending on labour market institutions. Differences in institutional environment can lead to a dual outcome: the presence of MNEs can have an amplifying effect on the elasticity of labour demand in countries with flexible labour market institutions, whereas it can have a dampening effect in countries with rigid institutions.

An alternative, though related, explanation for this empirical finding is that multinational firms choose the host countries where they will establish subsidiaries by looking at the labour market institutions: if MNEs operate in sectors characterised by highly volatile demand then they are more likely to move to countries with a flexible institutional environment. The formalisation of how flexible labour markets act as a comparative advantage is provided e.g. in Cunat and Melitz (2012).

The paper is organised as follows. The second section presents the theoretical model deriving the decomposition of employment volatility. The third section provides an overview of the Bureau van Dijk Amadeus firm-level data that we employ for the analysis. In the fourth section, we give an overview of unconditional and conditional employment volatilities for foreign and domestically owned firms. Section 5 focuses on estimating labour demand equations for foreign and domestically owned firms and investigating the role of labour market institutions. The last section summarises.

2. Decomposition of employment volatility

The subsidiaries of foreign-owned enterprises can have higher volatility than local companies for two reasons. First, they may be exposed to more volatile shocks, which can then be transferred into more volatile labour demand, and second, they may behave differently from local enterprises as they can react to shocks of similar size more or less strongly by adjusting labour. This section will derive a decomposition of employment volatility into two subcomponents: a) a function of exogenous economic shocks; and b) a function of the elasticities of labour supply and demand. This decomposition will enable us to demonstrate that employment volatility is positively related to the elasticity of labour demand as long as labour supply is not perfectly inelastic. This can be assumed to be the case if the subject of the analysis is a firm, as in the current study.

We build on the approach of Scheve and Slaughter (2004) and Barba Navaretti and Venables (2004) along the lines of Hamermesh (1993) to decompose employment volatility. Let us assume a Cobb-Douglas production function with diminishing returns to scale where capital is fixed in the short-term and normalised to one:

$$Y = AL^{\beta} \tag{1}$$

where Y denotes output, A is the parameter capturing technological progress and L denotes labour, while $0 < \beta < 1$. Profit maximisation under perfect competition in all markets yields:

$$W = pA\beta L^{\beta-1} \tag{2}$$

where W stands for wages, p is product price and the term $pA\beta$ is marginal revenue product, which captures exogenous price and productivity shocks. Solving for L and defining labour demand as L^D results in the following labour demand equation:

$$L^D = \left(\frac{W}{pA\beta}\right)^{1/(\beta-1)} \tag{3}$$

Given that the labour demand elasticity equals 1 / (β-1) in this case and defining η^{LL} as the absolute value of the wage elasticity of labour demand lets us rewrite equation (3) as:

$$L^D = \left(\frac{W}{pA\beta}\right)^{-\eta^{LL}} \tag{3'}$$

Let us assume the following labour supply function:

$$L^S = W^{\eta^S}, \tag{4}$$

where η^S denotes the wage elasticity of labour supply. The equilibrium employment and wage can then be expressed as follows:

$$L = (pA\beta)^{\eta^{LL}\eta^S/(\eta^{LL}+\eta^S)} \tag{5}$$

$$W = (pA\beta)^{\eta^{LL}/(\eta^{LL}+\eta^S)} \tag{6}$$

Taking natural logarithms of both sides of equations (5) and (6) (a monotonic transformation) yields:

$$l = [\eta^{LL}\eta^S/(\eta^{LL}+\eta^S)]\ln(pA\beta) \tag{7}$$

$$w = [\eta^{LL}/(\eta^{LL}+\eta^S)]\ln(pA\beta) \tag{8}$$

where $w = ln(W)$ and $l = ln(L)$.

Treating marginal revenue product as a random variable, we can express the variance of equilibrium employment and wages by building on equations (7) and (8) as follows:

$$var(l) = [\eta^S\eta^{LL}/(\eta^{LL}+\eta^S)]^2 var[ln(pA\beta)] \tag{9}$$

$$var(w) = [\eta^{LL}/(\eta^{LL}+\eta^S)]^2 var[ln(pA\beta)] \tag{10}$$

Equation (9) implies that employment volatility can be expressed as a combination of two components. The first part, in square brackets, captures volatility in employment due to changes in labour demand elasticity. Given non-zero finite elasticity of labour supply, the elasticity of labour demand is positively related to employment volatility, ceteris paribus. The second part captures volatility in employment due to changes in the exposure to economic shocks. The more exposed a firm is to external shocks or the higher the variation in marginal revenue product is, the higher its employment volatility is.

Note that when the labour supply is perfectly inelastic then changes in the elasticity of labour demand do not affect employment volatility. On the other hand, equation (10) implies that when the labour supply is perfectly elastic then changes in the elasticity of labour demand do not affect wage volatility. In general, the distribution of volatility between wages and employment depends on the slope of the labour supply curve. The more elastic it is, the larger employment volatility is relative to wage volatility, given a similar demand schedule and exogenous shocks to labour demand. Since labour market rigidities make the labour supply less elastic, it can be expected that employment will be more volatile in countries with flexible labour regulations, ceteris paribus.

The decomposition given in equation (9) illustrates that foreign-owned companies may have higher employment volatility because they react more sensitively to wage changes in a host country or because they are more exposed to external shocks. The latter might well be the case since foreign-owned MNEs are more likely to operate in several markets and to be hit by

shocks more frequently than domestically owned enterprises.[4] However, multinationals may also be faced by a more dispersed structure of shocks, so whether they are more or less exposed to a volatile economic environment is an empirical issue that depends on the cross-country correlation of shocks.

3. The data

We use an Amadeus (Bureau van Dijk, see https://amadeus.bvdinfo.com) firm-level panel dataset that covers a large set of European countries and spans the years 2001-2009. Amadeus data includes information about the balance sheets and profit/loss statements of firms and detailed information on the ownership structure.

Our initial goal was to cover all the EU27 countries, but the set of countries was reduced to 18 because of data availability. The Amadeus data on Greece and Lithuania do not cover employment costs while the data on Ireland do not cover employment volumes. The Amadeus data on Austria, Cyprus, Denmark, Hungary, Latvia, Luxembourg and Malta do not have enough observations to be suitable for econometric analysis. Our analysis includes Norway in addition to the EU member states. The default dataset covers 18 countries, 170 thousand firms and in total more than a million observations. In some cases, like when data on wage costs is not necessary for the analysis, the set of countries covered is larger. The variables for the empirical analysis are defined in Table 1.

Table 1. Variable definitions

Variable	Definition
Employment (empl)	Number of employees, head counts
Wage (rwage)	GDP deflator* deflated employment costs divided by employment
Output (rturn)	GDP deflator* deflated turnover (operational revenue for Denmark, Norway, UK)
Foreign-owned enterprise (FOE)	Foreign versus domestically owned enterprises (FOEs; DOEs), dummy variable. A firm is considered to be foreign-owned if its global ultimate owner is a foreigner (subsidiary) or its largest shareholder is a foreigner (associate). Ownership is time-invariant and fixed in the year 2009.
Age	Firm's age in years
No of subsidiaries	Number of recorded subsidiaries
No of shareholders	Number of recorded shareholders
Peer's employment	Employment of the business group or the largest recorded owner
Capital intensity	Total fixed assets per employee in real terms
Labour productivity	Deflated turnover divided by employment

Notes: The GDP deflator is taken from Eurostat and is at a 2-digit NACE 2008 level.

The ownership data are often missing in the Amadeus dataset. For some countries like Romania and Slovakia the data are only available for a small number of companies. The

[4] The focus in the current study is on comparing foreign and domestically owned companies. Practically all of the former are subsidiaries or affiliates of multinational companies. Although some of the domestically owned firms are also multinationals, the majority of firms in this group are local companies. Thus, as a group, foreign-owned firms can be expected to be more exposed to shocks.

number of observations across the dynamic dimension of the dataset is smaller than average for Germany as the years 2007-2009 are missing for almost all the firms. In general, larger firms tend to be overrepresented in the Amadeus sample in comparison to the whole population of firms.

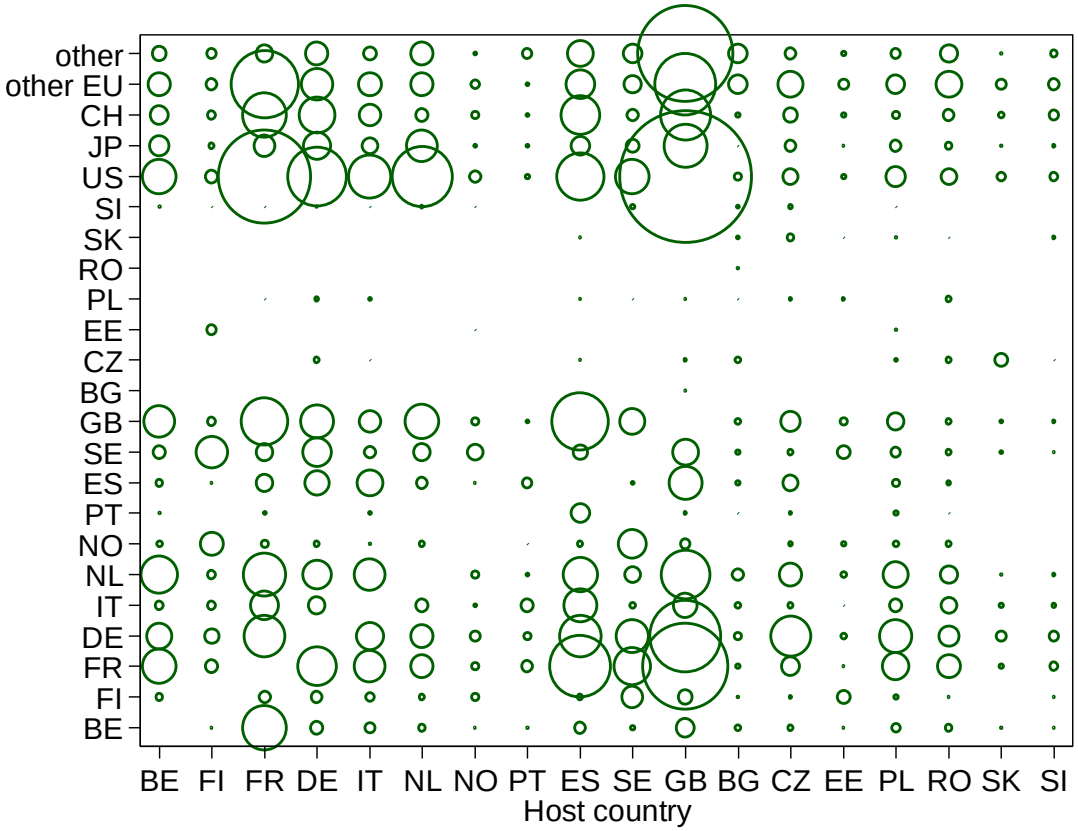
We also impose filters to remove possibly erroneous observations and make the dataset more comparable across countries. These filters differ for matching and dynamic panel data analysis and these differences are discussed in the sections that cover these topics. Country-by-country estimations use monetary variables in their original currency, while estimations with pooled data across countries employ monetary variables transformed into euros[5].

Appendix 1 presents the descriptive statistics of variables for foreign and domestically owned enterprises (FOEs and DOEs) separately for countries from Western Europe and from Central and Eastern Europe. The foreign-owned firms tend to be larger, to pay higher wages, to have higher capital intensity and labour productivity, to have more concentrated ownership and to operate more often in the manufacturing sector. In total, 18% of firms are foreign-owned in the final sample, while 30% of employment originates from foreign-owned companies. The sample of enterprises from Western Europe contains some very large firms, which make the samples of WE and CEE differ much more in the mean values of the variables analysed than in the medians.

Figure 1 presents the origin of foreign investment from the host country perspective. FDI in EU countries mostly originates from other EU countries and is highly concentrated in terms of origins, with Germany, France, the Netherlands and the UK being the main home countries. Outside the EU the main country of origin is the USA. Central and Eastern Europe is an important recipient of FDI from Western Europe but the FDI flows from Central and Eastern Europe to other EU countries are modest.

Figure 1. Country of origin of foreign enterprises (2005)

[5] The source of the exchange rates is the European Central Bank Statistical Data Warehouse: annual average bilateral exchange rates. [http://sdw.ecb.europa.eu/browse.do?node=2018794]



Notes: Foreign ownership is weighted by employment. See International Standard Codes for the Representation of the Names of Countries (version 2002) for the country abbreviations.
Source: Authors' calculations from the Amadeus dataset.

Our dataset imposes some limitations on what we can or cannot test. First, we cannot observe firm entry and exit in our data, which means that we can investigate firms' employment adjustment only via the intensive margin. Second, we do not cover employment across different skill groups as we only have data on total wages and employment. Third, our database consists of the balance sheets and profit/loss statements on a yearly basis but only includes ownership data for the year 2009, so it is possible that the firm ownership variable is subject to measurement error.

Trade and foreign ownership are sometimes difficult to disentangle. For example, part of production can be outsourced abroad to another company or a subsidiary can be established abroad to do this work within a business group. Offshoring is usually defined as a change in the supplier of intermediate inputs and services from a domestic one to a foreign one. Offshoring can be international outsourcing, which means importing goods from other firms, or it can be the relocation of a firm's own production so that some parts of the value-added chain are produced abroad within an affiliate or subsidiary. This relocation is also called in-house offshoring. OECD (2007) notes that offshoring via the establishment of a new affiliate is more common when OECD countries are offshoring to other developed countries. When OECD countries offshore to less developed countries the most common type of offshoring is usually subcontracting. Most of the host countries covered in this study are OECD countries, meaning that in-house offshoring should be the most common type of offshoring to these countries and this is what our database captures.

4. Unconditional and conditional employment volatility

In this section we will look at employment volatility across 24 European countries[6], differentiating between foreign and domestically owned enterprises. We start out by comparing the unconditional employment volatilities of FOEs and DOEs. This comparison performs a simple test as to whether firm-level employment volatility differs for these two firm groups, i.e. whether the overall volatility differs in the left-hand side of equation (9). Volatility is measured as a coefficient of variation (CV) for the time period 2001-2009. For better comparability, firms with fewer than 5 observations are excluded.

Next, to account for firm heterogeneity, we estimate conditional employment volatilities. We use propensity score matching with the nearest neighbour and a caliper (maximum propensity score distance) algorithm. As it is sometimes difficult to find a common support for treatment and artificial counterfactual groups, we match the three nearest neighbours and introduce a caliper of 0.05 or 0.10, meaning the three nearest neighbours are selected within a propensity score of 5% or 10%. A caliper of 10% is used in country-by-country analysis, and a caliper of 5% in the analysis of country groups. We use matching with replacement, meaning that the same firms from the artificial counterfactual can be used more than once as a match. (See Caliendo and Kopeinig (2008) for a discussion of options for matching algorithms and Leuven and Sianesi (2003) for psmatch2 module for Stata).

We use control variables from 2005 and estimate the conditional volatility as a cross-section over this period of analysis. The control variables are: logarithm of firm age, logarithm of firm employment, number of subsidiaries, logarithm of number of shareholders, peer group employment, logarithm of capital per employee, logarithm of labour productivity, industry dummies (NACE Rev 2, at 2-digit level) and country dummies.

Table 2 presents unconditional sales turnover and employment volatilities for FOEs and DOEs for each country separately. In addition, it gives a picture of the differences between conditional and unconditional volatilities for these two groups of enterprises. It can be observed that for the majority of countries unconditional sales turnover and employment volatilities are higher in FOEs than in DOEs. However, this is not a uniform result, since these differences are negative and statistically significant for several countries: turnover volatility is statistically significantly higher among domestic firms in France, Greece, Spain, the Czech Republic and Hungary, while employment volatility is higher among domestic firms in Greece and Spain. (Note that the Amadeus dataset is not a random sample and the estimated unconditional volatilities may not be representative of the whole population of firms.)

[6] We were able to increase the set of countries analysed here by adding Austria, Denmark, Greece, Hungary, Latvia and Lithuania as the employment and ownership data for these countries was available for a substantial number of firms, unlike the wage costs needed for the forthcoming sections.

Table 2. Unconditional and conditional volatilities by countries: Subsidiaries of foreign multinationals vs. domestic firms

	Unconditional volatility			Conditional volatility	
	FOE	DOE	Difference (FOE – DOE)	Difference after matching (FOE – DOE)	No. of obs.
Volatility of sales turnover					
Austria	0.227	0.217	0.010		200
Belgium	0.354	0.319	0.035+	0.046*	7115
Denmark	0.223	0.233	-0.010	0.005	4002
Finland	0.396	0.39	0.005	0.033*	4075
France	0.35	0.368	-0.019+	-0.011	6006
Germany	0.291	0.251	0.040+	0.045*	4463
Greece	0.375	0.432	-0.057+	-0.047*	1459
Italy	0.368	0.37	-0.002	0.018*	16730
Netherlands	0.338	0.299	0.039+	0.046*	2520
Norway	0.442	0.433	0.010	0.048*	23331
Portugal	0.301	0.337	-0.036	-0.007	1014
Spain	0.439	0.453	-0.014+	0.041*	91612
Sweden	0.417	0.384	0.033+	0.045*	16138
UK	0.388	0.374	0.014+	0.013*	24459
Bulgaria	0.642	0.611	0.031+	0.022	1502
Czech Rep.	0.388	0.411	-0.024+	-0.015	3525
Estonia	0.549	0.564	-0.016	0.002	2060
Hungary	0.444	0.472	-0.028+		148
Latvia	0.664	0.671	-0.007	-0.001	1262
Lithuania	0.515	0.502	0.013	0.019	2231
Poland	0.416	0.362	0.054+	0.041*	11117
Romania	0.891	0.67	0.221+	0.161*	679
Slovakia	0.501	0.444			58
Slovenia	0.379	0.381	-0.003	0.008	2087
Volatility of employment					
Austria	0.187	0.182	0.005	0.042*	682
Belgium	0.25	0.225	0.024+	0.029*	7116
Denmark	0.162	0.153	0.010	0.016*	4211
Finland	0.265	0.264	0.0004	0.011	3853
France	0.239	0.248	-0.009	-0.009	5453
Germany	0.194	0.159	0.035+	0.036*	3867
Greece	0.067	0.120	-0.053+	-0.056*	1464
Italy	0.36	0.323	0.037+	0.034*	15990
Netherlands	0.285	0.27	0.015	-0.011	2273
Norway	0.295	0.285	0.009	0.019*	17611
Portugal	0.18	0.197	-0.017	-0.017	656
Spain	0.286	0.298	-0.012+	0.010	90395
Sweden	0.324	0.308	0.016+	0.029*	16169
UK	0.281	0.26	0.020+	0.017*	24323
Bulgaria	0.461	0.445	0.016	-0.017	1523
Czech Rep.	0.318	0.287	0.031+	0.038*	3378
Estonia	0.311	0.317	-0.006	-0.006	2003
Hungary	0.157	0.208	-0.051		79

Latvia	0.332	0.338	-0.005	-0.01	1241
Lithuania	0.35	0.317	0.033+	0.012	2233
Poland	0.245	0.189	0.056+	0.033*	10778
Romania	0.446	0.399	0.047+	0.039	680
Slovakia	0.353	0.359	-0.006		58
Slovenia	0.242	0.251	-0.01	-0.005	2180

Notes: Volatility is estimated as a coefficient of variation (CV) over the years 2001-2009, control variables are from 2005. Firms with fewer than 5 observations are excluded, except for Denmark where firms with a minimum of 4 observations were used. Conditional volatilities are not estimated for some countries due to the small sample size. + indicates statistical significance of the difference in unconditional volatility (based on a t-test). * indicates statistical significance of the difference in conditional volatility based on bootstrapped standard errors.

The estimation of conditional volatilities enables us to compare FOEs and DOEs with similar characteristics. The estimated figures presented in Table 2 imply that FOEs tend to have larger employment volatility than similar DOEs. The difference in the volatility of sales turnover in favour of FOEs is significantly positive for 11 countries out of the 19 for which these estimates could be assessed. (We could not apply propensity score matching for some countries as there was an insufficient number of observations and a lack of common support for matching.) The employment volatility is statistically significantly higher in FOEs than in DOEs in 10 countries out of the 19. There is only one country, Greece, where this relationship is the other way around, i.e. the conditional volatilities of sales turnover and employment are statistically significantly higher among DOEs than among FOEs.

Next, we compare sales turnover and employment volatilities for two subsets of the pooled datafile: Western European and Central and Eastern European countries.[7] These two groups are differentiated throughout the paper as the income levels and institutional backgrounds differ substantially between these country groups. We discuss the institutional differences in more detail in Section 5. In addition, we assess volatility separately for services and manufacturing companies. The estimated volatilities presented in Table 3 are indicative of the existence of the following regularities or "stylised facts". First, volatility of sales turnover is larger than volatility of employment. (This is a standard result in the related literature which can be explained by inelastic labour demand.) Second, unconditional volatilities of sales turnover and employment are higher in services than in manufacturing. Third, conditional on firm characteristics, both sales turnover and employment are more volatile in the subsidiaries of foreign multinationals than in domestically owned companies.[8]

[7] WE countries are: Belgium, Finland, France, Germany, Italy, the Netherlands, Norway, Portugal, Spain, Sweden and the UK. CEE countries are: Bulgaria, the Czech Republic, Estonia, Poland, Romania, Slovakia and Slovenia. The same groups of countries are used in the forthcoming section on labour demand equations.

[8] Although it is not the aim of this paper to compare multinationals with domestic and foreign owners, we can still distinguish these groups in our data. The conditional employment volatility is higher among foreign-owned multinationals than among domestically owned multinationals in manufacturing, while the conditional difference is not statistically significant or becomes negative in services.

Table 3. Unconditional and conditional volatilities by country groups: Subsidiaries of foreign multinationals vs. domestic firms

	Unconditional volatility			Conditional volatility	
	FOE	DOE	Difference (FOE – DOE)	Difference after matching (FOE – DOE)	No. of obs.
Volatility of sales turnover					
WE Manufacturing	0.336	0.344	-0.008+	0.024*	47124
WE Services	0.428	0.449	-0.022+	0.037*	152066
WE difference (services – manufacturing)	0.092+	0.105+			
CEE Manufacturing	0.441	0.384	0.057+	0.031*	7486
CEE Services	0.503	0.449	0.054+	0.037*	14048
CEE difference (services – manufacturing)	0.062+	0.065+			
Volatility of employment					
WE Manufacturing	0.236	0.236	-0.0003	0.023*	45705
WE Services	0.302	0.306	-0.004+	0.021*	143462
WE difference (services – manufacturing)	0.066+	0.070+			
CEE Manufacturing	0.285	0.224	0.062+	0.034*	7362
CEE Services	0.326	0.245	0.081+	0.030*	13745
CEE difference (services – manufacturing)	0.041+	0.021+			

Notes: See notes for Table 2 and footnote no 6.

The results for unconditional and conditional volatility are somewhat different in the groups of WE and CEE countries. The FOEs are less volatile than DOEs in WE countries before firm characteristics are controlled for and this difference reverses to become positive after the control for firm characteristics. On the other hand, foreign-owned firms are more volatile than domestically owned firms before and after firm characteristics in CEE are controlled for and the difference in volatility diminishes by roughly half after matching. A possible reason for these diverging outcomes is that foreign firms have somewhat different characteristics in WE and CEE, and also that foreign firms operate in less volatile industries in WE and in more volatile areas in CEE. This finding is in accordance with the implications from the theoretical literature (Cunat and Melitz (2012)) that more flexible labour market institutions in CEE may attract more volatile FDI.

Appendix 2 presents the probit models behind these propensity score estimates. The appendix shows that the "propensity to be a foreign-owned firm" is often different in WE and CEE in terms of industry variables, meaning there are differences in the concentration of FDI to certain industries. For example there is relatively more FDI in labour-intensive manufacturing industries in the CEE countries (textiles and wearing apparel, wood products and furniture manufacturing) and in some volatile manufacturing industries (non-metallic mineral products, fabricated metal products, electrical equipment, and motor vehicle manufacturing). The

electrical equipment industry is one of the largest in the sample and one of the most volatile, like it is in the study of Cunat and Melitz (2012).

Second, these country groups differ in the conditional employment volatility of foreign firms. While there are hardly any differences in conditional turnover volatility between WE and CEE, the difference in conditional employment volatility is somewhat higher among foreign firms in CEE than foreign firms in WE. A "similar" foreign firm has 7-8% higher sales turnover volatility in WE than a DOE does and 8% higher sales turnover volatility in CEE, whereas a "similar" foreign firm has 7-10% higher employment volatility in WE and 12-15% higher employment volatility in CEE. This indicates that foreign firms are more prone to volatile employment in CEE than in WE.

The following section will investigate whether differences in labour demand elasticity could explain the higher employment volatility of foreign firms.

5. Elasticity of labour demand

5.1. Estimation methodology

We estimate the following labour demand equation, assuming that capital is fixed in the short-run and that employment is adjusted on a given output, y_{it} (a similar approach to Barba Navaretti (2003); and Görg et al. (2009)):

$$l_{it} = \alpha_0 + \alpha_1 l_{it-1} + \beta_1 w_{it} + \beta_2 y_{it} + \tau_t + \gamma_s + \varepsilon_{it} \tag{11}$$

where l_{it} is log(employment) in firm i at time t (t=1, …,9); w_{it} is log(real labour cost per employee); y_{it} is log(real output); τ_t notes time dummies and γ_s sector dummies (NACE 2-digit industries). Estimations covering the data from multiple countries include time dummies for each country, i.e. time*country dummies. Sector dummies are included in the base specification. However, for some estimations sector dummies were excluded when specification tests indicated poor fit of the specification or unfeasible coefficients were produced. Nominal variables are deflated by 2-digit industry level GDP deflators to obtain real values, see also the discussion in the data section. The coefficient α_1 captures firms' employment persistence (speed of adjustment = $1 - \alpha_1$). The coefficient β_1 measures short-term wage elasticity of labour demand and β_2 short-term output elasticity of labour demand. Long-term elasticities can be found by dividing short-term elasticities by the speed of adjustment.

We introduce the interaction terms with foreign ownership to test for the differences in the labour demand elasticities of domestic and foreign firms:

$$\begin{aligned} l_{it} &= \alpha_0 + \alpha_1 l_{it-1} + \beta_1 w_{it} + \beta_2 y_{it} \\ &+ \alpha_2 FO_i \times l_{it-1} + \beta_3 FO_i \times w_{it} + \beta_4 FO_i \times y_{it} + \tau_t + \gamma_s + \varepsilon_{it} \end{aligned} \tag{12}$$

where FO_i takes the value "1" when a company is foreign-owned and the value "0" when a company is domestically owned. Coefficients of the interactive variables capture the differences between FOEs and DOEs in employment persistence and short-term labour demand elasticities. If the speed of employment adjustment is higher in FOEs than in DOEs, we will observe the coefficient α_2 to be negative and statistically significant. If the short-term

wage elasticity of labour demand is higher in absolute terms for FOEs, we will observe coefficient β_3 to be negative and statistically significant. Similarly, if the short-term output elasticity of labour demand is higher in FOEs than in DOEs, β_4 will be positive and statistically significant.

5.2. *Elasticity of labour demand: Differences between FOEs and DOEs across countries*

Regression equation (12) is estimated by the system GMM method[9] developed by Arellano and Bover (1995) and Blundell and Bond (1998). We employ a two-step system GMM estimation with Windmeijer-corrected standard errors.[10] The lagged employment and real turnover are treated as endogenous variables in the model; real wages are treated as endogenous, pre-determined or exogeneous dependent on the coefficients and specification tests. We choose the dynamic form of our labour demand equation and the set of instruments from the serial correlation tests (Arellano and Bond, 1991) and the Hansen test for overidentifying restrictions (Hansen, 1982). We imply Hansen's test for overidentifying restrictions for testing the validity of the joint set of instruments. As is usual for system GMM estimations, the overidentification tests tend to reject the null hypothesis of no overidentification in large and heterogeneous samples. Arellano and Bond (1991) show that rejection takes place too often in the presence of heteroskedasticity. Our pooled sample of all countries is relatively large, which increases the probability that the tests of overidentifying restrictions are subject to type I error. The tests for second-order serial correlation are also subject to the criticism that they are inclined to type I error in samples with large cross-sections relative to the time dimension.

OLS and fixed effects (FE) estimations were also carried out to assess the sensitivity of the estimated coefficients to the various estimation techniques. The estimated coefficients for other explanatory variables (except for the lagged dependent variable) tend to be between the OLS and FE for wages and output, and are often larger than the OLS and FE for ownership-interacted wages and output. The endogeneity of wage and output against employment in DOEs and FOEs should be accounted for by the system GMM estimation as most of the Hansen tests applied to our regressions do not reject the null hypothesis of no overidentification of instruments.

Our first choice for the dynamic form is that specified in equation (12). If the specification tests described above reject the assumption of no second-order autocorrelation or the validity of instruments, or the coefficient of the lagged dependent variable does not lie within the brackets of fixed effects and OLS estimation, we use the specification where the second lag of the dependent variable is added to the RHS. Since the time dimension of the sample is 9 years at maximum, we include at most 2 lags of the dependent variable. If the specification tests and OLS and FE brackets are not satisfied for this dynamic form either, the third specification

[9] OLS and fixed effects (FE) estimations were also carried out. FE estimates are biased in dynamic panels (Nickell, 1981). Since employment and its lagged value are positively correlated, the FE estimate for the lagged dependent variable is downward biased. This also implies that the OLS estimate of the coefficient on the lagged dependent variable is upward biased. Thus the OLS and FE estimates of the lagged term determine a lower and upper bound for the estimated speed of adjustment. Note that the same boundaries could be applied for the other control variables included in the model only under assumption of their exogeneity, which in our specification is not valid. See Bond (2002) for this discussion. Difference GMM is not used in this paper as employment, output and wages are highly persistent time-series and hence their levels provide weak instruments for differences.

[10] We use the xtabond2 command for Stata, see Roodman (2009).

adds the first lag of wages and output to the RHS. As a result the applied dynamic form varies from country to country.

We also experimented with various sets of instruments and could not find a common set of instruments that would have been suitable for all countries. The differences in dynamic form and the set of instruments arise from different properties of the time-series across countries, cross-country differences in the time-dimension and object-dimension of the panel, and possibly also from differences in the institutions that shape the endogeneity of the explanatory variables.

We start out by estimating the labour demand relationship as specified in equation (12) separately for each country. Only firms with at least 5 consecutive observations for employment, wages and output, and without any gap in these series are included in the estimation sample. Firms that show yearly growth of 100% or more in employment, wages or output are excluded and taken as measurement error or merger/acquisition, which we cannot control for. There are 18 countries covered in this and the following sub-sections. The estimated effects for the interactive variables imply whether the elasticity of labour demand is different for FOEs and DOEs in each country. The estimated coefficients for specification (12) are presented in Tables 1 and 2 in Appendix C. Estimates for the interactive variables capturing the differences between short-term wage and output elasticities and speed of adjustment are insignificant for the majority of the countries covered. However, when the estimates indicate a faster speed of adjustment for foreign firms, it is always accompanied by greater (absolute) wage and output elasticity, while slower speeds come with lower elasticity. Consequently, all three indicators imply either greater or lower flexibility of labour adjustment for foreign firms.

Appendix C indicates that the speed of adjustment of foreign firms is statistically significantly higher in manufacturing in Italy and Slovenia and in services in Portugal and Bulgaria. The opposite is found in manufacturing in France and services in the Netherlands. The estimated coefficients on *FO*log(rwage)* are statistically significantly negative (implying larger elasticity in absolute terms in FOE) for manufacturing in Belgium and Italy, whereas they are statistically significantly positive for services in Finland and the Netherlands. The short-term output elasticity of labour demand is statistically significantly lower for foreign firms in manufacturing in France and in services in Finland and the Netherlands. Thus, country-by-country regressions do not yield conclusive results for the difference in labour demand between domestic and foreign companies. Grouping countries together in the groups of Western Europe and Central and Eastern Europe as in the previous section does not reveal any differences in foreign or domestic firms either (see Table 4).

There are even fewer statistically significant differences between domestic and foreign firms in long-run elasticities (see Appendix D). Long-run wage or turnover elasticity is found to be lower for foreign firms (in absolute value) in services in Finland and Spain, and higher in services in Italy. The speed of adjustment is on average higher in services and long-run elasticities are higher in manufacturing, which is to be expected given the smaller firm size in services and the higher substitutability of labour in manufacturing. The results by country groups presented in Table 4 do not indicate any significant differences between foreign and domestic firms in long-run elasticities either.

Table 4. Labour demand estimates of FOEs and DOEs, 2001-2009: country groups

	Western Europe		Central and Eastern Europe	
	Manufacturing	Services	Manufacturing	Services
	GMM SYS (3 .)	GMM SYS (3 5)	GMM-SYS (3 .)	GMM SYS (3 .)
	wage pre	wage pre	wage pre	wage ex
L.log(empl)	0.853***	0.611***	0.856***	0.737***
	(0.081)	(0.153)	(0.101)	(0.218)
L2.log(empl)	0.011			
	(0.077)			
Log(rwage)	-0.546***	-0.382***	-0.291**	-0.675***
	(0.085)	(0.136)	(0.125)	(0.242)
L.Log(rwage)	0.461***			
	(0.082)			
Log(rturn)	0.654***	0.250**	0.274***	0.504***
	(0.064)	(0.103)	(0.087)	(0.168)
L.Log(rturn)	-0.534***			
	(0.085)			
L.FO* log(empl)	-0.073	0.207	-0.014	-0.082
	(0.112)	(0.134)	(0.092)	(0.265)
L2.FO* log(empl)	0.087			
	(0.100)			
FO*log(rwage)	0.018	0.120	0.106	0.255
	(0.072)	(0.165)	(0.102)	(0.223)
L. FO*log(rwage)	-0.034			
	(0.073)			
FO*log(rturn)	-0.001	-0.177	-0.067	-0.105
	(0.066)	(0.134)	(0.078)	(0.188)
L. FO*log(rturn)	0.003			
	(0.055)			
Sector dummies	yes	yes	yes	yes
Year*country dummies	yes	yes	yes	yes
# of obs.	232058	718913	30648	58701
# of groups	41004	114224	4945	9721
Min obs. gr.	2	3	3	3
Mean obs. gr.	5.659	6.294	6.198	6.039
Max obs. gr.	7	8	8	8
# of instruments	211	188	182	158
Hansen p	0.123	0.441	0.601	0.555
AR(1) test	-8.056	-3.144	-7.809	-2.958
AR(2) test	0.392	1.281	-1.192	-0.926
FDI in sample	0.187	0.158	0.416	0.334

Notes: System GMM estimations. Dependent variable: log(employment), 2001-2009. Two-step estimators with Windmeijer-corrected cluster robust standard errors in parentheses. Lagged employment and turnover are treated as endogenous; wages are treated as endogenous, pre-determined or exogenous dependent on specification tests. Lag length of GMM type instruments are reported at the top of the column. *, **, *** indicate statistical significance at the 10%, 5% and 1% level of significance, respectively. See footnote no 6 for the list of host countries covered.

Overall we do not find similar conclusive results for foreign firms' higher speed of adjustment to those found by Barba Navaretti et al. (2003). However, they used difference GMM for estimating the labour demand equations, which might be poorly identified due to weak instruments in estimations with highly persistent variables (see the discussion by Bond (2002)). Our results are in line with the findings of Buch and Lipponer (2010) and Hakkala et al. (2010), who find no statistically significant differences between the labour demand of foreign and domestic firms in Germany and Sweden. However, the results seem to be country-specific, as in some countries the differences between foreign and domestic firms are large and statistically significant. French and Spanish foreign firms, for example, seem to behave much more inelastically than their domestic counterparts, and it is worth noting that

these countries have relatively strict employment protection legislation. The remaining sections of the paper investigate whether the differences between domestic and foreign firms can be explained by the home and host country labour market institutions.

5.3. Elasticity of labour demand: Labour market institutions

This section analyses whether labour market institutions could have an effect on labour demand elasticities and whether institutions could explain the differences in elasticities of FOEs and DOEs. We separate the sample into domestically and foreign-owned firms and analyse how labour market institutions affect the elasticity of labour demand in the two groups. For this purpose, we introduce interaction terms with measures of labour market regulations to the labour demand equation and estimate the following specification on two subsamples, DOE and FOE:

$$\begin{aligned} l_{it} &= \alpha_0 + \alpha_1 l_{it-1} + \beta_1 w_{it} + \beta_2 y_{it} \\ &+ \alpha_2 INST_{ct} \times l_{it-1} + \beta_3 INST_{ct} \times w_{it} + \beta_4 INST_{ct} \times y_{it} + \tau_t \times \eta_c + \gamma_s + \varepsilon_{it} \end{aligned} \tag{13}$$

where $INST_{ct}$ denotes the measure of labour market regulations in country c at time t and η_c denotes a set of country dummies.

We include two measures of labour market regulations in the regressions: union density, which is based on statistics from the OECD and ICTWSS database by Visser (2011), and the OECD's employment protection legislation (EPL) index (Version 2 published in 2009).[11] Appendix E presents the average values of these measures for 2001-2009 across the countries covered and the USA. Despite significant differences in income and wage levels within Europe (see Appendix F), the strictness of employment protection legislation does not diverge much across European countries according to the OECD measure. The UK stands out with a low value for the EPL index, while Portugal and Spain have the highest EPL indices in Europe. The EPL index reflects formal regulations. However, there is evidence that the actual labour market flexibility is higher in CEE due to weak enforcement of EPL (Eamets and Masso (2005)). To show a picture of the institutional differences in the home and host countries of MNEs, we present the weighted average measures of EPL and union density for the home countries of foreign subsidiaries operating in each country in Appendix D.

We interpret both EPL and union density as proxies of labour market strictness. High union coverage is associated with more staggered employment adjustments and should lead to less elastic labour demand. We include interactive country-year dummies in the regressions as additional controls for country-specific time trends capturing any other country-specific developments that may affect the elasticity of labour demand.

We present the results separately for countries from Western Europe and those from Central and Eastern Europe as the enforcement of institutions could differ between these country groups and the overall cost of employment adjustment is different due to the vast differences in wage costs (see Appendix E). EPL tends to be much more persistent over time than union coverage does during 2001-2009 in Europe. Union density measures exhibit more dynamism.

[11] Our preferred measure of regulations related to collective bargaining would be union coverage. However, this measure is often missing and only irregularly available for many of the countries that our dataset covers and therefore we use union density.

The results (presented in Table 5 and 6) imply that more strictly regulated labour markets are associated with a lower speed of adjustment, lower wage elasticity for employment and lower output elasticity for employment among domestic firms, as could be expected. Union density declined in most countries and employment contracts become less strictly regulated in 2001-2009, although changes in EPL were less pronounced. Given these trends, the estimated coefficients imply that the reduction in the strictness of labour market regulations was associated with increasing elasticity of labour demand in 2001-2009.

Both of the measures we use (union density and EPL) yield similar results for domestic firms, since these two forms of labour market regulation tend to be complements: European countries that generally have more powerful unions also tend to have stricter EPL. (Please refer to the theoretical model developed by Bertola and Rogerson (1997) for an explanation of why these two institutions should be complements.) It is worth noting that EPL has a statistically significant effect on domestic firms' labour demand in WE, while union density has a statistically significant effect on labour demand in the CEE countries. In Western European countries, our measure of union power (union density) may yield insignificant results because it is not sufficiently correlated with the actual coverage of collective bargaining. This is less of a problem in the CEE countries since union agreements are not typically extended to non-union members, as is customary in several WE countries (such as France, Italy, and Spain), and therefore collective bargaining coverage and trade union membership have an almost one-to-one correspondence in CEE. On the other hand, the OECD's EPL index may be a better measure of the actual strictness of labour regulations in WE than in CEE due to better enforcement of labour regulations in WE. In conclusion, the insignificance of the estimated effects may stem from measurement errors in the indicators of the labour market institutions that we employ. When variables are measured with errors then the estimated effects tend to be biased towards zero.

The estimated results imply that a stricter regulatory environment is associated with less elastic labour demand for domestic firms. Surprisingly, the foreign firms' reaction to host country institutions is different in WE and in CEE. While foreign firms in WE tend to behave even more elastically in the presence of stricter labour market institutions, foreign firms in CEE have less elastic labour demand in a stricter institutional environment. There is no good theoretical explanation for the estimated effects for WE. One possible explanation is that FDI in WE and CEE have different motivations and characters. Another explanation is that as the sample of foreign-owned companies in WE is dominated by companies hosted by the UK and originating from the US (see also Figure 1), the more inelastic US firms in the UK, with its relatively weak EPL, are distorting the relationship. If the UK is removed from the sample of foreign firms in WE, the statistically significantly negative effect of the host institutions disappears. This specific case illustrates the importance of also controlling for home country institutions in the estimations of host country effects, as we do in the following estimations (Tables 5 and 6).

Differences in the elasticity of labour demand between FOEs and DOEs could be influenced by institutional differences in the home and host countries of multinationals. Table 5 and Table 6 test for the relevance of home country institutions in MNEs' labour demand. These results are more consistent across country groups and imply that FDI from countries with stricter labour market regulations tends to have less elastic labour demand. This result could be interpreted as an indication of spillover effects of institutions from home to host countries within firms. However, this interpretation may not be valid, as the decision to invest in a

particular country is subject to both home and host institutions, and we are not controlling for host country institutions in these regressions.

To address these concerns we introduce a variable which is the ratio of the measures of labour market regulations (EPL index, union density) in the host and home countries. This ratio is calculated for each subsidiary of a foreign-owned company and is variable over time and across all bilateral pairs of home-host relationships. The decision to invest in a company in a particular country might be motivated by the difference in host and home institutions. Firms in countries with strict regulations might look for investments in countries with weak regulations to reduce the costs of employment adjustment caused by demand volatility. Our results confirm this hypothesis; the institutional difference is statistically significant in manufacturing and the interaction terms indicate that the stricter the home country institutions are relative to those of the host country, the more elastic the labour demand is in the foreign-owned subsidiary of an MNE in the host country compared to the demand of other MNEs. This regularity also holds in the opposite direction: the weaker the home country institutions are relative to those of the host country, the less elastic the labour demand of MNEs is as it is less costly for them to adjust for employment changes in their home country.

Table 5. Labour market institutions and the elasticity of labour demand, manufacturing 2001-09, dependent variable: log(employment)

	DOEs in WE		FOEs in WE					
			Host institutions		Home institutions		Ratio of host and home institutions	
	EPL (3 4) wage pre	UD (3 .) wage pre	EPL (3 .) wage pre	UD (3 .) wage pre	EPL (3 4) wage pre	UD (3 5) wage pre	EPL (3 5)	UD (2 .) wage pre
L.lempl	0.621***	0.947***	0.759***	0.855***	0.792***	0.740***	0.828***	0.842***
	(0.154)	(0.109)	(0.117)	(0.092)	(0.109)	(0.080)	(0.072)	(0.050)
L2.lempl		-0.018						
		(0.103)						
lrwage	-0.637***	-0.507***	-0.229**	-0.137**	-0.174	-0.240***	-0.211***	-0.104**
	(0.184)	(0.086)	(0.103)	(0.069)	(0.131)	(0.077)	(0.062)	(0.045)
L.lrwage	0.334	0.410***						
	(0.232)	(0.092)						
lrturn	0.626***	0.590***	0.211**	0.176**	0.163*	0.284***	0.215***	0.125***
	(0.175)	(0.090)	(0.095)	(0.069)	(0.093)	(0.056)	(0.049)	(0.029)
L.lrturn	-0.359*	-0.512***						
	(0.213)	(0.121)						
L.INST*lempl	0.121**	-0.284	-0.004	-0.382***	-0.043	0.008	0.017	-0.002
	(0.056)	(0.183)	(0.053)	(0.141)	(0.036)	(0.064)	(0.022)	(0.006)
L2.INST*lempl		0.056						
		(0.198)						
INST*lrwage	0.001	-0.183	-0.004	-0.296**	-0.045	0.170*	0.057*	-0.017
	(0.069)	(0.149)	(0.054)	(0.117)	(0.054)	(0.097)	(0.031)	(0.014)
L.INST*lrwage	0.128	0.180						
	(0.087)	(0.188)						
INST*lrturn	0.030	0.125	0.016	0.201*	0.039	-0.121*	-0.041*	0.011
	(0.060)	(0.147)	(0.048)	(0.121)	(0.042)	(0.072)	(0.023)	(0.010)
L.INST*lrturn	-0.109	0.060						
	(0.080)	(0.209)						
Sector dummies	yes	yes	yes	yes	yes	yes	yes	yes
Year*country dummies	yes	yes	yes	yes	yes	yes	yes	yes
# of obs.	222483	188720	51021	51021	49234	49460	49234	49460
# of gro~s	33395	33395	7609	7609	7346	7377	7346	7377
Min.. gr.	3	2	3	3	3	3	3	3
Mea.. gr.	6.662	5.651	6.705	6.705	6.702	6.705	6.702	6.705
Max.. gr.	8	7	8	8	8	8	8	8
# of instr	167	209	212	212	168	188	204	256
Hansen p	0.597	0.897	0.063	0.031	0.225	0.285	0.442	0.214
AR(1)	-13.578	-5.774	-9.316	-8.020	-5.520	-7.910	-9.707	-11.007
AR(2)	2.523	0.579	-1.915	-1.877	-1.457	-1.858	-1.876	-1.712
INST in sample	2.664	0.259	2.165	0.282	1.795	0.253	1.595	1.602

Table 5 (continued).

	DOEs in CEE		FOEs in CEE					
			Host institutions		Home institutions		Ratio of host and home institutions	
	EPL (2 .)	UD (2 .)	EPL (3 .) wage pre	UD (2 .)	EPL (3 5) wage pre	UD (3 .) wage pre	EPL (3 5) wage pre	UD (3 5) wage pre
L.lempl	0.997***	0.889***	0.813***	0.839***	0.760***	0.755***	0.733***	0.731***
	(0.080)	(0.067)	(0.130)	(0.074)	(0.102)	(0.097)	(0.135)	(0.112)
L2.lempl	-0.084**							
	(0.035)							
lrwage	-0.156	-0.110	-0.341*	-0.226***	-0.111	-0.257**	-0.331***	-0.306***
	(0.112)	(0.082)	(0.178)	(0.065)	(0.158)	(0.104)	(0.126)	(0.112)
lrturn	0.173	0.139*	0.393*	0.223***	0.216**	0.267***	0.302***	0.288***
	(0.115)	(0.074)	(0.233)	(0.058)	(0.089)	(0.062)	(0.086)	(0.081)
L.INST*empl	-0.008	0.139	0.017	0.169	0.020	0.008	0.012	0.020
	(0.012)	(0.098)	(0.037)	(0.140)	(0.024)	(0.180)	(0.009)	(0.015)
L2.INST*empl	0.005							
	(0.011)							
INST*lrwage	0.027	0.220**	0.063	0.266**	-0.045	0.060	0.029	0.043
	(0.043)	(0.110)	(0.072)	(0.135)	(0.056)	(0.208)	(0.040)	(0.027)
INST*lrturn	-0.024	-0.165**	-0.085	-0.220*	0.017	-0.035	-0.017	-0.028*

	(0.041)	(0.083)	(0.098)	(0.120)	(0.033)	(0.143)	(0.021)	(0.016)
Sector dummies	yes	yes	yes	yes	yes	yes	yes	yes
Year*country dummies	yes	yes	yes	yes	yes	yes	yes	yes
# of obs.	14922	17890	12758	12758	11057	11173	11057	11173
# of gro~s	2953	2953	1992	1992	1725	1741	1725	1741
Min.. gr.	2	3	3	3	3	3	3	3
Mea.. gr.	5.053	6.058	6.405	6.405	6.410	6.418	6.410	6.418
Max.. gr.	7	8	8	8	8	8	8	8
# of instr	251	258	182	258	182	182	158	158
Hansen p	0.027	0.975	0.211	0.327	0.186	0.799	0.466	0.680
AR(1)	-8.911	-10.009	-7.762	-10.110	-6.841	-6.585	-4.421	-5.615
AR(2)	-0.119	-1.502	-0.019	0.577	-0.231	-0.232	-0.864	-0.662
INST in sample	2.277	0.241	2.174	0.219	2.177	0.295	1.174	1.083

Notes: See notes for Table 4 and footnote no 6 for the list of host countries covered. EPL denotes OECD employment protection legislation index and UD union density.

Table 6. Labour market institutions and the elasticity of labour demand, services 2001-09, dependent variable: log(employment)

	DOEs in WE		FOEs in WE					
			Host institutions		Home institutions		Ratio of host and home institutions	
	EPL (2 3) wage pre	UD (3 .) wage pre	EPL (3 4) wage ex	UD (2 4) wage pre	EPL (2 4) wage pre	UD (2 4)	EPL (3 .)	UD (3 5) wage pre
L.lempl	0.854***	0.711***	0.893***	0.666***	0.680***	0.756***	0.744***	0.743***
	(0.113)	(0.109)	(0.253)	(0.146)	(0.103)	(0.092)	(0.078)	(0.108)
lrwage	-0.485***		-0.382	-0.083	-0.341*	-0.567***	-0.131	-0.270**
	(0.114)		(0.502)	(0.107)	(0.197)	(0.095)	(0.116)	(0.135)
L.lrwage	0.389***					0.404***		
	(0.125)					(0.081)		
lrturn	0.766***	-0.124	0.111	0.113	0.194*	0.500***	0.043	0.164*
	(0.148)	(0.089)	(0.409)	(0.102)	(0.104)	(0.085)	(0.067)	(0.087)
L.lrturn	-0.576***					-0.443***		
	(0.123)					(0.098)		
L.INST*lempl	0.020	0.249***	-0.017	0.079	0.007	0.235*	-0.010	-0.014
	(0.029)	(0.084)	(0.077)	(0.134)	(0.031)	(0.124)	(0.022)	(0.011)
INST*lrwage	-0.008	-0.110	0.029	-0.071	0.021	0.017	-0.016	0.007
	(0.032)	(0.067)	(0.181)	(0.145)	(0.055)	(0.130)	(0.036)	(0.018)
L.INST*lrwage	0.093**					0.124		
	(0.043)					(0.139)		
INST*lrturn	-0.120**	0.034	-0.082	0.034	0.003	-0.011	0.031	0.003
	(0.052)	(0.102)	(0.192)	(0.117)	(0.042)	(0.089)	(0.024)	(0.015)
L.INST*lrturn	0.081**					-0.125		
	(0.036)					(0.113)		
Sector dummies	yes	yes	yes	yes	yes	yes	yes	yes
Year*country dummies	yes	yes	yes	yes	yes	yes	yes	yes
# of obs.	605306	605306	113607	113607	106897	107500	106897	107500
# of gro~s	96540	96540	17684	17684	16655	16740	16655	16740
Min.. gr.	3	3	3	3	3	3	3	3
Mea.. gr.	6.270	6.270	6.424	6.424	6.418	6.422	6.418	6.422
Max.. gr.	8	8	8	8	8	8	8	8
# of instr	186	212	146	211	211	227	239	187
Hansen p	0.227	0.060	0.977	0.136	0.500	0.382	0.045	0.042
AR(1)	-13.681	-7.046	-2.400	-4.823	-6.175	-8.605	-8.241	-5.195
AR(2)	-0.985	-0.228	-1.032	-1.902	-1.010	-1.977	-2.071	-1.485
INST in sample	2.644	0.276	2.145	0.312	1.841	0.252	1.545	1.818

Table 6 (continued).

	DOEs in CEE		FOEs in CEE					
			Host institutions		Home institutions		Ratio of host and home institutions	
	EPL (3 4)	UD (3 4) wage ex	EPL (2 .)	UD (2 .) wage pre	EPL (2 .)	UD (2 4) wage pre	EPL (2 .)	UD (2 3) wage pre
L.lempl	0.792***	0.653***	0.764***	0.597***	0.731***	0.646***	0.799***	0.733***
	(0.132)	(0.230)	(0.099)	(0.129)	(0.132)	(0.126)	(0.099)	(0.190)

lrwage	-0.296	-0.395	-0.108	-0.204**	-0.268	-0.299*	-0.138	-0.230
	(0.467)	(0.592)	(0.078)	(0.092)	(0.167)	(0.172)	(0.087)	(0.248)
lrturn	0.333	0.320	0.182***	0.234***	0.219**	0.299***	0.161***	0.205
	(0.240)	(0.612)	(0.066)	(0.072)	(0.107)	(0.099)	(0.059)	(0.126)
L.INST*lempl	0.009	0.012	-0.001	0.212*	-0.016	0.308*	-0.018	0.009
	(0.007)	(0.023)	(0.009)	(0.121)	(0.021)	(0.182)	(0.011)	(0.019)
INST*lrwage	-0.016	-0.089	-0.015	0.066	0.004	-0.012	-0.011	-0.020
	(0.180)	(0.295)	(0.014)	(0.117)	(0.054)	(0.174)	(0.022)	(0.029)
INST*lrturn	-0.053	0.031	0.002	-0.019	0.001	-0.067	0.008	0.009
	(0.103)	(0.228)	(0.017)	(0.124)	(0.035)	(0.116)	(0.012)	(0.018)
Sector dummies	yes	yes	yes	yes	yes	yes	yes	yes
Year*country dummies	yes	yes	yes	yes	yes	yes	yes	yes
# of obs.	39116	39113	19588	19588	17285	17374	17285	17374
# of gro~s	6518	6517	3204	3204	2810	2823	2810	2823
Min.. gr.	3	3	3	3	3	3	3	3
Mea.. gr.	6.001	6.002	6.114	6.114	6.151	6.154	6.151	6.154
Max.. gr.	8	8	8	8	8	8	8	8
# of instr	150	117	258	226	258	182	258	156
Hansen p	0.068	0.369	0.406	0.787	0.873	0.976	0.842	0.874
AR(1)	-5.047	-1.908	-6.583	-4.629	-4.554	-5.743	-6.350	-3.422
AR(2)	-0.540	-1.314	0.251	0.085	-0.308	-1.018	-0.201	-1.039
INST in sample	2.171	0.216	2.174	0.213	2.097	0.292	1.268	1.099

Notes: See notes for Table 4 and footnote no 6 for the list of host countries covered. EPL denotes OECD employment protection legislation index and UD union density.

The relative distances between the measures of host and home country institutions can explain only a small portion of the difference in labour demand elasticities between FOEs and DOEs. This result is at least partly caused by the use of measures which do not capture well the actual differences in institutions. The OECD's EPL index is based on formal legislation, which does not take account of the fact that law enforcement differs between countries. Labour market flexibility depends on norms and cultural attitudes in addition to formalised rules, and so the EPL index, which is a combination of different legislative procedures, is only a crude measure of the actual strictness of regulations. Union density is also a poor measure for capturing variations in actual union power across countries. Collective bargaining coverage would be a better measure but unfortunately the complete time series are not available for this variable for all the countries that our sample covers and so we could not use it.

The inclusion of country-level variables for the firm-level regression estimations together with the country-time interactions means that the effect of institutions could also be picked up by these dummies. In this context it is relevant that we can still observe statistically significant effects for institutions in addition to the country-specific time trends. However, because of the measurement problems discussed above, the variables that we employ have insufficient variation and do not capture the actual differences in labour market regulations to a full extent. Therefore we also carried out additional estimations which should capture the effect of institutions. These estimations, which are presented in the following section, can be considered as an additional consistency check to the empirical findings described above.

5.4. Estimations for two subsamples

We hypothesised that institutional differences in the home and host countries matter for labour demand elasticity of multinational enterprises since they can shift the adjustment of labour in response to economic shocks to countries where it is easier to make the adjustment.

It may be expected that this occurs only when the institutional framework is substantially different in the home and host countries, and so the impact of any such reallocation of adjustment should be more prevalent when the sample is restricted to a subset of firms for which these institutional differences are more pronounced. In order to see whether this is the case, we evaluate the elasticities of labour demand for two subsets of our sample. First, the subsidiaries of the US companies are compared with domestically owned firms in Western European (WE) countries. The US labour market institutions are substantially less strict than those of Western Europe, see Appendix E. Second, the subsidiaries of German firms are compared with domestic companies in the Central and Eastern European (CEE) countries. Germany's EPL index and union density is not significantly higher than those of the CEE countries (Appendix E), but as noted earlier there could be more substantial differences in the enforcement of the employment regulations (Eamets and Masso (2005)). Both of these groups represent the most important country of origin among foreign companies as US companies make up 25% of all the foreign companies in the WE sample and German companies make up 21% of all the foreign companies in the CEE sample.

Table 7. Labour market institutions: Estimations for two subsamples, 2001-09, dependent variable: log(employment)

	US FDI to Western Europe		German FDI to Central and Eastern Europe	
	Manufacturing	Services	Manufacturing	Services
	(lag 2 2) wage pre	lag(3 4) wage pre	(lag 3 5) wage pre	(lag 3 5) wage pre
L.lempl	0.639***	0.580*	0.942***	0.897***
	(0.073)	(0.306)	(0.110)	(0.177)
lrwage	-0.161*	-0.487	-0.178	-0.423**
	(0.090)	(0.441)	(0.134)	(0.183)
lrturn	0.252***	0.435	0.159	0.309**
	(0.063)	(0.291)	(0.108)	(0.132)
L.fdiempl	0.221*	0.125	-0.406**	-0.432**
	(0.132)	(0.206)	(0.186)	(0.200)
fdiwage	0.028	0.271	-0.195	-0.043
	(0.105)	(0.344)	(0.162)	(0.199)
fditurn	-0.067	-0.257	0.230	0.150
	(0.089)	(0.266)	(0.141)	(0.151)
Sector dummies	yes	yes	yes	yes
Year*country dummies	yes	yes	yes	yes
# of obs.	235078	629588	20759	42903
# of gro~s	35243	100318	3398	7130
Min.. gr.	3	3	3	3
Mea.. gr.	6.670	6.276	6.109	6.017
Max.. gr.	8	8	8	8
# of instr	153	168	158	158
Hansen p	0.021	0.884	0.772	0.416
AR(1)	-9.252	-2.075	-7.348	-5.025
AR(2)	1.102	-0.578	-1.737	-1.797
Share of FO in sample	0.054	0.039	0.138	0.088

Notes: See notes for Table 5.

Our first exercise focuses on subsidiaries of foreign MNEs from a country with mostly unregulated labour markets, the USA, in a group of countries with relatively strict labour market institutions, Western Europe.[12] The results are presented in Table 7. The estimated figures indicate that in comparison to domestic companies, the subsidiaries of the US multinationals in Western Europe have more persistent labour adjustment. This implies that

[12] Franco, C. (2013) argues that as there is no substantial technological gap between the USA and the OECD countries, the US resource-seeking FDI in OECD countries is not looking for natural resources or cheap labour but is instead looking for technological resources that could complement or augment the resources at home.

when the country of origin has a less regulated labour market environment, the subsidiaries of an MNE have less elastic labour demand than local companies in their host countries as it is less costly for the MNE to adjust labour input in the country of origin. The effects on the long-term and short-term wage and output elasticities of labour demand are not statistically significant.

In the second case, we assess the differences in labour demand elasticities between the subsidiaries of German firms in CEE countries and domestically owned firms. The results are in accordance with our hypothesis in this subsample as well. The speed of adjustment is substantially higher in the subsidiaries of German-owned firms than in the local companies in CEE. This suggests that foreign subsidiaries originating from home countries with a relatively strict institutional environment have a substantially higher speed of adjustment than domestic companies as it is more costly for the MNEs to adjust labour inputs in their home country. The effects on the long-term and short-term wage and output elasticities of labour demand are not statistically significant.

6. Conclusion

The purpose of the current study is to analyse how employment volatility differs in companies with foreign and domestic owners. Our analysis is based on an Amadeus firm-level dataset which covers more than 20 European countries. We derive employment volatility on the basis of standard labour supply and demand functions and demonstrate that it can be expressed as a combination of two components. The first component captures volatility due to changes in labour demand elasticity. Given a non-zero elasticity of labour supply, the elasticity of labour demand is positively related with employment volatility. The second component captures volatility in employment due to economic shocks. The more exposed a firm is to external shocks, the higher its employment volatility is. This decomposition indicates that the presence of foreign-owned companies may lead to higher employment volatility because FOEs react more sensitively to wage changes in the host country or because they are more tightly integrated in international markets and are per se more exposed to external shocks.

The estimations of conditional volatility based on propensity score matching yield the result that employment tends to be more volatile in the subsidiaries of foreign-owned MNEs than in domestically owned firms. However, larger volatility in foreign-owned enterprises is not unanimously caused by their more elastic labour demand. Our estimations imply that labour demand can be either more or less elastic in subsidiaries of foreign-owned multinationals, depending on the institutional environments of their home and host countries. When FDI originates from a region with a more flexible institutional environment (e.g. from the USA to Western European countries) then the elasticity of labour demand is smaller in absolute value in FOEs than in DOEs. In the opposite case (e.g. when FDI is originating from Germany to CEE countries) the elasticity of labour demand is higher.

A potential explanation for this finding is that in countries with rigid labour market regulations, multinational companies avoid changing domestic employment in response to economic shocks and instead use other margins of adjustment. They are more likely to do this than domestic firms are since it is easier for multinational companies to substitute between factor inputs. In addition to adjusting via alternative margins, they may also shift the adjustment of labour in response to economic shocks to subsidiaries which are located in countries with less regulated labour markets. Alternatively, multinational firms may choose

the host countries where they establish subsidiaries by looking at the labour market institutions: if they operate in sectors that have highly volatile demand then they are more likely to move to countries with a flexible institutional environment. In either case, the presence of foreign-owned firms would have an amplifying effect on the elasticity of labour demand in countries with flexible labour market institutions, whereas it would have a dampening effect in countries with rigid institutions.

Due to the limitations of the Amadeus data we can only study labour adjustment via the intensive margin, i.e by assessing changes in employment in incumbent companies. Employment may also be more volatile in foreign-owned multinationals than in domestically owned firms as they are more likely to establish and close down subsidiaries. The second of these two margins has been tested in the empirical literature and it has mostly been confirmed that FOEs are more "footloose", i.e. they have higher conditional exit rates, than DOEs (e.g. Bernard and Sjöholm (2003); Görg and Strobl (2003) Alvarez and Görg (2009); Wagner and Weche Gelübke (2011)). Investigation of the role that labour market institutions play in the entry and exit decisions of foreign multinationals would be an interesting area for further research that would complement the findings of the current study.

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Appendix A. Descriptive statistics

Table 1. Descriptive statistics of domestically and foreign-owned firms in WE countries, 2001-09

	Domestically owned			Foreign-owned		
	Mean	Std. Dev.	No of Obs.	Mean	Std. Dev.	No of Obs.
Employment	210.3	3597.2	958941	431.8	3873.9	190154
Real wages (th of EUR)	1384.0	11659.3	958941	5212.9	25066.6	190154
Real turnover (th of EUR)	261317.7	4830482.0	958941	682999.7	3958836.0	190154
Real capital per employee (th of EUR)	1768.8	39547.9	958640	4158.3	78291.3	190093
Real labour productivity (th of EUR)	6266.4	58843.9	958941	27686.7	228795.4	190154
Age of firm	23.8	15.5	957385	27.2	19.5	189819
No of subsidiaries	1.76	16.64	958941	2.49	20.80	190154
No of shareholders	2.45	4.85	912449	1.87	3.19	176160
Group's employment	4936.8	8151.0	958941	2754.7	4599.2	190154
Share of manufacturing	0.267	0.443	958941	0.309	0.462	190154

Note: The following countries are covered: Belgium, Finland, France, Germany, Italy, the Netherlands, Norway, Portugal, Spain, Sweden and the UK.
Source: authors' own calculations from the Amadeus dataset.

Table 2. Descriptive statistics of domestically and foreign-owned firms in CEE countries, 2001-09

	Domestically owned			Foreign-owned		
	Mean	Std. Dev.	No of Obs.	Mean	Std. Dev.	No of Obs.
Employment	161.2	621.8	66526	248.7	883.6	37561
Real wages (th of EUR)	9.9	8.8	66526	13.1	15.8	37561
Real turnover (th of EUR)	8525.7	26981.0	66526	13827.2	36123.8	37561
Real capital per employee (th of EUR)	47.3	279.2	66457	55.9	443.3	37556
Real labour productivity (th of EUR)	122.7	279.9	66526	199.1	704.5	37561
Age of firm	16.8	5.4	62806	15.3	4.6	35906
No of subsidiaries	0.49	2.30	66526	0.32	1.60	37561
No of shareholders	2.07	1.67	65752	1.43	0.92	36834
Group's employment	4301.0	7221.3	66526	2874.9	4893.5	37561
Share of manufacturing	0.314	0.464	66526	0.393	0.488	37561

Note: The following countries are covered: Bulgaria, the Czech Republic, Estonia, Poland, Romania, Slovakia and Slovenia.
Source: authors' own calculations from the Amadeus dataset.

Appendix B. Probit model used in propensity score matching.

Table 1. Probit model used in propensity score matching, marginal effects, manufacturing, 2005

	Dependent: Pr(Foreign owned=1, domestically owned=0)			
	Turnover volatility		Employment volatility	
	WE	CEE	WE	CEE
Log(age of firm)	-0.012***	-0.182***	-0.013***	-0.181***
Log(employment)	0.044***	0.040***	0.045***	0.044***
No of subsidiaries	-0.001***	-0.011**	-0.001***	-0.014**
Log(no of shareholders)	-0.050***	-0.191***	-0.050***	-0.191***
Log(group's employment)	-0.032***	-0.061***	-0.032***	-0.058***
Log(capital per employee)	-0.004***	0.028***	-0.005***	0.029***
Log(labour productivity)	0.016***	0.010	0.017***	0.012*
Industries[a)], manufacture of (base: food):				
beverages	0.021	0.094*	0.018	0.088*
tobacco products	0.149**	-0.039	0.151**	-0.034
textiles	-0.040***	0.119***	-0.040***	0.130***
wearing apparel	-0.038***	0.212***	-0.041***	0.223***
leather and related products	-0.015	0.045	-0.012	-0.000
wood and of products of wood	-0.044***	0.095**	-0.046***	0.098**
paper and paper products	0.062***	0.183***	0.063***	0.181***
printing and reproduction of recorded media	-0.018*	0.014	-0.018*	0.016
coke and refined petroleum products	0.186***	-0.093	0.169***	-0.060
chemicals and chemical products	0.204***	0.115***	0.209***	0.133***
basic pharmaceutical products	0.255***	0.244***	0.261***	0.263***
rubber and plastic products	0.109***	0.219***	0.109***	0.225***
other non-metallic mineral products	0.008	0.140***	0.008	0.152***
basic metals	0.036***	-0.022	0.037***	-0.013
fabricated metal products	0.035***	0.119***	0.036***	0.125***
computer, electronic and optical products	0.186***	0.128***	0.191***	0.138***
electrical equipment	0.128***	0.249***	0.128***	0.241***
machinery and equipment n.e.c.	0.128***	0.092***	0.128***	0.092***
motor vehicles	0.165***	0.306***	0.164***	0.312***
other transport equipment	0.002	-0.049	0.003	-0.033
furniture	-0.048***	0.092**	-0.050***	0.095**
other manufacturing	0.095***	0.131**	0.096***	0.137***
repair and installation of machinery and equipment	0.072***	-0.095**	0.076***	-0.085**
Country dummies	Yes	Yes	Yes	Yes
No of obs.	47124	7486	45705	7362
Pseudo R^2	0.264	0.233	0.265	0.239
Predicted Y	0.124	0.379	0.125	0.374
Actual Y	0.190	0.402	0.191	0.399

Notes: See notes for Table 2.

[a)] The list of NACE Rev. 2 industries can be found at:
http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-07-015/EN/KS-RA-07-015-EN.PDF

Table 2. Probit model used in propensity score matching, marginal effects, services, 2005

	Dependent: Pr(Foreign owned=1, domestically owned=0)			
	Turnover volatility		Employment volatility	
	WE	CEE	WE	CEE
Log(age of firm)	-0.013***	-0.121***	-0.014***	-0.120***
Log(employment)	0.020***	0.022***	0.021***	0.025***
No of subsidiaries	-0.000***	0.002	-0.000***	-0.000
Log(no of shareholders)	-0.034***	-0.157***	-0.033***	-0.160***
Log(group's employment)	-0.017***	-0.030***	-0.017***	-0.028***
Log(capital per employee)	-0.005***	-0.007***	-0.005***	-0.007**
Log(labour productivity)	0.011***	0.036***	0.012***	0.039***
Industries[a)], (base: Electricity, gas, steam):				
Water collection, treatment and supply	0.031*	-0.202***	0.038*	-0.187***
Sewerage	-0.026	-0.231***	-0.026	-0.218***
Waste collection, treatment and disposal	-0.049***	-0.031	-0.048***	-0.011
Remediation activities and other waste management	-0.065***	-0.121	-0.066***	-0.099
Construction of buildings	-0.058***	-0.057*	-0.060***	-0.041
Civil engineering	-0.048***	-0.090***	-0.049***	-0.072**
Specialised construction activities	-0.056***	-0.060*	-0.056***	-0.045
Wholesale and retail trade and repair of motor vehicles	-0.029***	0.002	-0.029***	0.024
Wholesale trade, except of motor vehicles	0.088***	0.172***	0.088***	0.192***
Retail trade, except of motor vehicles	-0.042***	0.075**	-0.041***	0.095***
Land transport and transport via pipelines	-0.030***	-0.044	-0.029***	-0.035
Water transport	0.025*	0.024	0.028*	0.049
Air transport	-0.027**	-0.005	-0.028**	0.032
Warehousing and support activities for transportation	0.043***	0.125***	0.044***	0.146***
Postal and courier activities	-0.027*	0.207	-0.022	0.203
Accommodation	-0.004	-0.052	-0.002	-0.047
Food and beverage service activities	-0.050***	-0.033	-0.049***	-0.017
Publishing activities	0.009	0.149***	0.009	0.166***
Motion picture, video and television programme production	0.018	0.166**	0.021	0.211**
Programming and broadcasting activities	-0.015	-0.022	-0.013	0.008
Telecommunications	0.064***	0.231***	0.071***	0.226***
Computer programming, consultancy and related activities	0.093***	0.217***	0.098***	0.247***
Information service activities	0.033**	0.047	0.035**	0.101
Financial service activities, except insurance and pension funding	0.104***	0.309***	0.110***	0.349***
Activities auxiliary to financial services and insurance activities	0.056***	0.163***	0.057***	0.214***
Real estate activities	0.006	0.055	0.009	0.063*
Legal and accounting activities	-0.027***	0.113*	-0.021**	0.146**
Activities of head offices; management consultancy activities	0.091***	0.296***	0.094***	0.354***
Architectural and engineering activities; technical testing and analysis	0.024**	0.042	0.023**	0.067
Scientific research and development	0.089***	-0.195***	0.106***	-0.179***
Advertising and market research	0.081***	0.277***	0.086***	0.314***
Other professional, scientific and technical activities	0.046***	0.164*	0.051***	0.239***
Veterinary activities	-0.068***		-0.074***	
Rental and leasing activities	-0.007	0.198***	-0.008	0.214***
Employment activities	0.003	0.229*	0.005	0.236*
Travel agency, tour operator reservation service and related activities	0.017	0.028	0.017	0.044
Security and investigation activities	-0.021*	-0.142***	-0.020	-0.135***
Services to buildings and landscape activities	-0.070***	-0.172***	-0.071***	-0.157***
Office administrative, office support and other business support activities	0.064***	0.160***	0.067***	0.180***

Public administration and defence; compulsory social security	-0.069***	-0.023	-0.068***	0.035
Education	-0.054***	-0.213***	-0.053***	-0.195***
Human health activities	-0.052***	-0.179***	-0.050***	-0.178***
Residential care activities	-0.076***		-0.076***	
Social work activities without accommodation	-0.089***		-0.091***	
Creative, arts and entertainment activities	-0.056***	-0.090	-0.056***	-0.121
Libraries, archives, museums and other cultural activities	-0.076***		-0.074***	
Gambling and betting activities	-0.037***	-0.156***	-0.041***	-0.142**
Sports activities and amusement and recreation activities	-0.048***	-0.238***	-0.047***	-0.219***
Activities of membership organisations	-0.080***		-0.078***	
Repair of computers and personal and household goods	0.005	0.043	0.014	0.048
Other personal service activities	-0.004	-0.033	-0.002	0.021
Activities of households as employers of domestic personnel	-0.052		-0.051	
Country dummies	Yes	Yes	Yes	Yes
No of obs.	152066	14048	143462	13745
Pseudo R^2	0.227	0.255	0.226	0.259
Predicted Y	0.090	0.303	0.092	0.297
Actual Y	0.146	0.340	0.148	0.335

Notes: See notes for Table 2.

[a)] The list of NACE Rev. 2 industries can be found at:
http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-07-015/EN/KS-RA-07-015-EN.PDF

Appendix C. Labour demand equation estimates of FOEs and DOEs: country by country

Table 1. Labour demand estimates of FOEs and DOEs, manufacturing 2001-2009

	Belgium (lag 3 5)	Finland (lag 3 4)	France (lag 2 .) wage pre	Germany (lag 2 3)	Italy (lag 3 5) wage pre	Netherlands (lag 3 4)	Norway (lag 3 5) sec as instr	Portugal (lag 3 4) wage pre	Spain (lag 3 3) wage pre	Sweden (lag 3 .)	UK (lag 3 5)
L.log(empl)	0.975***	0.795***	0.695***	0.876***	0.761***	0.708***	0.733***	0.860***	1.015**	0.800***	1.018***
	(0.241)	(0.156)	(0.110)	(0.148)	(0.104)	(0.218)	(0.073)	(0.100)	(0.399)	(0.147)	(0.133)
L2.log(empl)	-0.123	0.004		-0.098*					-0.114	0.039	-0.156
	(0.156)	(0.145)		(0.055)					(0.332)	(0.134)	(0.115)
Log(rwage)	-0.088	-0.197*	-0.306**	-0.301**	-0.894***	-0.308	-0.253***	-0.143*	0.619	-0.122	-0.101
	(0.120)	(0.114)	(0.128)	(0.141)	(0.043)	(0.254)	(0.095)	(0.085)	(0.546)	(0.075)	(0.072)
L.log(rwage)					0.741***				-0.680		
					(0.096)				(0.589)		
Log(rturn)	0.089	0.226**	0.241***	0.178*	0.745***	0.312*	0.302***	0.174**	0.180	0.168***	0.126**
	(0.090)	(0.089)	(0.070)	(0.098)	(0.084)	(0.162)	(0.082)	(0.073)	(0.133)	(0.047)	(0.057)
L.log(rturn)					-0.530***						
					(0.103)						
L.FO*log(empl)	-0.308	0.105	0.158*	0.102	-0.235*	0.030	-0.112	0.077	-0.392	-0.146	-0.029
	(0.256)	(0.246)	(0.094)	(0.181)	(0.132)	(0.222)	(0.195)	(0.108)	(0.416)	(0.198)	(0.143)
L2.FO*log(empl)	0.265	-0.046		-0.100					0.321	0.172	0.052
	(0.201)	(0.198)		(0.078)					(0.343)	(0.197)	(0.135)
FO*log(rwage)	-0.193*	0.059	0.173	0.101	-0.020	0.196	-0.118	0.073	-0.139	-0.026	-0.026
	(0.116)	(0.162)	(0.111)	(0.156)	(0.042)	(0.252)	(0.247)	(0.104)	(0.393)	(0.035)	(0.080)
L.FO*log(rwage)					-0.226*				0.001		
					(0.117)				(0.286)		
FO*log(rturn)	0.132	-0.054	-0.135*	-0.034	0.079	-0.084	0.100	-0.071	0.102	0.008	0.002
	(0.092)	(0.134)	(0.077)	(0.121)	(0.085)	(0.178)	(0.211)	(0.087)	(0.201)	(0.040)	(0.067)
L.FO*log(rturn)					0.140						
					(0.089)						
Sector dummies	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
# of obs.	11123	4414	20695	3590	38471	2312	7112	1241	111476	13636	29736
# of groups	1716	806	3466	900	5986	364	1795	254	18420	2347	4890
Min obs. gr.	2	2	3	2	3	3	3	3	2	2	2
Mean obs. gr.	6.482	5.476	5.971	3.989	6.427	6.352	3.962	4.886	6.052	5.810	6.081
Max obs. gr.	7	7	8	7	8	8	6	8	7	7	7
# of instruments	133	109	186	121	118	110	106	98	75	169	133
Hansen p	0.858	0.321	0.677	0.653	0.758	0.851	0.214	0.891	0.942	0.176	0.298
AR(1) test	-2.615	-2.785	-7.471	-3.190	-6.505	-3.409	-8.407	-2.206	-1.840	-2.892	-5.291
AR(2) test	-1.795	-1.500	-1.611	-0.598	1.152	0.383	-0.451	0.450	0.790	-0.765	0.064
FDI in sample	0.379	0.247	0.403	0.368	0.167	0.486	0.066	0.137	0.066	0.103	0.470

Table 1 is continued on the next page.

Table 1 (continued).

	Bulgaria (lag 3 4)	Czech R. (lag 2 3)	Estonia (lag 2 4)	Poland (lag 3 .)	Romania (lag 2 .)	Slovakia (lag 2 2) wage pre	Slovenia (lag 2 4) wage ex, size*year
L.log(empl)	0.798***	0.746***	0.860***	0.852***	0.891***	0.791***	0.776***
	(0.183)	(0.117)	(0.255)	(0.117)	(0.136)	(0.110)	(0.184)
L2.log(empl)		0.001	-0.156				
		(0.029)	(0.097)				
Log(rwage)	-0.222	-0.270***	-0.285**	-0.221*	-0.199	-0.265**	-0.346
	(0.179)	(0.098)	(0.127)	(0.114)	(0.136)	(0.122)	(0.399)
Log(rturn)	0.328**	0.184**	0.301*	0.196*	0.218*	0.146*	0.163
	(0.128)	(0.080)	(0.160)	(0.104)	(0.112)	(0.081)	(0.149)
L.FO*log(empl)	0.041	0.070	-0.102	-0.028	0.052	-0.038	-0.270*
	(0.149)	(0.125)	(0.231)	(0.120)	(0.177)	(0.294)	(0.160)
L2.FO*log(empl)		0.057	0.080				
		(0.039)	(0.113)				
FO*log(rwage)	-0.009	0.125	-0.044	-0.002	0.111	-0.047	-0.039
	(0.178)	(0.104)	(0.213)	(0.129)	(0.134)	(0.176)	(0.229)
FO*log(rturn)	-0.005	-0.122	0.011	0.003	-0.091	0.042	0.102
	(0.122)	(0.094)	(0.174)	(0.096)	(0.128)	(0.188)	(0.171)
Sector dummies	yes	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes
# of obs.	3518	4661	1585	11744	2230	536	5696
# of groups	589	850	304	1967	313	85	908
Min obs. gr.	3	2	2	3	3	4	3
Mean obs. gr.	5.973	5.484	5.214	5.971	7.125	6.306	6.273
Max obs. gr.	8	7	6	8	8	8	7
# of instruments	110	121	126	170	218	82	114
Hansen p	0.445	0.059	0.621	0.108	0.964	0.645	0.670
AR(1) test	-3.852	-5.489	-2.319	-8.533	-4.403	-2.780	-3.560
AR(2) test	0.520	-0.089	-1.487	-1.506	-1.936	1.121	-1.045
FDI in sample	0.320	0.786	0.539	0.333	0.706	0.670	0.129

Notes: System GMM estimations. Dependent variable: log(employment), 2001-2009. Two-step estimators with Windmeijer-corrected cluster robust standard errors in parentheses. Lagged employment and turnover are treated as endogenous; wages are treated as endogenous, pre-determined or exogenous dependent on specification tests. Lag length of GMM type instruments are reported at the top of the column. *, **, *** indicate statistical significance at the 10%, 5% and 1% level of significance respectively.

Table 2. Labour demand estimates of FOEs and DOEs, services 2001-2009

	Belgium (lag 2 2)	Finland (lag 3 4) wage pre, sec as instr	France (lag 2 .) wage ex, size*year	Germany (lag 2 3) wage ex, size*year	Italy (lag 2 4)	Netherlands (lag 2 .) wage pre	Norway (lag 3 5) wage pre, sec as instr	Portugal (lag 3 4) sec as instr	Spain (lag 3 5) wage ex, size*year	Sweden (lag 2 2) wage ex, size*year	UK (lag 3 .) wage ex, size*year
L.log(empl)	0.724***	0.760***	0.808***	0.791***	0.420***	0.561***	0.774***	0.827***	0.772***	0.766***	0.426*
	(0.213)	(0.089)	(0.037)	(0.140)	(0.087)	(0.107)	(0.066)	(0.090)	(0.084)	(0.034)	(0.249)
L2.log(empl)	-0.005			-0.096**							0.122
	(0.096)			(0.038)							(0.215)
Log(rwage)	-0.833***	-0.333***	-0.629***	-0.144**	-0.828***	-0.371***	-0.139**	-0.167**	-0.291***	-0.207***	-0.264
	(0.172)	(0.114)	(0.072)	(0.058)	(0.055)	(0.082)	(0.061)	(0.081)	(0.111)	(0.058)	(0.183)
L.log(rwage)	0.567***		0.540***		0.410***					0.064	
	(0.185)		(0.089)		(0.072)					(0.062)	
Log(rturn)	0.425***	0.334***	0.710***	0.139**	0.461***	0.258***	0.284***	0.205**	0.395***	0.563***	0.201
	(0.146)	(0.095)	(0.046)	(0.057)	(0.096)	(0.096)	(0.061)	(0.084)	(0.071)	(0.036)	(0.170)
L.log(rturn)	-0.359***		-0.593***		-0.213**					-0.422***	
	(0.139)		(0.054)		(0.108)					(0.041)	
L.FO* log(empl)	-0.044	0.058	0.042	-0.024	0.091	0.255*	0.054	-0.130*	-0.185	0.038	-0.020
	(0.212)	(0.069)	(0.034)	(0.122)	(0.127)	(0.144)	(0.131)	(0.070)	(0.136)	(0.045)	(0.305)
L2.FO*log(empl)	-0.183			-0.082							-0.046
	(0.147)			(0.055)							(0.247)
FO*log(rwage)	0.015	0.259***	-0.003	-0.069	-0.035	0.202*	-0.032	-0.084	-0.067	-0.010	0.066
	(0.205)	(0.095)	(0.104)	(0.110)	(0.055)	(0.104)	(0.097)	(0.070)	(0.181)	(0.026)	(0.205)
L.FO*log(rwage)	0.003		0.046		-0.023					-0.009	
	(0.181)		(0.110)		(0.107)					(0.026)	
FO*log(rturn)	0.232	-0.193***	-0.078	0.070	0.036	-0.181*	0.012	0.087	0.054	-0.132**	-0.036
	(0.174)	(0.075)	(0.059)	(0.093)	(0.104)	(0.103)	(0.092)	(0.059)	(0.130)	(0.061)	(0.157)
L.FO*log(rturn)	-0.149		0.039		-0.024					0.137**	
	(0.157)		(0.064)		(0.138)					(0.058)	
Sector dummies	yes	yes	no	no	yes	yes	yes	yes	yes	no	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
# of obs.	27125		56306	9277	44915	5332	44634	2312	343149	59948	87274
# of groups	4369	2512	9709	2302	7651	885	11331	483	50756	8908	15066
Min obs. gr.	2	3	3	2	3	3	3	3	3	3	2
Mean obs. gr.	6.209	6.024	5.799	4.030	5.870	6.025	3.939	4.787	6.761	6.730	5.793
Max obs. gr.	7	8	8	7	8	8	6	8	8	8	7
# of instruments	85	148	174	106	158	186	137	149	94	90	138
Hansen p	0.417	0.023	0.306	0.273	0.034	0.236	0.377	0.440	0.089	0.011	0.637
AR(1) test	-4.578	-7.772	-14.595	-5.604	-4.169	-3.937	-12.187	-5.497	-9.265	-27.612	-1.706
AR(2) test	0.869	-2.876	1.471	0.419	0.207	-0.420	1.147	-1.454	0.070	1.842	-1.301
FDI in sample	0.408	0.264	0.285	0.223	0.154	0.334	0.071	0.126	0.058	0.124	0.372

Table 2 is continued on the next page.

Table 2 (continued).

	Bulgaria (lag 2 4) wage pre	Czech R. (lag 2 2)	Estonia (lag 3 4) wage pre	Poland (lag 2 .) wage pre	Romania (lag 3 5) wage pre	Slovakia (lag 2 3)	Slovenia (lag 3 .) wage ex
L.log(empl)	0.860***	0.671	0.840*	0.559***	0.610*	0.665***	0.719***
	(0.099)	(0.484)	(0.438)	(0.124)	(0.324)	(0.141)	(0.179)
L2.log(empl)				0.089***			
				(0.034)			
Log(rwage)	-0.224*	-0.741***	-0.282	-0.656***	-0.258	-0.261*	-0.219
	(0.126)	(0.164)	(0.228)	(0.085)	(0.195)	(0.136)	(0.211)
L.log(rwage)		0.402	0.015	0.276***			
		(0.393)	(0.222)	(0.094)			
Log(rturn)	0.178**	0.390**	0.633***	0.386***	0.246	0.230*	0.310***
	(0.081)	(0.175)	(0.158)	(0.071)	(0.206)	(0.120)	(0.101)
L.log(rturn)		-0.241	-0.418	-0.070			
		(0.178)	(0.260)	(0.087)			
L.FO* log(empl)	-0.358**	-0.127	-0.161	0.084	0.115	-0.018	-0.390
	(0.153)	(0.189)	(0.473)	(0.128)	(0.325)	(0.179)	(0.318)
L2.FO*log(empl)				-0.034			
				(0.045)			
FO*log(rwage)	-0.012	0.007	0.043	0.246**	0.085	-0.107	0.013
	(0.163)	(0.200)	(0.251)	(0.097)	(0.242)	(0.164)	(0.346)
L.FO*log(rwage)		0.142	-0.135	-0.134			
		(0.276)	(0.231)	(0.095)			
FO*log(rturn)	0.123	0.097	-0.478**	-0.216**	0.041	0.061	0.102
	(0.095)	(0.263)	(0.204)	(0.093)	(0.209)	(0.118)	(0.248)
L.FO*log(rturn)		-0.146	0.635*	0.107			
		(0.157)	(0.349)	(0.105)			
Sector dummies	yes	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes
# of obs.	6280	8009	5678	23681	2732	949	6815
# of groups	1020	1359	920	4744	397	178	1139
Min obs. gr.	3	3	3	2	3	3	3
Mean obs. gr.	6.157	5.893	6.172	4.992	6.882	5.331	5.983
Max obs. gr.	8	8	7	7	8	8	7
# of instruments	142	92	79	183	118	120	89
Hansen p	0.005	0.257	0.042	0.012	0.256	0.333	0.016
AR(1) test	-6.645	-1.542	-2.631	-2.533	-2.946	-4.836	-3.519
AR(2) test	1.084	-0.095	-0.683	-1.775	-0.503	-0.428	-2.529
FDI in sample	0.276	0.755	0.433	0.213	0.787	0.427	0.347

Notes: See notes for Table 1.

Appendix D. Estimated speed of adjustment and long-run elasticities: country by country

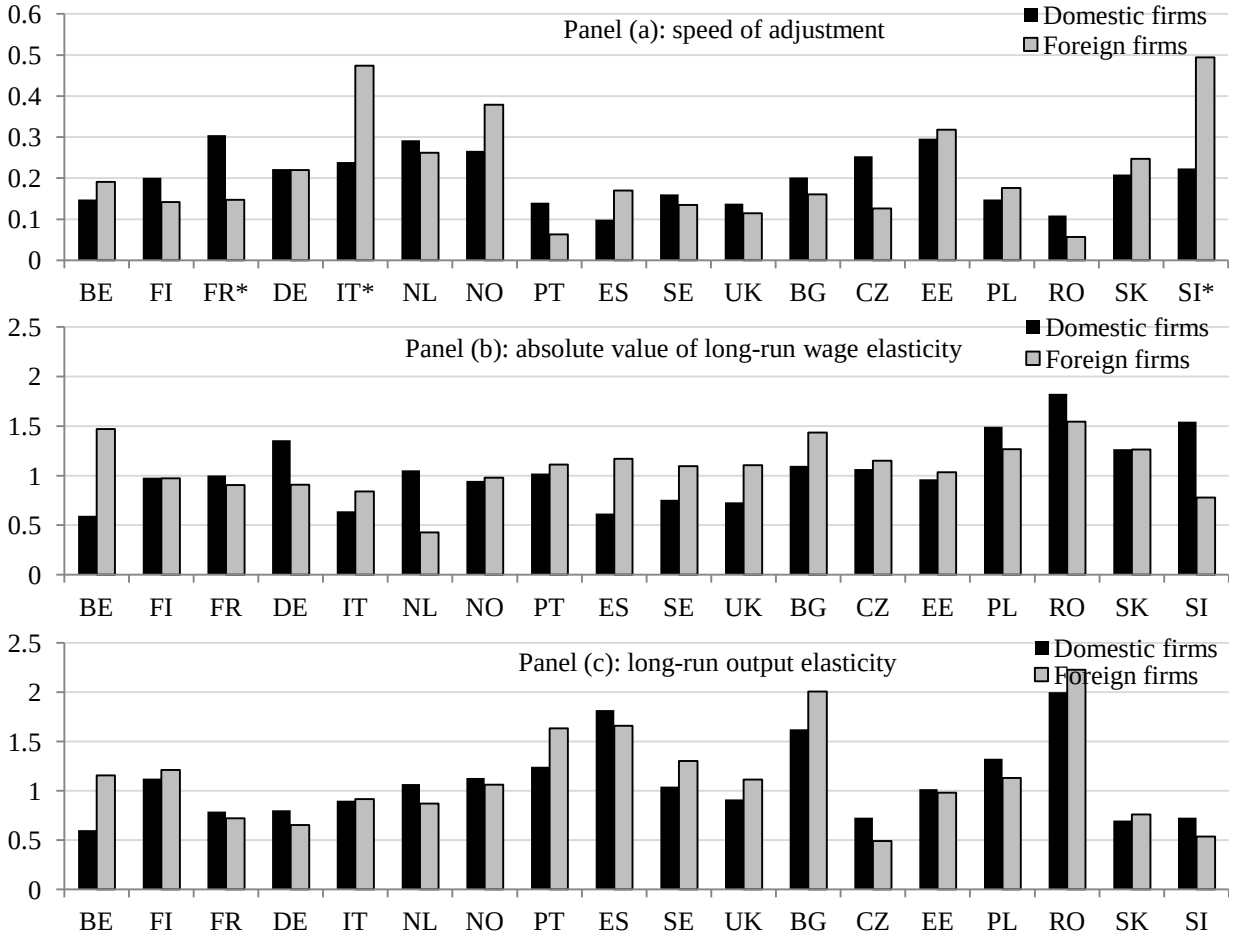

Figure 1. Manufacturing firms speed of adjustment, long-run wage and output elasticities.

Note: Based on coefficients presented in Appendix C Table 1. * indicates statistically significant difference between domestic and foreign firms at the 10% level of significance; statistical significance of difference in long-run elasticities is based on non-linear Wald-type test using testnl command in Stata.

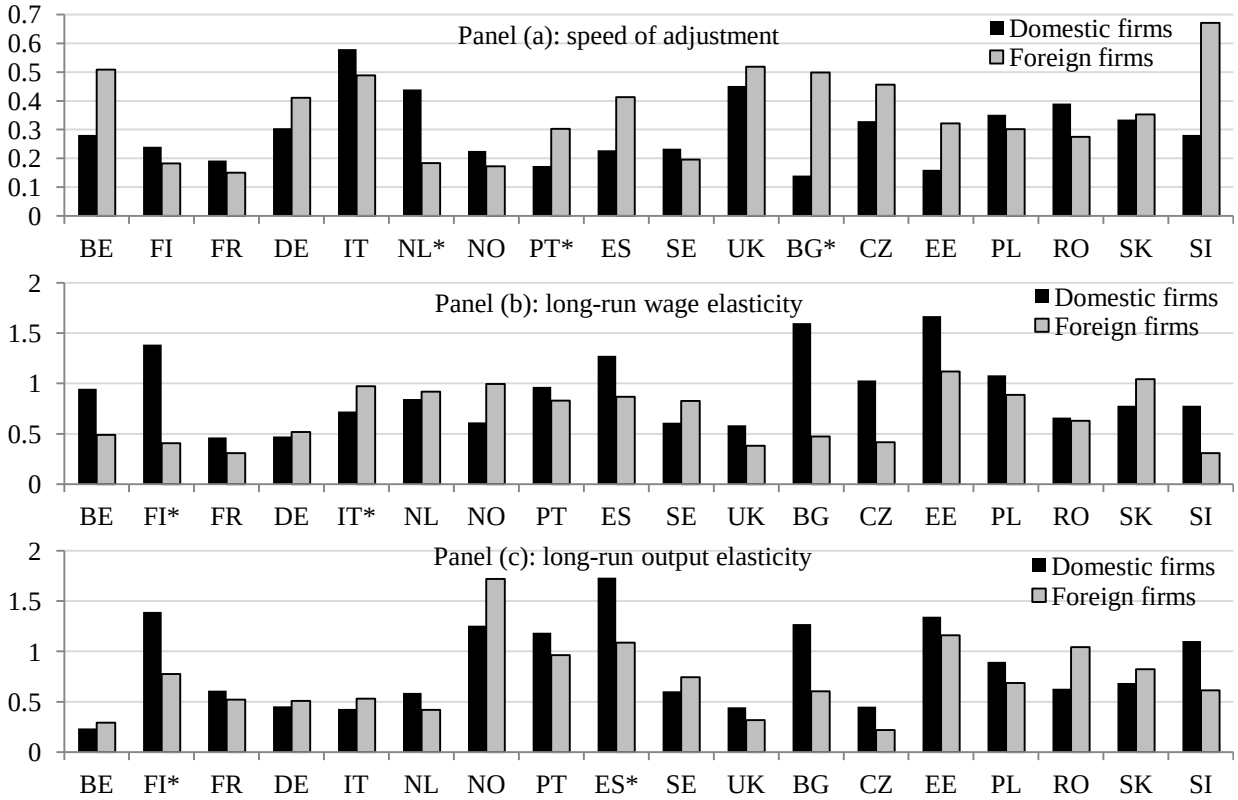

Figure 2. Services firms speed of adjustment, long-run wage and output elasticities.

Note: Based on coefficients presented in Appendix C Table 2. * indicates statistically significant difference between domestic and foreign firms at the 10% level of significance; statistical significance of difference in long-run elasticities is based on non-linear Wald-type test using testnl command in Stata.

Appendix E. Labour market institutions in host and home countries, average for 2001-2009

	Average EPL	Average EPL of home countries of foreign firms	Average union density	Average union density of home countries of foreign firms
Sample countries				
Austria	2.233	2.177	0.343	0.285
Belgium	2.500	1.964	0.522	0.221
Denmark	1.900	1.915	0.738	0.342
Finland	2.105	1.991	0.719	0.424
France	2.889	1.771	0.078	0.279
Germany	2.411	1.741	0.222	0.248
Greece	2.954	2.025	0.247	0.250
Italy	2.376	1.950	0.338	0.225
Netherlands	2.239	1.678	0.202	0.245
Norway	2.697	1.927	0.542	0.446
Portugal	3.387	2.438	0.212	0.200
Spain	3.025	2.062	0.155	0.233
Sweden	2.433	1.843	0.745	0.391
UK	1.094	1.635	0.286	0.219
Bulgaria	2.000	2.283	0.238	0.282
Czech Rep.	1.990	2.084	0.205	0.250
Estonia	2.290	2.211	0.099	0.520
Hungary	1.676	2.127	0.179	0.250
Latvia	2.500	2.141	0.185	0.388
Lithuania	2.800	2.113	0.131	0.399
Poland	2.061	2.145	0.198	0.271
Romania	2.676	2.182	0.355	0.271
Slovakia	1.874	1.950	0.243	0.246
Slovenia	2.570	2.150	0.345	0.267
Home countries of FDI in sample countries				
All countries	1.879		0.261	
USA	0.650		0.121	

Sources: Amadeus data, ICTWSS database by Visser (2011), OECD StatExtracts.

Appendix F. Monthly average labour cost, wages and salaries (including apprentices), 2008

	Wage cost in Euros, per employee in full-time units
European Union (27 countries)	3 141
European Union (15 countries)	3 682
CEE10 average	1046
Austria	3 847
Belgium	4 195
Denmark	4 539
Finland	3 712
France	4 110
Germany	3 846
Greece	2 391
Italy	3 430
Netherlands	4 203
Norway	5 918
Portugal	1 742
Spain	2 808
Sweden	4 428
United Kingdom	3 677
Bulgaria	374
Czech Republic	1 323
Estonia	1 149
Latvia	886
Lithuania	848
Hungary	1 164
Poland	1 089
Romania	648
Slovakia	991
Slovenia	1 991

Note: 10 employees or more.
Source: Eurostat, LCS 2008 [*lc_n08costot_r2*]