How important are plant and regional characteristics for labor demand? Plant-level evidence for Germany

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Abstract

To what extent depend employment decisions of individual plants on characteristics specific to the plant and to the local environment? We aim at answering this question by integrating insights from industrial organization as well as regional science into the framework of microeconomic labor demand. Resorting to static and dynamic regression models, this paper analyzes both the long-run and short-run relationships in detail. The analysis is based on the IAB Establishment Panel, a comprehensive data set on German plants, and covers the years from 2001 to 2006. Econometric results confirm the prominent impact of wages and output as predicted by economic theory as well as that of plant characteristics. In order to take account of spatial aspects, the impact of the regional characteristics is controlled for both on the level of counties and labor-market regions. Our results highlight the role that the plant's environment, measured both in the county and the labor-market region it is located in, exerts on labor demand. This refers especially to the spatial concentration of the sector the plant belongs to. Last, we find pronounced differences between Eastern and Western Germany with respect to the impact of plant and regional characteristics on plant-level labor demand.

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1 Introduction

Plant-level analyses on labor demand are often carried out without detailed references to plant characteristics or to the plants' local environment. However, empirical results from industrial organization as well as from regional science suggest to incorporate these two dimensions into research on the demand for labor, as they can considerably add to a refined understanding of the parameters driving employment and its growth at the microeconomic level.

Approaching employment dynamics from the side of industrial organization, a stylized fact can be seen in the negative interrelation between employment growth and plant age (Evans, 1987, Caves, 1998, or Hart, 2000). Another decisive impact comes from a plant's innovation activities (Audretsch/Dohse, 2007, Lachenmaier/Rottmann, 2007). Furthermore, the presence in foreign markets (Slaughter, 2001, Buch/Lipponer, 2010) can also influence the labor-demand elasticity at the plant level.

Coming from regional science, empirical research on agglomeration externalities puts high emphasis on the importance of specialization, diversity, and competition for regional employment dynamics (Glaeser et al., 1992, Henderson/Kuncoro/Turner, 1995, Blien/Südekum/Wolf, 2006, Combes/Magnac/Robin, 2004, Fuchs, 2009). However, Beugelsdijk (2007) and Raspe/van Oort (2008) argue that this relationship should most profoundly hold at the micro or firm level. Between single plants within a sector or region there is considerable heterogeneity, and within each plant complex processes of employment, output and productivity growth interact (Raspe/van Oort, 2008, 104). Hence, an analysis of labor demand at the level of the plant can give valuable evidence if the relationships found at the meso level also hold at the micro level. Surprisingly, with the notable exception of Blien/Kirchhof/Ludewig (2006), the few existing studies of Raspe/van Oort (2008), Hoogstra/van Dijk (2004) and Audretsch/Dohse (2007) that pick up this critism do not resort to labour-market theory as basis for their analyses.

The aim of this paper is to integrate insights from the two strands of research into the neoclassical analysis of labor demand in order to assess the importance of factors specific to the plants as well as to the region the plants are located in for the employment decisions of individual plants. In analyzing static and dynamic models we take a detailed look at both short-run and long-run relationships. Importantly, the dynamic model allows to estimate the effect of the explanatory variables on the growth rate of employment.

The analysis is based on the IAB Establishment Panel. It is an annual representative employer survey at individual establishments in Germany and provides a sound basis for research into the demand side of the German labor market. For the considered years from 2001 to 2006 it encompasses roughly 28,900 observations. The regional variables are added on the NUTS3-level. Since at this fine level of disaggregation high spatial dependence with neighboring counties is to be expected, we additionally consider labor-market regions that are delineated according to workers' commuting patterns.

The paper is structured as follows. Section 2 is dedicated to the theoretical model underlying the empirical analysis. Section 3 presents the empirical design and discusses econometric issues as well as data aspects and the variables used in the analysis. Estimation results are reported in section 4, while section 5 concludes with a summary of our results.

2 Theoretical background

The theoretical framework for our research question is based on the labor-demand function of firm i (Hamermesh, 1996, 22–33). It produces good Y under constant returns to scale with the production factors labor (L) and capital (K). We assume perfect competition in the goods and factor markets, i.e. the prices for labor (w), capital (r) and good Y (p) are exogenous for the firm. Labor and capital are available without any supply constraints.

Firm i's aim is to minimize costs for a given level of output. The cost function can be described in general terms as

$$C = C(w, r, Y), C_i > 0, C_{ij} > 0, \tag{1}$$

with $i, j = w, r$. Applying Shepard's Lemma yields the firm's factor demands

$$L^* = C_w = \frac{\partial C(.)}{\partial w} \tag{2}$$

and

$$K^* = C_r = \frac{\partial C(.)}{\partial r}. \tag{3}$$

In the following we adopt a CES production function for good Y,

$$Y = [\alpha L^\rho + (1 - \alpha) K^\rho]^{1/\rho}, \tag{4}$$

with the parameters α and ρ, $0 < \alpha < 1$, $-\infty \leq \rho \leq 1$. The CES cost function can be derived as

$$C = Y[\alpha^\alpha w^{1-\sigma} + [1 - \alpha]^\alpha r^{1-\sigma}]^{1/(1-\sigma)}, \tag{5}$$

with $\sigma = \frac{1}{1-\rho} \geq 0$. The ensuing demand for labor is

$$L = \frac{\partial C}{\partial w} = \alpha^\alpha w^{-\sigma} Y. \tag{6}$$

Taking logarithms results in

$$lnL = \alpha'' - \sigma lnw + lnY, \tag{7}$$

with α'' a constant.

3 Empirical design

3.1 Econometric issues

Our basic econometric model is directly derived from equation (7) and has the following form (see also Slaughter, 2001, Fabbri/Haskel/Slaughter, 2003 and Blien/Kirchhof/Ludewig, 2006):

$$l_{it} = \alpha + \beta_1 w_{it} + \beta_2 y_{it} + \mu_i + \nu_{it}. \tag{8}$$

l_{it} denotes the number of employees in firm i at time t, w_{it} is wage and y_{it} output. μ_i is a time-invariant error term that controls for any time-invariant heterogeneity not covered by the other variables, and ν_{it} denotes a time-varying error term. Since all variables enter in logs, the coefficients can be interpreted as elasticities. β_1 is the constant-output labor-demand elasticity, and β_2 is the demand elasticity for good Y.

Model (8) can be extended by characteristics specific to the plant and its environment:

$$l_{it} = \alpha + \beta_1 w_{it} + \beta_2 y_{it} + \gamma B_{it} + \delta R_t + \mu_i + \nu_{it}, \tag{9}$$

with B_{it} containing the plant-specific and R_t the region-specific variables.

In containing variables for both the plant and the region, model (9) combines information on two different levels of observation, with some of them not varying between plants or regions. This multilevel structure can result in inefficient estimates of the coefficients and in biased estimates of the standard errors especially of the variables for the higher level (Moulton, 1990). In order to deal with this problem clustering-robust linear regression techniques are used to estimate standard errors that recognize this clustering of the data. This method relaxes the independence assumption and requires only that the plant-level observations be independent across regions. By allowing any given amount of correlation within regions, clustering-robust techniques estimate appropriate standard errors when many observations share the same value on some but not all independent variables.

The static econometric model of labor demand specified in equations (8) and (9) neglects that employment decisions are often subject to adjustment processes that may take some time to be reflected in a change in the number of employees (Oi, 1962, Hamermesh/Pfann, 1996). Hence, the static models rather describe the plants' long-term behavior. Dynamic approaches, in contrast, explicitly address the short-run adjustment processes (Nickell, 1986). The inclusion of a lagged dependent variable allows for the presence of adjustment costs, which imply that the level of employment may deviate from its steady state as adjustment to the long-run equilibrium takes place:

$$l_{it} = \alpha + \beta_l l_{i,t-1} + \beta_1 w_{it} + \beta_2 y_{it} + \gamma B_{it} + \delta R_t + \mu_i + \nu_{it}. \tag{10}$$

In dynamic panel models such as (10), OLS estimates are biased and inconsistent if the lagged dependent variable is correlated with the error term, as it is frequent in dynamic panels with a short time dimension (Nickell, 1981). Equation (10) is therefore estimated with the system GMM estimator proposed by Arellano/Bover (1995) and Blundell/Bond (1998). In comparison to the difference GMM estimation technique of Arellano/Bond (1991) it allows the introduction of more instruments, which improves efficiency. However, any estimation method involving differencing equation (10) would eliminate the time-invariant variables. Since it would be informative to have the effect of these variables on the growth rate of labor demand not only in the static but also in the dynamic specifications, we resort to a method introduced by Nickell/Wadhwani/Wall (1992) and also used by Bellmann/Pahnke (2006), Blien/Kirchhof/Ludewig (2006) and Buch/Lipponer (2010). To avoid the elimination of the time-invariant variables, they include interaction terms of the time-constant variables with a time trend t:

$$l_{it} = \alpha + \beta_l l_{i,t-1} + \beta_1 w_{it} + \beta_2 y_{it} + \gamma B_{it} + \delta R_t + t\vartheta D_i + \mu_i + \nu_{it}. \tag{11}$$

D_i includes the time-invariant variables, whose influence on the growth rate of employment can now be estimated.

3.2 Data

For information on the level of the individual plants we resort to the IAB Establishment Panel, an annual representative employer survey at individual establishments in Germany (for details see Fischer et al., 2009). Approximately 16.000 establishments from all sectors of the economy and of all sizes are questioned on a large number of employment-related subjects, including employment development, business policy and development, innovations, wages and salaries, working times and general data on the establishment. The Establishment Panel was started in Western Germany in 1993 and in Eastern Germany in 1996. As a comprehensive longitudinal data set, it forms the basis for detailed research into the demand side of the German labor market.[1]

[1] English versions of the questionnaire can be downloaded under `http://fdz.iab.de/en/FDZ_Establishment_Data/IAB_Establishment_Panel/IAB_Establishment_Panel_Working_Tools.aspx`

We only include plants where it is guaranteed for all years that always the same unit is surveyed. This way, changes in employment due to strategic business activities like outsourcing or mergers and acquisitions are not considered. Furthermore, we consider only those sectors that are subject to market-based forces, i.e. where our assumptions of a cost-minimizing firm are appropriate. Hence, plants that belong to the public sector are excluded. In addition, those plants are excluded that express their business volume by the budget volume (administration and property budget), so that we also control for publicly owned establishments that are included in the market-oriented sectors. Last, sectors that are strongly dependent on geographical features (agriculture, fishing and mining) are not considered either. The period of observation covers the years from 2001 to 2006. Our final panel data set comprises a total of 24,088 observations on 3,011 plants.

The variables characterizing the plant's environment are calculated at the NUTS-3 level that comprise 439 *Kreise* and *kreisfreie Städte*. In order to control for any spatial spillover effects, we separately run estimations with the regional variables calculated at the level of 150 labor-market regions. They are defined according to the observations of workers' daily commuting patterns and calculated in analogy to Eckey/Kosfeld/Türck (2006). Table 1 lists all the data sources for the regional variables used.

Table 1: Data sources for the regional variables

Variables	Data source
population	Federal Statistical Office
area in km^2	Federal Statistical Office
GDP	Statistical Offices
accessibility	Federal Office for Building and Planning
number of employees	Federal Employment Office
number of plants and employees	Establishment History Panel of the IAB

3.3 Dependent variable

The dependent variable measuring employment is based on the total number of employees as on June 30 of the respective year. This figure comprises employees liable to social security as well as not liable to social security (civil servants, working proprietors and unpaid family workers) and other employees (mainly short-term employees).

Furthermore, in the IAB Establishment Panel the establishments are asked if they employ staff in addition to the total number of employees. This includes casual workers, trainees, freelancers under contract for services and agency workers. Since the last group experienced a boom starting in 2005, this additional staff is added to the total number of employees.

The sole concentration on the number of employees masks the fact that employees are very heterogeneous with respect to the number of hours worked per time period

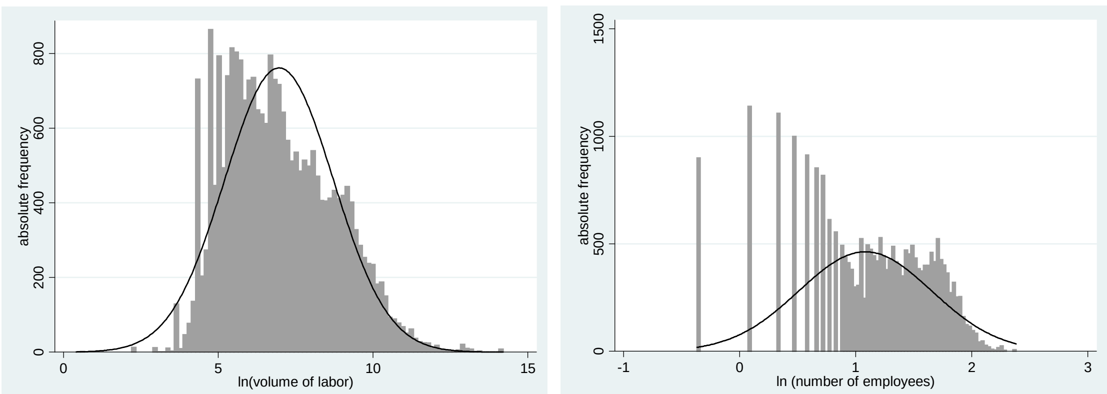
(Hamermesh, 1996). It might make a big difference if one enterprise has primarily full-time employees or primarily part-time employees, the latter resulting in a much higher number of persons employed. For example, the working hours of East and West German women differ considerably (Klenner, 2005, 207), which results in considerable differences in the relevance of part-time in the two parts of the country. Moreover, in the short run, enterprises might react to changes in product demand with overtime or short time rather than with hiring or firing new staff. Hence, using the number of employees as measure for the dependent variable might lead to biases if hours per worker are correlated with factor prices or output (Hamermesh, 1996, 68). For this reason we resort to the volume of labor as measure for plant-level employment l_{it}.

The IAB Establishment Panel provides us with detailed information on the number of hours worked for full-time and for part-time workers. First of all, the establishments are asked about the agreed working hours per week for full-time employees at present. As regards the part-time employees, the establishments are asked to group them according to working less than 15 hours per week, between 15 and 25 hours or more than 25 hours. Taking the total number of hours per week as reference, we can then calculate the number of full-time equivalents. The resulting number of hours worked by the full-time equivalents in an establishment is our dependent variable.

Figure 1 compares the distribution of the volume of labor with that of the number of employees (both in logs). The volume of labor corresponds considerably better to a normal distribution, which is represented by the bold solid lines. Hence, the assumptions of the linear regression model underlying the analysis (see Greene, 2003, 10) should be better met when resorting to the volume of labor. Importantly, however, the dynamic labor demand can be better captured.

Figure 1: Distribution of the volume of labor and the number of employees

of labor.pdf



3.4 Explanatory variables

Our explanatory variables can be divided threefold. For estimating the basic labor-demand equation (8) only variables for wages and output are needed. Influences on labor demand that are inherent to the single plant are covered by plant-specific variables, and those that act on the level of the plants' environment are captured by the region-specific variables.

3.4.1 Basic variables

The average **wage** rate per employee is calculated as the total amount of gross pay in the month of June in the year under consideration (excluding employers' social security contributions and holiday allowances) divided by the number of full-time equivalents as described above in the same month.

Output is covered by the turnover in the last fiscal year. However, the turnover does not necessarily reflect the actual value added by the surveyed enterprise. In order to control for this, we use information on the share of intermediate inputs and external costs in total sales in order to calculate the value added as an adequate indicator for output. This way, we also stay closer to our theoretical model, which does not arrange for intermediate inputs.

3.4.2 Plant-specific variables

Engaging in **exports** is an important opportunity for a plant to expand the market for its products. On the other hand, the establishment is relatively prone to negative demand shocks emanating from the export partners, so that a priori there is no clear-cut relationship (Slaughter, 2001). We use the share of sales achieved abroad on total sales in the last fiscal year as indicator of export orientation.

The **technical state** of the plant's equipment is included as a rough proxy for innovations and market leadership. A plant that engages in innovative activities can be assumed to have a rather modern and up-to-date technical state. The variable is measured with a scale ranging from 1 (very modern state) to 5 (outdated).[2]

The influence of external enterprises can generate both positive and negative growth effects (Bates, 1995). On the one hand, the provision of technological or enterpreneurial know-how or networks with customers or suppliers can stimulate positive employment effects. On the other hand, they can also be negative if an establishment is strongly influenced by strategies and (employment) decisions of the external partner. The IAB-Establishment Panel asks if the establishment surveyed is a) an **independent** company or an independent organization without other places of business, b) the head office of an enterprise or an organization with other places of business/offices/branches, c) a place of business/office/branch of a larger enterprise or organization.[3] The answers are captured with the help of dummy variables. We also include a dummy variable if the enterprise

[2] Since this variable is not included in the questionnaire 2004, we fill the missing values with the information from 2003.

[3] It is also asked if it is a middle-level authority of a multi-level company or a multi-level autho-

is mainly or exclusively in foreign **property** (see also Navaretti/Checchi/Turrini, 2003, Fabbri/Haskel/Slaughter, 2003).[4]

Since employers are very heterogeneous with respect to their level of qualification, labor demand is highly interconnected with the **qualification structure** of the workforce (Hamermesh, 1996). As in the studies of Cordes (2008), Blien/Kirchhof/Ludewig (2006) and Südekum/Blien/Ludsteck (2006), we include information on the share of unqualified employees with no vocational training, qualified employees with vocational training or college degree,[5] and employees in apprenticeship.

An enterprise's employment decisions are influenced decisively by the existence of **wage agreements** or a works council (Blanchflower/Milward/Oswald, 1991, Gold, 1999, Kohaut/Ellguth, 2008). This is captured by two dummy variables that take the value of one if a wage agreement exists or if the establishment has a works or staff council or some other company-specific form of staff representation (staff spokesperson, round table conferences).

Last, labor demand can be expected to vary significantly between **sectors**. We control for sector-specific effects by introducing the following nine different sectoral dummies at the 1-digit level of the WZ 2003 (corresponding to the NACE Rev.1 classification):

Table 2: Sectoral dummies

Description		Share in %
$WZ-D$	Manufacturing	41.24
$WZ-E$	Electricity, gas and water supply	1.13
$WZ-F$	Construction	12.22
$WZ-G$	Wholesale and retail trade, repairs	16.07
$WZ-H$	Hotels and restaurants	2.19
$WZ-I$	Transport, storage and communication	3.42
$WZ-J$	Financial intermediation	3.69
$WZ-K$	Real estate, renting and business activities	11.55
$WZ-O$	Other public and private services	8.50

Share in % refers to the share of sectors in the dataset.

Although the IAB Establishment Register contains very detailed information for each plant covered, one grave disadvantage when working with a panel of plants is that not all relevant questions are included in the questionnaires every year. For this reason, we have to exclude further information on innovative activities and research and development. Furthermore, due to the liability of newness (see Aldrich/Auster, 1986) we exclude plant age. The younger a plant, the higher the probability of failure is, and the few plants remaining in our balanced panel would give way to highly distorted results.

rity/organization. But since this includes basically the public sector, these enterprises are a priori excluded from the analysis.

4 Henderson (2003) and Baldwin et al. (2008) also consider in their estimations of plant-level production functions holding and dependency structures, whose influence turns out to be highly significant.

5 Employees with college degree only are included only from 2003 onwards.

3.4.3 Region-specific variables

The variables capturing the plants' regional environment are based on information on the general features as well as on the specific economic structure of the regions.

The variables on the more general regional features are first of all the **population per district**. It is used as a proxy for agglomeration effects that are related to the size of a region (see also Hoogstra/van Dijk, 2004 and Audretsch/Dohse, 2007). We use quotient of the yearly averages of total population per district and the area in square kilometers.

A further factor relevant for the economic prospects of a region is its **accessibility**. It covers the geographical position as well as the existence of a good road and rail transport system, an airport or a harbor. The accessibility of a region decisively influences the costs for the transport of goods and hence its integration with other regions (see also Ottaviano/Puga, 1998 and Hoogstra/van Dijk, 2004). It is calculated as the average driving time in minutes by car to the nearest highway entry.

The economic strength of a region is another important factor for labor demand. The demand for local goods should ceteris paribus be higher, the larger the local market and the higher the income of the local population. We use **gross domestic product per capita**, measured as nominal GDP in Million Euro per inhabitant, as an indicator of total regional market size and of the overall economic climate.

Variables characterizing the specific economic structure of a region capture agglomeration economies and externalities that come into effect through the local economic structure and, more specifically, through the degree of specialization, diversity, and competition. The seminal work by Glaeser et al. (1992) argues that a diversified economic structure is advantageous, while Henderson/Kuncoro/Turner (1995) conclude that own industry specialization is the major engine for employment growth. Generally, the economic structure is captured by various measures of specialization. The indices used in this study are calculated on the basis of all employees liable to social security that are provided by the Federal Employment Office.

Establishments that form part of a spatially concentrated sector can profit from positive agglomeration externalities at work in this sector (Holmes/Stevens, 2002, Südekum, 2006). We measure the spatial **concentration** of sectors with a localization quotient (LQ) that is calculated at the 3-digit level of the WZ 2003 (see also O'Donoghue/Gleaves, 2004):

$$LQ_{zs} = \frac{L_{zs}/L_s}{L_z/L}. \tag{12}$$

The share of employment L in region z and sector s is divided by the share of employment in sector s on the national level. If LQ is smaller than one, the sector under consideration is represented in region z below average. Values larger than one indicate that the sector is concentrated above average.

The degree of **specialization** in a region that can give rise to localization externalities is measured with the Krugman specialization index (KSI_z) (Südekum, 2006):

$$KSI_z = \sum_i \left(|\frac{L_{zs}}{L_z} - \frac{L_s}{L}| \right). \qquad (13)$$

It corresponds to the absolute value of the difference between the share of employment L in region z and sector s on total employment in region z and the corresponding share on the national level. The values for KSI range between zero and two. If KSI is equal to zero, the region under consideration has the same economic structure as the national average. A value of two indicates that there is no sector that exists in both regions simultaneously.

In contrast to localization externalities, urbanization externalities depend on a diversified economic structure with many different sectors. Economic **diversity** is measured with a Hirshman-Herfindahl index across the number of sectors per region (Combes, 2000, Combes/Magnac/Robin, 2004, Mameli/Faggian/McCann, 2008):

$$div_z = -\ln \left[\sum_{s=1}^{I} \left(\frac{L_{zs}}{L_z} \right)^2 \right]. \qquad (14)$$

div_z is zero if local employment is concentrated in only one sector and equals the logarithm of the number of sectors if employment is distributed uniformly across sectors.

The last group of regional variables accounts for the degree of **competition** between plants within one sector (see Combes/Magnac/Robin, 2004). The following Hirshman-Herfindahl index measures the dispersion of local employment between plants in one sector:

$$comp_{zs} = -\ln \left[\sum_{i \in I_{zs}} \left(\frac{L_s}{L_{zs}} \right)^2 \right]. \qquad (15)$$

L_i defines the size of plant i, and I_{zs} measures the number of all plants active in region z and sector s. Analogous to div_z the index is zero if employment in concentrated in one plant and equal to the number of plants if employment is distributed uniformly across the plants within one sector. Given the number of plants, this variable can be interpreted as a measure of the intensity of competition within sectors (Encaoua/Jacquemin, 1980).

If there is only one plant per sector and region, $comp_{zs}$ is zero. This case of monopoly is covered by the additional dummy variable

$$mono_{zs} = \left\{ \begin{array}{l} 1 \; if \; I_{zs} = 1 \\ 0 \; if \; not \end{array} \right\} \qquad (16)$$

Last, we include a dummy variable for Eastern and Western Germany. Table 3 summarizes all variables under consideration. Descriptive statistics are provided in table 9 in the appendix.

Table 3: Overview over the variables

variables	abbr.	description
dependent variable		
volume of labor	l	employees (in full-time equivalents) times working hours
basic explanatory variables		
wages	w	gross pay divided by full-time equivalents (in Euro)
output	y	value added (in Mill. Euro)
plant-specific variables		
exports	$export$	share of of sales abroad on total sales in percent
technical state	$tech$	1: modern to 5: old fashioned
dependency structure	$struct1$	dummy: 1= independent
	$struct2$	dummy: 1= branch
	$struct3$	dummy: 1= head office
property structure	$fprop$	dummy: 1= foreign property
qualification level	$unqual$	share of unqualified workers in percent
	$qual$	share of qualified workers in percent
wage agreement	$agreem$	dummy: 1= wage agreement
works council	$counc$	dummy: 1= works council
sector	WZ	dummies for $WZ-D$ to $WZ-O$
region-specific variables		
population density	$popdens$	population per km^2
GDP per capita	$gdppc$	GDP per inhabitant (in Thousand Euro)
accessibility	$access$	driving time by car to next highway (in minutes)
concentration	$conc$	localization quotient
specialization	$spec$	Krugman specialization index
diversity	div	Hirshman-Herfindahl index across sectors
competition	$comp$	Hirshman-Herfindahl index across plants
monopoly	$mono$	dummy: 1= monopoly
East-West-dummy	$east$	dummy: 1= Eastern Germany

4 Econometric analysis

The econometric analysis is divided in three parts. First, we present the results of the static and long-run labor-demand equations as specified in (8) and (9). We start with the estimation of pooled OLS regressions and then go on to panel-data methods in order to take account of the heterogeneity between plants. The second part centers on the dynamic labor-demand model (11) depicting the short-run demand for labor. The last section broaches the issue of spatial range of the region-specific variables in comparing results for the level of counties with that of the labor-market regions.

4.1 Long-run labor demand

Table 4 contains the results for the long-run impact on the plant-level labor demand. In total, we estimate three models. We start with the basic model (8) that examines the fundamental relationships derived from the theoretical framework of labor demand. Results are depicted in the first broad column. The second broad column extends the basic model by incorporating plant-specific variables. In the last broad column, results of the full model (9) with the region-specific variables are presented. All variables except the dummies enter in logs. In the static regressions the lagged levels of y are used in order to reduce possible endogeneity between y_t and l_t (see Greene, 2003, 381).

For the long-run analysis each model is estimated with fixed-effects (FE) panel methods. The FE method allows for correlation of the unobserved plant-specific effects with the explanatory variables (Wooldridge, 2002, 265). This is of advantage for the analysis of plant-level data, because relationships between variables vary systematically for example with plant age or size. It also implies that no time-invariant variables like the affiliation to a certain sector can be considered in the econometric model, since their effect cannot be separated from that of the equally time-invariant plant-specific effects (Wooldridge, 2002, 266). Therefore, we additionally run the regressions with the pooled OLS estimator in order to quantify the impact of the time-invariant explanatory variables. In order to control for any remaining heteroscedasticity, consistent standard errors are computed with the Huber-White-Sandwich procedure (see Greene, 2003, 199–200). The full model containing both plant- and region-specific variables is estimated with clustering-robust linear regression techniques.

The OLS-results in table 4 show that all three models explain the plant-level demand for labor quite well, and the goodness of fit even increases along with the extension of the basic model. Almost all of the characteristics specific to the plant are highly significant, and there are also distinct differences between the sectors. In comparison to the reference group of manufacturing, labor demand is significantly lower in four of the nine reported sectors. Among the region-specific variables four (GPD per capita, accessibility, concentration, and competition) result to be significant.

The significance of the dummy for Eastern Germany (*east*) in the model with plant variables and in the full model hints towards factors specific to the East German plants that are not yet captured by the explanatory variables. Hence, separate estimations are made for the two parts of Germany. Results are reported in tables 10 and 11 and chiefly depart from each other with respect to the region-specific characteristics. Apart from the similar impact of *conc* and *comp*, *gpdpc* is also significant and positive in Western Germany, while in Eastern Germany *popdens* is positive. The impact of the accessibility seems to be of relevance only for Eastern Germany. Finally, *mono* is not significant in

Table 4: Results for the long-run labor demand

Variable	Basic model		With plant variables		Full model	
	OLS	FE	OLS	FE	OLS	FE
w	0.424***	-0.049***	0.168***	-0.037*	0.159***	-0.045***
y	0.519***	0.030***	0.454***	0.030***	0.437***	0.024***
$export$			0.004***	0.000	0.003***	0.000
$tech$			-0.085***	-0.024***	-0.080***	-0.019***
$struct2$			0.035	-0.002	0.051	0.024
$struct3$			0.509***	0.030**	0.474***	0.025
$fprop$			-0.009	-0.000	-0.028	-0.036
$unqual$			0.006***	0.001***	0.005***	0.001***
$agreem$			0.146***	0.011	0.151***	0.008
$counc$			0.852***	0.083***	0.770***	0.052*
$WZ-E$			-0.243***		-0.264**	
$WZ-F$			-0.084***		0.084*	
$WZ-G$			-0.291***		-0.175***	
$WZ-H$			0.054		0.166*	
$WZ-I$			-0.006		0.066	
$WZ-J$			0.163		-0.510**	
$WZ-K$			-0.191***		-0.075	
$WZ-O$			0.078*		0.120	
$popdens$					0.025	0.074
$gdppc$					0.146*	0.026
$access$					0.066**	
$conc$					0.129***	0.110***
$spec$					0.032	0.031
div					-0.061	0.002
$comp$					0.085***	0.007
$mono$					0.004	0.083***
$east$	-0.002		0.108***		0.136***	
R^2 within		0.04		0.05		0.06
R^2 between		0.57		0.77		0.42
R^2 overall	0.65	0.39	0.78	0.65	0.79	0.39
no. obs.	20,602	20,602	19,287	19,287	14,330	14,330

*/ **/ *** denotes significance at the 10/5/1 percent level. Time dummies included in the FE regressions but not reported.

Germany as a whole, but this hides a weakly significant and negative influence in Western Germany and a weakly significant and positive influence in Eastern Germany.

In all three models, OLS results assign the wage a highly significant and positive impact on the demand for labor. This stands in sharp contrast to the theoretical model as well as to the empirical findings of Blanchflower/Milward/Oswald (1991), Kölling (1998), Franz/Gerlach/Hübler (2003), Bellmann/Pahnke (2006) or Blien/Kirchhof/Ludewig (2006). In addition, the coefficients of the FE regression are smaller than those of the OLS regression. The F test of the null hypothesis that the constant terms are equal across units provided by the FE model is rejected,[6]which implies that there are significant plant-specific effects, and hence pooled OLS would produce inconsistent estimates. In the following, we therefore concentrate on the FE results.

The FE results on the basic model are highly significant and confirm the appropriateness of our theoretical framework. Wage (w) exerts a negative influence on the number of hours worked, while output (y) has a decidedly positive impact. The basic model is also robust when the plant- and the region-specific variables are included.

Turning from the basic model to the model with additional plant variables confirms the significant impact of plant characteristics on labor demand. Notably, an up-to-date state of equipment positively influences the volume of labor (see also Bellmann/Pahnke, 2006). It can further be interpreted as a confirmation of the studies by Lachenmaier/Rottmann (2007) or Zimmermann (2009), who find a positive influence of plant-level innovation activities on employment. Likewise, the share of unqualified workers is positive. This might be due to the fact that they are paid less than their qualified colleagues and thus tend to work more often in labor-intensive sectors (Schank, 2003, Bellmann/Stegmaier, 2007). The existence of a works council also positively influences labor demand.

Additionally considering the region-specific variables changes the magnitude of the plant-specific estimates only slightly. Although merely two of the seven regional variables considered in the FE model for the whole of Germany are significant (*conc* and *mono*), they provide strong evidence that environmental conditions contribute to explaining plant-level labor demand. The spatial concentration of a sector turns out to be highly significant and positive. This result corroborates the findings of Holmes/Stevens (2002) in that plants located in regions with a high degree of sectoral concentration are larger on average than plants belonging to the same sector, but are located in other regions. Hence, plants located in spatially concentrated sectors might profit from positive agglomeration externalities existing in these sectors.

Profound differences between Western and Eastern Germany emerge also under consideration of the FE regression results. The most prominent divergence concerns the in-

[6] The F-test with the null $u_i = 0$ can only be computed if the estimation of the variance-covariance matrix is not restricted and is therefore not reported in table 4. For the basic model the F-test has a value of 127.68, for the model with plant variables a value of 79.42, and for the full model a value of 69.17. In all three cases the corresponding p-value is 0.000.

fluence of the wages. Table 5 sums up the corresponding FE results from tables 10 and 11 in the appendix.

Table 5: Selected results for the long-run labor demand in Western and Eastern Germany

Variable	Basic model		With plant variables		Full model	
	West	East	West	East	West	East
w	-0.098***	-0.008	-0.080***	-0.002	-0.082***	-0.014
y	0.021***	0.041***	0.019***	0.044***	0.016***	0.031***
no. obs.	10,020	10,582	9,253	10,034	6,891	7,439

*/ **/ *** denotes significance at the 10/5/1 percent level. Complete results are in tables 10 and 11 in the appendix.

Wage is highly significant and negative in Western Germany, but has no explanatory power in Eastern Germany. Obviously, different forces are at work in the two parts of the country regarding wages and the process determining the wage levels. One possible explanation is provided by Goerzig/Gornig/Werwatz (2004). They point out that the economic structure in Eastern Germany has developed in favor of those types of plants that pay wages below average. This part of the country has thus turned to a structural low-wage region that possibly follows own rules when it comes to the determination of the wage level. Brixy/Kohaut/Schnabel (2007) share this view with respect to young plants. Also highlighting structural differences, Blien/Haas/Wolf (2003) argue that in manufacturing high real wages tend to have a negative impact on employment, whereas in the service sector the impact is positive. Another explanation could be related to general differences regarding plant size and age. Generally, larger plant pay higher wages (Brown/Medoff, 2003, Brixy/Kohaut/Schnabel, 2007), but to the major part they are located in the Western part of the country. The significant and positive impact of the existence of a works council only in Eastern Germany supports the effect of two different forces in the two parts of Germany. The influence of the works councils in Eastern Germany has to be seen against the background of a generally lower collective bargaining coverage of the East German plants, which again depends on the profound differences regarding plant size (Ellguth/Kohaut, 2009).

4.2 Short-run labor demand

In this section, results of the dynamic labor-demand equation (11) are presented. Just as in the case of the static models, we first estimate the basic model and successively add the plant and regional characteristics. The models are estimated with the system GMM estimator proposed by Arellano/Bover (1995) and Blundell/Bond (1998), and we report heteroskedasticity-robust standard errors calculated according to the mechanism by Windmeijer (2005).

In the dynamic case, we have to slightly adjust the output variable. Output is asked for in t for $t-1$, and using this variable as in the static regressions is misleading in the dynamic context. We solve this by assigning the observations on each plant at time t its output at time $t+1$ to make sure that all variables are measured at the same point in time.

Before turning to the results, the validity of the system GMM estimator should be checked. As an indicator can serve a comparison of the regression results for the lagged endogenous variable with the system GMM estimator on the one hand and the OLS and FE estimator on the other hand (Bond, 2002; Roodman, 2009, 103). Bond (2002, 4-5) notes that the OLS estimation results for equation (11) are biased upwards, whereas the FE estimation results are biased downwards. Accordingly, consistent GMM results should lie between those of the two former estimators. In addition, we compare the system GMM results with those of the Arellano/Bond estimator (Diff GMM).[7]

Table 6 presents the results for the four estimation methods for the basic model (8). The system GMM estimator yields a value for the coefficient on l_{t-1} that lies between that of the OLS and the FE estimator. Hence, the OLS estimator gives an upper boundary and the FE and the difference GMM estimators a lower boundary for the coefficient estimated with the system GMM technique (see also Buch/Lipponer, 2010). As a consequence, the system GMM estimator should generate consistent results.

Table 6: Comparison of the results on l_{t-1}

Variable	OLS	FE	Diff GMM	System GMM
l_{t-1}	0.978***	0.494***	0.481***	0.846***
	(457.12)	(23.08)	(10.53)	(16.14)
w	-0.001	-0.063***	-0.054***	-0.066***
	(-0.16)	(-4.31)	(-4.27)	(-4.07)
y	0.015***	0.011***	0.005**	0.008***
	(9.13)	(4.85)	(2.25)	(2.81)
no. obs.	17,924	17,924	11,945	15,177

*/ **/ *** denotes significance at the 10/5/1 percent level. t-values (z-values) are in parentheses. Time dummies included in the regressions but not reported.

Analog to the analysis of the long-run labor demand we first estimate the basic model and successively extend it by the plant and the regional variables. The results obtained with the system GMM estimator are shown in table 7. The significant and high coefficient on l_{t-1} suggests a high persistence of the volume of labor, supporting the results of Blien/Kirchhof/Ludewig (2006), Bellmann/Pahnke (2006) and Buch/Lipponer (2010) who also use dynamic panel methods for the analysis of plant-level labor demand.

Although according to the Sargan test the hypothesis of the exogeneity of the instru-

7 Since the Arellano/Bond estimator is based only on an equation in differences, it is also called difference GMM estimator as opposed to the system-GMM estimator (see, for example, Roodman, 2009).

Table 7: Results of the dynamic labor-demand regressions

variable	Basic model		With plant variables		Full model	
l_{t-1}	0.846***	(16.14)	0.821***	(13.29)	0.742***	(7.69)
w	-0.066***	(-4.07)	-0.051***	(-3.19)	-0.060***	(-3.59)
y	0.008***	(2.81)	0.009***	(3.12)	0.009**	(2.42)
export			-0.000	(-0.22)	0.000	(0.00)
tech			-0.004	(-0.87)	-0.005	(-0.82)
*struct*2			-0.011	(-1.00)	-0.009	(-0.74)
*struct*3			-0.024**	(-2.29)	-0.017	(-1.49)
fprop			-0.006	(-0.35)	-0.022	(-1.14)
unqual			0.001***	(3.26)	0.001***	(3.70)
agreem			-0.004	(-0.40)	-0.005	(-0.82)
counc			0.027*	(1.67)	0.031	(1.78)
popdens					-0.204	(-1.04)
gdppc					0.098	(1.11)
access					0.000	(0.07)
conc					0.045*	(1.78)
spec					0.066	(0.41)
div					-0.001	(-0.02)
comp					0.015	(0.87)
mono					0.028	(0.97)
no. obs.	15,177		14,290		11,833	
Sargan	77.378	(0.000)	88.927	(0.000)	45.627	(0.014)
AC(1)	-7.395	(0.000)	-6.822	(0.000)	-5.351	(0.000)
AC(2)	1.298	(0.194)	0.941	(0.347)	1.406	(0.160)

*/ **/ *** denotes significance at the 10/5/1 percent level. t-values (z-values) are in parentheses. Time dummies included in the regressions but not reported.

ments used has to be rejected, the conditions for the absence of second-order autocorrelation in the error terms are met. Hence, the instruments used in the estimations can be regarded as vaild.

As in the long-run analysis, wage and output are both highly significant and have the expected sign. These fundamental relationships are robust against the inclusion of the plant and regional variables.

Characteristics specific to the plants seem to exert a minor influence in the short run than in the long run. The technical state is now insignificant. In addition, the estimates of the remaining three significant plant variables have lower values than under the short-run FE estimator.

In the full model, among the plant-specific variables only the share of unqualified workers remains significant. Possibly they can be employed in a more flexible manner and can also be hired and fired more easily because of fixed-term contracts.[8]

8 Especially among the borrowed workforce the share of unqualified workers is very high. Whereas it amounted to 19.1 % among all employees liable to social security in 2008, it amounted to 40.2 % among the borrowed workforce.

Among the region-specific variables the time-constant accessibility is now interacted with a time trend, as denoted in equation (11). In the short run, however, it is insignificant, and only the sectoral concentration turns out to have a slightly significant and positive impact on the volume of labor.

As was already the case for the static regressions, the dynamic regression results reveal fundamental differences between Western and Eastern Germany (see tables 12 and 13 in the appendix). While in Western Germany the influence of wages and output is in accordance with the relationships derived from the theoretical model, in the Eastern part of the country not only wages, but also the output becomes insignificant in the short run. Hence, the explanations provided for the long-run results also hold in the short run. Furthermore only in Eastern Germany two region-specific variables are of a low significance. Population density is negative, and in analogy to the static results the concentration of a sector is positive.

To sum up, in the short run the plant and regional characteristics have a lower importance for the labor demand than in the long run. Wages and output play a statistical role only for plants in Western Germany. This can be seen as evidence that the differences between Western and Eastern Germany as to the impact of these two fundamental variables are even more pronounced in the short run than in the longer run.

4.3 Consideration of the labor-market regions

One aspect that is important to take a closer look at concerns the spatial range of the assumed knowledge spillovers captured by the regional variables. A priori there is no reason for them to be confined to the county boundaries (Jaffe/Trajtenberg/Henderson, 1993, van Oort, 2007). In order to control for the range, we additionally measure the region-specific variables at the level of the labor-market regions and accordingly replace the variables measured at the level of the counties in the regressions for the full model with the FE and the system GMM estimator.[9]

The results in table 8 assign the labor-market characteristics a significant influence only in the static FE model. In the long run, the sectoral concentration as well as the existence of a monopoly are not only of positive influence with respect to the own county, but also with respect to the labor-market region the plant is located in. The results on *conc* corroborate those of Holmes/Stevens (2004) who likewise provide evidence that the impact of a sector's spatial concentration extends over several counties.

Under the use of the system GMM estimator all regional variables turn to insignificance. It has to be kept in mind, however, that already in the regressions with the county variables only on regional variable (*conc*) was weakly significant. This result once again

9 Since the data on accessibility is only available for the counties, this variable is dropped here.

confirms the findings above that the regional characteristics play a role rather in the long run.

Table 8: Long-run and short-run results for the labor-market regions (full model)

variable	FE		System GMM	
l_{t-1}			0.784***	(10.16)
w	-0.047***	(-2.71)	-0.057***	(-3.49)
y	0.024***	(7.54)	0.008**	(2.16)
export	0.000	(0.30)	0.000	(0.18)
tech	-0.019***	(-3.11)	-0.005	(-0.94)
*struct*2	0.023	(1.61)	-0.013	(-0.99)
*struct*3	0.025	(1.60)	-0.020*	(-1.70)
fprop	-0.036	(-1.27)	-0.023	(-1.22)
unqual	0.001***	(3.34)	0.001***	(3.87)
agreem	0.008	(0.92)	-0.007	(-0.60)
counc	0.063**	(2.12)	0.029*	(1.69)
popdens	0.594	(1.60)	-0.098	(-0.65)
gdppc	-0.005	(-0.04)	-0.005	(-0.04)
conc	0.129***	(5.97)	0.057	(1.66)
spec	-0.176	(-1.38)	-0.025	(-0.15)
div	0.009	(0.10)	0.150	(1.13)
comp	-0.019	(-1.16)	0.022	(1.47)
mono	0.132***	(3.52)	0.011	(0.25)
no. obs.	14,410		11,895	
R^2 within	0.06			
R^2 between	0.07			
R^2 overall	0.07			
Sargan			52.431	(0.002)
AC(1)			-5.845	(0.000)
AC(2)			1.382	(0.167)

*/ **/ *** denotes significance at the 10/5/1 percent level. t-values (z-values) are in parentheses. Time dummies included in the regressions but not reported.

5 Conclusions

The plant-level demand for labor is influenced decisively by factors specific to the plant and to a lesser extent also by regional characteristics specific to the county and the labor-market region the plant is located in. However, in accordance with the theoretical model underlying the econometric analysis the fundamental determinants of the volume of labor are wages and output. While this holds for plants in Western Germany, in Eastern Germany there is no statistical relation between wages and labor demand, which might be led back to differences in the wage level, the wage-finding processes as well as the sectoral structure and the plant-size distribution. Moreover, the theoretical model rather explains the short-run labor demand in Eastern Germany, since in the long run neither wages nor output are significant.

The long-run labor demand is influenced positively by the plant variables such as the technical state of the machinery that can be regarded as an indicator for plant-level innovation activities. Likewise, the significant impact of the share of unqualified workers can be interpreted in that especially plants with a labor-intensive production process and paying low wages have a high demand for labor.

Among the regional characteristics the spatial concentration of a sector and the existence of a monopoly exert a significant long-run influence on the plant-level labor demand. The affiliation to a spatially concentrated sector enhances the volume of labor. Obviously the plants profit from positive agglomeration externalities induced by the proximity to other plants of the same sector. These effects are not restricted to the county the plant is located in, but extends to the level of the labor-market regions. In contrast, regional specialization, diversity, and competition are insignificant.

In the short run the volume of labor is highly persistent, indicating that the demand for labor today depends to a large degree on the demand in the previous period. Furthermore, among the plant-specific determinants only the share of unqualified workers and among the region-specific variables only the spatial concentration of a sector remain significant. This implies that especially the plant-specific and to a lesser degree also the region-specific characteristics are of stronger relevance for the long-run labor demand. Concluding, among the region-specific variables there are some important determinants of the plant-level labor demand, but they are dominated by the plant-specific determinants.

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Appendix

Table 9: Descriptive statistics

variables	n	Mean	SD	Median	Min	Max
l	24,088	6,473.77	36,560.18	852.15	0	1,481,111
w	22,461	1,894.90	970.50	1,765.90	0	9,892.75
y	21,234	13.90	108.57	0.71	0.0001	5,383.8
$export$	21,809	8.94	19.96	0	0	100
$struct1$	24,088	0.76	0.43	1	0	1
$struct2$	24,088	0.14	0.35	0	0	1
$struct3$	24,088	0.10	0.30	0	0	1
$fprop$	24,088	0.05	0.22	0	0	1
low	24,087	16.54	24.02	4.00	0	100
$qual$	24,087	78.34	24.04	86.70	0	100
$tech$	24,034	2.17	0.73	2	1	5
$agreemf$	24,088	0.78	0.42	1	0	1
$counc$	24,088	0.33	0.47	0	0	1
$popdens(county)$	24,088	754.81	1,012.09	242.13	38.43	4,245.35
$gdppc(county)$	24,088	25.14	10.63	23.01	11.54	85.49
$access(county)$	24,088	14.28	9.80	11.23	0.40	63.67
$conc(county)$	24,088	2.60	7.90	1.16	0	244.56
$spec(county)$	24,088	0.63	0.11	0.63	0.37	1.32
$div(county)$	24,088	0.03	0.02	0.03	0.02	0.38
$comp(county)$	17,893	0.23	0.27	0.11	0.00	1
$mono(county)$	17,893	0.04	0.19	0	0	1
$podpens(lmr)$	24,088	289.62	255.80	216.78	40.04	1,692.01
$gdppc(lmr)$	24,088	24.68	6.29	23.24	13.72	47.53
$conc(lmr)$	24,088	1.69	4.26	1.04	0	144.44
$spec(lmr)$	24,088	0.48	0.11	0.46	0.25	1.21
$div(lmr)$	24,088	0.03	0.01	0.02	0.02	0.28
$comp(lmr)$	17,982	0.13	0.20	0.05	0.00	1
$mono(lmr)$	17,982	0.01	0.10	0	0	1

Table 10: Results for the long-run labor demand in Western Germany

Variable	basic model		with plant variables		full model	
	OLS	FE	OLS	FE	OLS	FE
w	0.440***	-0.098***	0.257***	-0.080***	0.213***	-0.082***
y	0.545***	0.021***	0.428***	0.019***	0.415***	0.016***
export			0.004***	0.000	0.003***	-0.000
tech			-0.088***	-0.020***	-0.088***	-0.017**
*struct*2			0.073**	-0.002	0.073	0.025
*struct*3			0.541***	0.022	0.521***	0.020
fprop			0.025	-0.057**	-0.004	-0.073**
unqual			0.006***	0.001***	0.006***	0.001***
agreem			0.174***	-0.005	0.149***	-0.015
counc			0.966***	0.018	0.888***	-0.004
$WZ-E$			-0.479***		-0.456***	
$WZ-F$			-0.105***		0.085	
$WZ-G$			-0.257***		-0.143**	
$WZ-H$			0.183***		0.334**	
$WZ-I$			-0.151**		-0.084	
$WZ-J$			0.150		-0.498	
$WZ-K$			-0.091***		-0.019	
$WZ-O$			0.010		0.122	
popdens					-0.009	0.919
gdppc					0.255**	0.149
access					0.017	
conc					0.106***	0.079***
spec					-0.005	0.073
div					-0.114	-0.022
comp					0.104***	0.028
mono					-0.211**	0.032
R^2 within		0.03		0.04		0.06
R^2 between		0.11		0.22		0.02
R^2 overall	0.68	0.07	0.80	0.15	0.81	0.02
no. obs.	10,020	10,020	9,253	9,253	6,891	6,891

*/ **/ *** denotes significance at the 10/5/1-percent level. Time dummies included in the regressions but not reported.

Table 11: Results for the long-run labor demand in Eastern Germany

Variable	basic model		with plant variables		full model	
	OLS	FE	OLS	FE	OLS	FE
w	0.410***	-0.008	0.132***	-0.002	0.160***	-0.014
y	0.481***	0.041***	0.474***	0.044***	0.455***	0.031***
$export$			0.003***	0.000	0.002*	0.000
$tech$			-0.082***	-0.029***	-0.068***	-0.022***
$struct2$			0.007	-0.005	0.048	0.018
$struct3$			0.424***	0.042	0.378***	0.037
$fprop$			-0.076	0.038	-0.076	0.012
$unqual$			0.006***	0.001*	0.006***	0.001**
$agreem$			0.132***	0.019*	0.144***	0.020*
$counc$			0.731***	0.163***	0.662***	0.120**
$WZ-E$			-0.026		-0.105	
$WZ-F$			-0.052**		-0.064	
$WZ-G$			-0.319***		-0.231***	
$WZ-H$			-0.101**		-0.056	
$WZ-I$			0.194***		0.246*	
$WZ-J$			0.165		-0.404*	
$WZ-K$			-0.241***		-0.116	
$WZ-O$			0.116***		0.112	
$popdens$					0.057**	-0.491
$gdppc$					-0.100	0.012
$access$					0.108*	
$conc$					0.139***	0.126***
$spec$					-0.032	0.163
div					0.135	-0.061
$comp$					0.066***	-0.011
$mono$					0.117*	0.105***
R^2 within		0.05		0.06		0.09
R^2 between		0.62		0.76		0.01
R^2 overall	0.59	0.49	0.75	0.68	0.76	0.01
no. obs.	10,582	10,582	10,034	10,034	7,439	7,439

*/ **/ *** denotes significance at the 10/5/1-percent level. Time dummies included in the regressions but not reported.

Table 12: Results for the short-run labor demand in Western Germany

Variable	Basic model		With plant variables		Full model	
l_{t-1}	0.860***	(13.45)	0.767***	(8.90)	0.762***	(5.79)
w	-0.108***	(-5.93)	-0.090***	(-5.70)	-0.103***	(-5.47)
y	0.009***	(2.82)	0.010***	(2.96)	0.010**	(2.09)
export			0.000	(0.25)	0.000	(0.65)
tech			0.000	(0.06)	0.004	(0.60)
*struct*2			-0.004	(-0.26)	-0.022	(-1.13)
*struct*3			-0.016	(-1.35)	-0.018	(-1.31)
fprop			-0.005	(-0.24)	-0.018	(-0.65)
unqual			0.001***	(3.34)	0.001***	(3.00)
agreem			-0.000	(-0.03)	-0.008	(-0.47)
counc			0.026	(1.41)	0.029	(1.50)
popdens					-0.015	(-0.06)
gdppc					0.162	(1.22)
access					0.000	(0.79)
conc					-0.007	(-0.18)
spec					0.335	(1.61)
div					-0.026	(-0.23)
comp					0.009	(0.44)
mono					-0.018	(-0.40)
no. obs.	7,366		6,827		5,685	
Sargan	46.485	(0.191)	57.537	(0.028)	49.363	(0.005)
AC(1)	-6.928	(0.000)	-6.151	(0.000)	-5.186	(0.000)
AC(2)	0.012	(0.991)	-1.071	(0.284)	-0.284	(0.776)

*/ **/ *** denotes significance at the 10/5/1-percent level. t-values (z-values) are in parentheses. Time dummies included in the regressions but not reported.

Table 13: Results for the short-run labor demand in Eastern Germany

variable	Basic model		With plant variables		Full model	
l_{t-1}	0.804***	(10.89)	0.822***	(10.31)	0.663***	(5.61)
w	-0.008	(-0.36)	-0.001	(-0.06)	-0.029	(-1.15)
y	0.007	(1.61)	0.007	(1.56)	0.004	(0.79)
export			-0.000	(-0.53)	-0.000	(-0.23)
tech			-0.006	(-0.91)	-0.009	(-1.23)
*struct*2			-0.019	(-1.28)	-0.003	(-0.18)
*struct*3			-0.018	(-0.92)	-0.003	(-0.14)
fprop			-0.031	(-1.10)	-0.037	(-1.31)
unqual			0.001*	(1.75)	0.001**	(2.30)
agreem			-0.005	(-0.37)	0.000	(0.03)
counc			0.025	(0.87)	0.029	(0.95)
popdens					-0.425*	(-1.84)
gdppc					-0.044	(-0.40
access					-0.000	(-0.25)
conc					0.054*	(1.70)
spec					-0.168	(-0.76)
div					0.020	(0.24)
comp					0.012	(0.54)
mono					0.031	(0.92)
no. obs.	7,811		7,463		6,148	
Sargan	72.805	(0.001)	80.514	(0.000)	36.279	(0.109)
AC(1)	-5.097	(0.000)	-4.819	(0.000)	-3.905	(0.000)
AC(2)	1.364	(0.172)	1.252	(0.211)	1.504	(0.133)

*/ **/ *** denotes significance at the 10/5/1-percent level. t-values (z-values) are in parentheses. Time dummies included in the regressions but not reported.