Economic and Employment Growth in Germany –

The Sectoral Elements of Verdoorn´s Law with regional Data

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by

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Abstract

A major aspect of employment growth is discussed in relation to economic growth. This paper deals with the question as to whether the relationship between economic and employment growth, subsumed under the idiom Verdoorn´s Law, holds true at the sectoral level. For this reason, the German labor market is divided into regional functionally delineated labor markets. The employees are differentiated into sectoral affiliation, education, national status and part-time employment. The economy is split into six sectors. The labor demand function is derived from the cost-function of companies, and factor prices (interest rates and wages) are considered. It is evident that the construction sector still has intense connections to the labor market concerning output changes. This cannot be verified in the finance, insurance and service sector. Part-time work increased during the economic crisis. The elasticity to factor-prices holds true for most types of employment. It is found that, regional labor market performance is directly linked to industrial structure. The fixed an random-effects estimations used here deliver satisfying results to most investigations. However, some concerns about the results regarding characteristics of employees remain.

JEL: J21, J23, O11, R 11

Keywords: Verdoorn, sectoral growth, regional growth, employment elasticity

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1. Introduction

The main targets of regional and national policies, which are omnipresent in public discussions, are sound economic growth and good labor market performance. The latter is represented either by unemployment or employment rates. A positive relationship between a prosperous economy and positive development of labour market outcome has been deemed to be undisputed. Indeed, this idea is based on the assumption of adjusting labour demand due to changes in production. The common "rule" related to this is called "Verdoorn´s law," which states that the growth of (labour) productivity is an endogenous result of output growth – focusing particularly on the manufacturing sector. Although Verdoorn´s law refers to a study of Petrus J. Verdoorn (1949), the common interpretation considering employment growth was mainly developed by Kaldor (1966). He showed that the change in labour productivity could be measured as the difference between output and employment growth. Assuming a linear relationship of output and productivity growth with the latter being the dependent variable, this can be – considering Kaldor´s findings - transformed to a linear relationship between employment and economic growth.[2]

The importance of economies of scale has to be stressed. Higher production tends to result in increasing divisions of labour and productivity gains. This leads to employment growth. Traditionally, studies concerning the Verdoorn-Law are focused on the manufacturing sector. These, however, do not take into account the situation in economies with diversified economic structures. In Germany, the share of gross value added by the manufacturing sector (without construction) to the total gross value added was about 25 % in 2010. Thus, the influence of other sectors on employment development should be considered. The same holds true if talking about employment rates which can be segregated into diverse components as well. Besides sectoral affiliation, age and the human capital of employees will be of interest. The human capital requirement should vary between sectors and the production structure of sectors is far from being unique. The labor demand will differ concerning employees` characteristics and the labor intensity of the production. This aspect will be considered when controlling for factor elasticity. Assuming a production function with two input factors (labor and capital), there should be an inverse relationship to the factor prices, the so called Shephard´s Lemma. Following Flaig/Rottmann (2001), it will be shown that factor prices have significant influences. To discuss this aspect, costs for capital and labor, i.e. the interest rate and remuneration, will be included. As the economic crisis of the years 2008 and 2009 and the unexpected absence of dismissals can be interpreted as a structural break in the relationship between production and employment, the influential aspects of factor prices have to be stressed. Thus, the years of the financial crisis are represented by using a dummy for these years.[3] However, this indicator will give information about the existence of a structural break, which should be important for the production sector or for atypical employment. The latter will be represented by part-time employment.

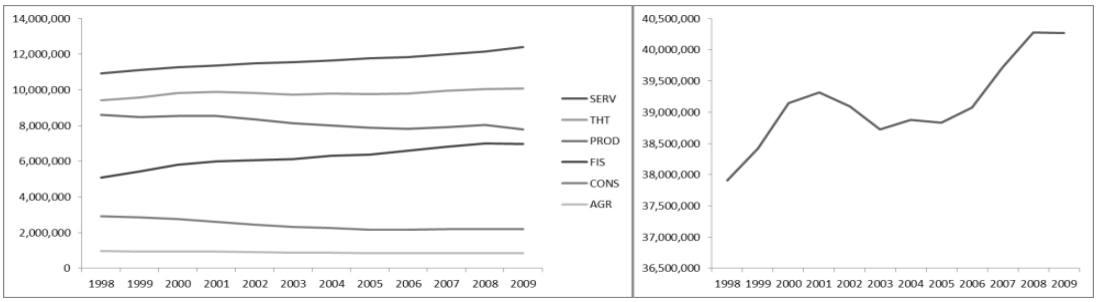
During the past decade, employment has grown more intensely than in prior booming periods in Germany (Eichhorst/Marx/Thode, 2009). Nonetheless, this development does not hold true for all

[2] A formal description can be found in Kapsos (2005).

[3] This approach is analogous to the dummy for the structural break in 1982/1983, used by Sögner/Stiassny (2002), who investigated the Okun-coefficient for 15 OECD-countries.

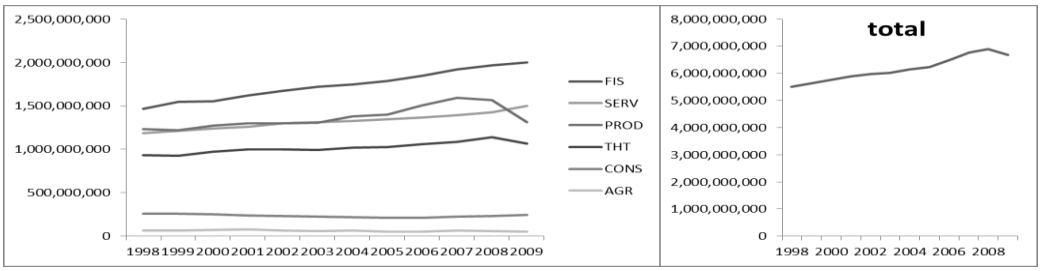
sectors, as can be seen in Figure 1.[4] Increasing employment does occur in the sectors Financial, Insurance and services (FIS) and the Public and Private Service Sector (SERV) on the one hand, whereas employment within the sectors Production (PROD) and Construction (CONS) declined on the other.[5]

Figure 1: Total Employment per sector and total



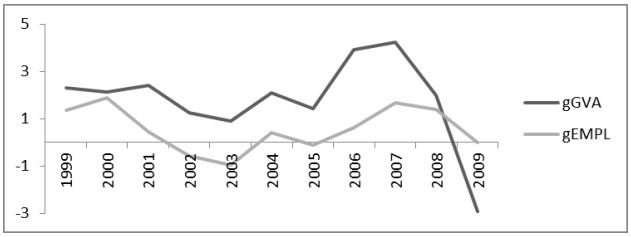
The development of the total gross value added (GVA) of these sectors is shown in Figure 2. The movement of the GVA- and the employment-curve show the same tendencies. Especially the GVA in the Financial and the Service sectors increases constantly. Aside from the years 2008 and 2009, solid growth rates have taken place in the Production sector.

Figure 2: Development of Gross value Added (GVA) on sector-level and total



The growth rates for total employment and total GVA in Germany are plotted in Figure 3, showing the connection between economic and employment growth. This relationship does obviously hold true up until the financial crisis, at which point the enormous decline in economic growth is not reflected by decline in employment rates.

Figure 3: Growth rates of employment and gross value added



This paper tries to shed a diversified light on the German labor market development as the "Verdoorn Law" is taken as a basic idea and the interdependencies between economic growth and changes in employment rates are identified. To do so, the German labor market is separated into its

[4] Means and Standard-Errors for the growth rates of gross value added and employment are presented in Appendix A.

[5] Schanne (2006) analyzed the regional development of employment in nine industries, focusing on the reciprocal relationship between regions.

regional counterparts. The functionally delineated labor markets by Oberst (2012) are used as administrative borders tend not to reflect the real economic relations. While an analysis of the Verdoorn-relationship at the national level neglects the high degree of regional heterogeneity within the German labor market, the use of sole administrative regions as the German districts (NUTS 3 level, i.e. the 413 German districts "kreisfreie Städte und Landkreise") neglects the systematic interdependency between those districts. Both approaches are inadequate areas of research for the analysis of regional labour market development as they distort the behavior of the labour force (Casado-Diaz, 2000). Using travel to work areas minimizes commuting between these regions but maximizes the commuting within and thus reduces spillover effects. Hence, the correlation between changes in a locally and economically situated labor market is concentrated at its regional level. Functionally defined regional study areas, seen as sub-national economies, are useful laboratories for examining macroeconomic theory and policy (Carlino/DeFina, 2006). They enable additional data observations within one country, which are comparable with respect to legal, political and social systems. Because working with regional data might induce special problems,[6] the necessity to control for spatial components is taken into account.

The paper is structured as follows. The first section presents a brief review of the literature that addresses questions relevant to this paper; the results of basic Verdoorn-calculations are presented as well. After that, the model is expanded to control more precisely for sector specific labour demand as factor prices are included. The third part takes into account different characteristics of employment, and the fourth section provides concluding remarks.

[6] The motivations for, and explanations of, spatial econometric approaches can be found in LeSage / Pace (2009); there is a special focus to this issue regarding regional employment growth in Germany in Zierahn (2012).

2. The Basic Model

Several studies have investigated how labour markets have reacted to employment output growth. While some studies have tried to link the reduction of unemployment rates, i.e. testing the Okun relationship, to output growth, others have focused on movements of employment rates.[7] Many studies emphasize international comparisons to obtain information about the flexibility of labor markets as well as to show the influence of labor market institutions like employment protection (Flaig/Rottmann, 2009; Döpke, 2001; Kapsos, 2005). Furthermore, the employment effect of economic growth in order to reduce poverty is analyzed.[8] This has been done with focus on specific countries like Botswana (Ajilore/Yinusa, 2011) Cote d`Ivoire (N`Zue, 2001), Malaysia (Jiun/Nga, 2011) or Cameroon (Besso, 2010).

National investigations have been done concerning the elasticity of employment in certain sectors, mainly in the manufacturing sector (Flaig/Rottmann, 2001). The regional perspective has become more intensified in recent years. Regional comparisons have been done for Finland (by Kangasharju/Pehkonen, 2001), the United Kingdom (Hildreth, 1988), the United States (McCombie/de Ridder, 1984) and Spain (León-Ledesma, 2000). Alexiadis/Tsadis (2006) used spatial models for Greek regions and stressed the geographical dualism concerning manufacturing agglomeration. Kangasharju/Pehkonen (2001) additionally found that the sector structure in the Finish region had a significant influence, and the private service sector a major impact. This confirms the results from León-Ledesma (2000), who analyzed the relationship between the agriculture, construction, manufacturing and services sectors, focusing on economies of scale. He found legal support for the manufacturing and construction sectors but none for agriculture. The service sector showed positive effects as well, but there were estimation problems and results should be interpreted cautiously. Kunz (2012) investigated Germany's regional labor market, analyzing particularly regional unemployment disparities and adjustment paths in Germany. Kosfeld/Dreger (2006) solely used functionally delineated areas, focusing on spatial dependencies and sector composition.

This study deals with regional data from Germany by choosing data on NUTS III level. These regions are based on administrative borders and economical interactions between will be present. Thus, they have to be aggregated into areas where spillover effects are minimized. This can be done by developing functional areas, such as travel to work areas (TWA). By doing so, commuting within a TWA is maximized while the commuting between them is minimized. In fact, there are several methods for building these areas resulting in a different number of regions.[9] In this case, the delineation by Oberst (2012) with 110 functional labour markets in Germany is chosen, as this is a good compromise between quite narrow and wide boundaries.[10] The gross value, added in each sector for all administrative districts *k* within the TWA *r*, has to be aggregated, which takes the form:

$$GVA_r^s = \sum_{k=1}^{K} GVA_k^s. \quad (1)$$

[7] Both laws are analyzed in Herwartz/Niebuhr (2007).

[8] This topic is broadly discussed by Hull (2009), Islam (2004) and Loayza/Raddatz (2010).

[9] See, for example the 50 labor market regions defined by Kropp/Schwengler (2011), and the 141 German Labour Markets of Kosfeld/Werner (2012). Oberst (2012) is based on an evolutionary computational approach; Kropp/Schwengler (2011) used a graph theory approach; and, Kosfeld/Werner (2012) employed a factor analysis. For a comparison of six different labour market delineation see Kropp/Schwengler (2012).

[10] The assignment of administrative districts to functional labour markets is presented in the Appendix J.

The same has been done for employment data. This allows for a more differentiated look at German performances and permits working with a higher amount of observations within one institutional setting in comparison to studies at the national level. Furthermore, the socio-economic factors show greater homogeneity, and production factors should be more mobile as barriers should not exist in contrast to international studies (McCombie/de Ridder, 1984). As Thirlwall (1980) states, the high level of mobility between subnational regions prevents a shortage of supply of production factors. Thus, growth is determined by demand and not by supply, which is important for model specification. Actually, the estimations conducted with 109 TWA, as the region of "Diethmarschen," have to be removed from the sample. This became necessary as several implausible and extreme changes within regional gross value added, e.g. a 117-percentage increase within the production-sector from 2003 to 2004 (among other problems), were identified. Another data-adjustment had to take place for the region of "Altenburger Land". Here, the amount of total gross value added was far above the sum of sectoral values in the year 1999 and was substituted by the latter.

As in common studies, the basic Verdoorn-Law is estimated by regressing output-growth on employment growth. Flaig/Rottmann (2001) added the component of dependence on factor prices and capital accumulation. The assumed substitution of labour through capital can be considered by the inclusion of the factor prices of capital (interest rate) and labour (remuneration). The rudimental expression of the Verdoorn takes the form:

$$gE_t = \propto + \beta_1 \, gGVA_t + \varepsilon_t \tag{2}$$

where *E* is the number of employees and *GVA* the gross value added in year *t*. By using growth rates (*g*), the elasticity of the labour market on output changes is estimated. The coefficient β_1 is known as the Verdoorn-coefficient and represents the marginal influence of growth on employment. The results of estimation based on equation (2) are presented in Table 1, column (A), row "total GVA", with total employment rate as a dependent variable.

In the first model-specification, the Verdoorn-coefficient β_1 for each sector *s* is measured:

$$gE_t^s = \propto + \beta_1^s gGVA_t^s + \varepsilon_t \, , \tag{3}$$

as the regional sectoral output-growth is regressed on the regional changes of sectoral employment growth. The results can be found in column (A) in Table 1, Model (3). For all coefficients, the t-value is presented below the β-values. Additionally, the constant α is shown by the estimations R^2 in the cell beneath.

This simple model is expanded by adding the time-lag of economic growth to allow for adjustment processes within labor demand driven by output changes. A further extension within this model is done by employing a Fixed-Effects-model, which can be expressed by adding the Dummy ρ for each TWA *r*.[11] This is done in accordance with the approach used by Kapsos (2005), who added Dummies for each country in his international comparison of the rate of employment growth. As annual data is used, the coefficient β_2 shows the elasticity of regional and sectoral labor demand on regional and sectorial economic development, which happened a year ago; this is presented in column (B):

[11] The Fixed-Effects were dominantly used, supported by the Hausman-Test, with χ^2 ranges between 14.08 (FVU, model (4)) and 1437.42 (PPS, model (1)). However, the estimations have worked with random effects as well. The results and $\chi^2$are presented in the Appendix B.

$$gE_t^s = \propto +\rho^r + \tau + \beta_1^s gGVA_t^s + \beta_2^s gGVA_{t-1}^s + \varepsilon_t \,. \quad (4)$$

Finally, the differentiation between the economies of western and eastern Germany with β_1 and β_3 for controls in the same period and β_2 and β_4 for time-lagged gross value added, is done in formula (5). To separate eastern and western-data the growth-rates are interacted with the Dummy-variable D^r or $(1 - D^r)$ respectively: [12]

$$gE_t^s = \propto +\rho^r + \beta_1^s gGVA_t^s * (1 - D^r) + \beta_2^s gGVA_{t-1}^s * (1 - D^r) + \beta_3^s gGVA_t^s * D^r + \beta_4^s gGVA_{t-1}^s * D^r + \varepsilon_t. \quad (5)$$

The coefficients $\beta_{1\text{-}4}$ in formula (5) are shown in column (C).[13]

These quite simple regressions provide interesting results. There are only little explanatory power for the sectors Agriculture (AGR), Finance, Insurance and Services (FIS) and - in model (3) - Public and Private Services (PPS). The service sectors, FIS and PPS, are the most heterogeneous and therefore difficult to classify with a single model.[14] Obviously, the inclusion of time-lagged gross value added improves the model-quality as R^2 rises for all sectors; see column (B). This appears at a low level, especially for AGR and FIS. With respect to explanatory power, the differentiation between West- and East-Germany has a low but positive impact. It is notable that there are variations in how labor markets react to economic growth. For example, the east's construction (CON) and PPS sectors seem to be more sensitive to economic growth than their western counterparts. Within the Trade, Transport and Hospitality (TTH) sectors it's the other way round. The construction sector shows the highest employment elasticity to economic growth. Surprisingly, the impact of the production sector on the labor market is rather weak at first glance. Apparently, some time is required to adapt output growth when hiring employees.

Table 1: Verdoorn-Coefficients total and by sector

	Effects on employment in total…									
	(A)		(B)			(C)				
Model	(2)		(4)			(5)				
Fixed Effects						*West*		*East*		
	t		*t*	*t-1*		*t*	*t-1*	*t*	*t-1*	
coef *(t) | (R^2)*	**β_1** ***t-value***	**α** ***R^2***	**β_1** ***t-value***	**β_2** ***t-value***	**α** ***R^2***	**β_1** ***t-value***	**β_2** ***t-value***	**β_3** ***t-value***	**β_4** ***t-value***	**α** ***R^2***
total GVA	0.1612	0.0097	0.1662	0.1261	-0.2905	0.1575	0.1164	0.2074	0.1639	-0.2987
	*14.01****	*0.167*	*15.04****	*9.34****	*0.235*	*12.95****	*7.67****	*7.90****	*5.57****	*0.239*
	Effects on employment per sector…..									
Model	(3)		(4)			(5)				
Aggriculture (AGR)	0.0568	-0.9642	0.0678	0.0436	-0.9461	0.0677	0.0524	0.0672	0.0276	-0.9465
	*7.74****	*0.058*	*9.07****	*5.69****	*0.0878*	*7.29****	*5.51****	*5.24****	*2.14****	*0.090*
Contruction (CONS)	0.3714	-2.2161	0.3411	0.1776	-2.1598	0.2801	0.1273	0.4169	0.2626	-1.9587
	*23.78****	*0.366*	*23.34****	*12.99****	*0.4592*	*16.16****	*8.16****	*15.12****	*9.38****	*0.489*
Production (PROD)	0.0700	-0.7152	0.0724	0.0693	-0.9083	0.0734	0.0555	0.0668	0.1093	-0.9260
	*9.33****	*0.082*	*9.94****	*7.95****	*0.1374*	*8.85****	*5.51****	*4.45****	*6.38****	*0.144*
Trade, Hospitality, Transportation (THT)	0.2022	0.1164	0.2171	0.0651	-0.0416	0.2400	0.0766	0.1023	0.0009	-0.0322
	*19.28****	*0.275*	*20.21****	*5.19****	*0.2945*	*20.61****	*5.62****	*3.94****	*0.03*	*0.312*
Finance, Insurance, Services (FIS)	-0.0021	3.1508	0.0176	0.1397	2.6114	0.0113	0.1419	0.0344	0.1322	2.6135
	-0.08	*0.000*	*0.68*	*5.60****	*0.031*	*0.37*	*4.88****	*0.7*	*2.70****	*0.031*
Public and private services (PPS)	-0.0552	1.0159	-0.0440	0.2348	0.5155	-0.0394	0.1696	-0.1085	0.5873	0.4851
	*-2.84****	*0.008*	*-2.43***	*12.46****	*0.1438*	*-2.07***	*8.54****	*-2.40***	*12.681****	*0.202*

****, **, *: Significant at 1, 5, 10%-level*

[12] $D^r = 1$ if the TWA includes at least one district belonging to former DDR, as these TWA lie in the former "Zonenrandgebiet" which were structurally weak areas in general.

[13] Robust standard errors are used in all estimations (5, 6.1a, 6.1b, 6.2) here, as the Modified Wald test indicates heteroskedasticity.

[14] For a similar argument, see Leon-Ledesma (2000).

These simple models show some relationship between employment and economic growth, but results should be interpreted cautiously. In total, the connection between output and labour does still exist, but obviously a regional labour market does not benefit from general output growth equally. The sector structure is an important factor when analyzing this economic law at the regional level as will be shown in the following. Further model modifications have to take place to get more elaborate results, which will be done in section 3.

3. Extended Model – Labour demand and Factor Prices

Theoretical implementation

As previously discussed, factor prices (wages and interest rates), expressed in growth rates, will be implemented. Interest rates are taken from the OECD's Monthly Monetary and Financial Statistics (MEI), which deliver national interest rates at equal rates for every region.[15] To differ between short- and long-term investments, short- (*sti)* and long-term (*lti*) interest rates can be chosen. Substituting the factors labor and capital should mainly depend on the long-term interest rate. The short-term interest rate is more applicable in cases concerning short-term adjustments in production, which would be of interest if monthly or quarterly data were available. Moreover, due to the intense drop of short-term interest rates in 2009[16] there is a high degree of correlation between several sectoral GVA-values and the crisis-dummy. Thus, the long-term interest rate is used next.

The implementation of wage-data at the regional and sector level is more complex. Unfortunately, sector wage developments at the regional level are not available, besides those that are within the production sector. In Table 2, model (6.1a), the development of *total* employment growth per region is estimated. Here, the wage rate was not separated at the sector level but at the regional level. More precisely, the variable "remuneration" (*gwage_*), which includes average regional income per full time employee, was chosen.[17] Sectoral differentiation, as will be done in estimation (6.1b), Table 3, contains data on national average per sector (*gwage_sectors*). The sector 'Production' is an exception as information about "remuneration in production" at the regional level can be achieved and has been included into the sectorial-specific regression for production (Table 3, 6.1b). Although this variable is not directly comparable with the more general variable *gwage_sector*, explanatory power would be lost if this information would have been omitted.

It might be of interest to investigate the effect of sectoral growth, in addition to the effect of national growth on regional employment, as national growth would contain information about regional and sectoral interactions and reflect the overarching picture, as it is discussed most in media. But, national and sectoral economic growth is naturally highly correlated and therefore remains unconsidered in the following.[18]

Besides regional structural breaks (Dummy *D*, as presented above) effects directly connected to a certain year may occur. These time-effects could be captured by time-dummies for each year. But multicollinearity of the time-dummies is a major problem in estimations here. Therefore, the financial crisis, starting in 2008, is underlined using a Dummy *C* for the years 2008 and 2009. This Dummy is interacted with the regional-dummy *D* to show the different impacts of the crisis on western and eastern Germany whereas the time-dummies are omitted.

[15] As a high mobility of capital and near perfect capital markets is assumed, interest rates without regional differentiation are quite realistic.
[16] See Figure 5 in Appendix C.
[17] The average income per anno (2007-2009), differentiated by sectors, are presented in Appendix D.
[18] Furthermore, the correlation between changes in the long-term interest rate and national economic growth is 0.74. The high impact of national-gross value added growth on the regional unemployment rate is discussed by Oberst/Oelgemöller (2013).

Following Flaig/Rottmann (2001), who showed that the employment threshold, i.e. the growth rate of economic output required to hold employment constant, depends in the short run on the growth rate of relative factor prices, capital accumulation and technical change; the underlying cost-function of employers is therefore given with

$$Cv = Cv(w, i, Y, P) \tag{a}$$

where the variable costs *Cv* of production *Y* depend on factor prices for labour *w*, capital *i* and labor productivity *P*.[19] Productivity can be shown as reciprocal of employment elasticity[20] so that the demand of Labour *L* and Capital *K* in the short-term can be written with respect to Shepard´s Lemma (Shephard, 1954) as:

$$L(w, i, Y) = \frac{\partial Cv}{\partial w} < 0 \tag{b}$$

$$K(w, i, Y) = \frac{\partial Cv}{\partial i} < 0. \tag{c}$$

Cv (a) is concave in *w* leading to , and thus labour demand will decline if wages increase. The same holds true for the demand of capital concerning changes in interest rates. Assuming a cost function with the form

$$Cv = Y * \ w^{\propto} * i^{1-\alpha} \tag{d}$$

the labor demand is received under consideration of (b) as:

$$L(w, i, Y) = \propto * Y * w^{\propto - 1} * i^{1-\propto}. \tag{e}$$

This shows labor demand´s dependency on economic output and factor prices:

$$\frac{\partial L}{\partial w} < 0 \quad \text{and} \quad \frac{\partial L}{\partial i} > 0. \tag{f}$$

Note that demand from low-income-employees *li*, having an average wage level (w_{li}) below the average wages used here, i.e. $w^{li} < w$, will react positively to changes in average wages:

$$\frac{\partial \mathrm{L}^{\mathrm{li}}(w, w^{li}, i)}{\partial \mathrm{w}} > 0\,. \tag{g}$$

Besides the cost-character of wages, it is often argued that higher wages lead to higher demand and therefore have positive effects on the economy and hence on employment. This dual nature of wages is debatable and is not questioned further here.[21]

Changes in unemployment in region *r* finally depend on changes of economic growth *gGVA* separated by sector *s* in region *r* and changes in factor prices *FP*, which lead to equation 6:

[19] Flaig/Rottmann (2001) used a quite different cost-function, as they included prices for intermediate goods and the stock of capital. Here, however, a production function with labour and capital as input factors is chosen. The focus lies on factor prices and does not take the accumulation of capital and labor into account. Additionally, intermediate goods are omitted due to lack of data. The technical progress is also unattended as a period of ten years is investigated. The technical change would be of more interest, if longer lasting periods would be compared.

[20] See Löbbe (1998) and Kapsos (2005) for an arithmetic foundation.

[21] Discussion on this issue can be found in Jerger/Michaelis (2003) and Lurweg (2009).

$$gE_t^{r,s} = \alpha + \rho^r + \beta gGVA_t^{r,s} * D + \gamma FP_t^{r,s} + \mu X + \varepsilon_t \,, \tag{6}$$

where *X* represents a vector of control variables. The factor prices can differ between sectors and/or regions. The perfect mobility of capital leads to equal interest rates for all regions and sectors, as presumed. The time-Dummy *C* controlling for structural breaks during the financial crisis is one example for *X*.

Dealing with regional data requires controlling for spatial dependencies. It is quite possible that developments in region A have influences on developments in region B, especially if these regions are adjacent. Using functionally delineated labor markets is one way to deal with this issue. But indeed, these markets are based on administrative districts which are not functionally delimited. This might lead to imperfect areas and therefore to interdependencies between the regions. To sum it up, it might be necessary to take into account economic growth in neighboring regions (spatial-lag) and/or control for imperfect delineation (spatial error). One standard approach for checking spatial autocorrelation is to use the so-called Moran´s I, which has been done for the regional variables (employment and (sectorial) economic growth) as well as for the residuals of the estimations. The Moran's I statistics (Cliff/Ord, 1981) as global measure of spatial autocorrelation are reported in the Appendix E and do not strongly support the necessity of using spatial-lags or spatial-error-estimations. There are few significant values, but indeed they do not occur structurally, e.g. in certain years or clearly for a certain variable. Thus, spatial-models are left out here but might be an interesting aspect in further research.[22]

The question as to whether using fixed or random effects is more profitable – as mentioned in section 2 – has been decided by means of the Hausman-Test. Model 6.1a[23] has been done with random effects; the Hausman-Tests support random effects and fixed effects for models 6.1b and 6.2 depending on sector or employment characteristic. However, the corresponding random- (6.1a and 6.2) and fixed- (6.1b) effect-estimations are presented in the Appendix as well.

Estimation results – sectorial differentiation

As the results of equations (3)-(5) confirm, the gross value added component is separated into East and West (*D* resp. *1-D*) and time-lags are included as well. This leads to equation (6.1a), which is the sectoral expansion of equation (5). The variable remuneration is added to test for the wage-component *w*. The costs of capital *i* are represented with the long-term *(lt_ir)* interest rates. Wages and interest rates are included in growth rates ("*g*") as changes in labor demand will be driven by changes in factor prices:

$$\begin{aligned} gE_t^r = \propto + \rho^r + \beta_1^s gGVA_t^{r,s} * (1 - D^r) + \beta_2^s gGVA_{t-1}^{r,s} * (1 - D^r) + \\ \beta_3^s gGVA_t^{r,s} * D^r + \beta_4^s gGVA_{t-1}^{r,s} * D^r + \gamma_1 g.w^r + \gamma_2 g.lt\_ir + \\ \mu_1 C * (1 - D^r) + \mu_2 C * D^r + \varepsilon_t. \end{aligned} \tag{6.1a}$$

Table 2 presents the estimation results for sectoral undifferentiated employment growth. Besides the time-lagged coefficient of THT in eastern Germany all (significant) parameters show the expected sign. The different results for eastern and western Germany are obvious. The reagibility of employment growth to output growth is higher in the east for the sectors CONS and PPS in

[22] See, for example, Oberst/Oelgemöller (2013), which uses a spatial Durban Error model with spatial lags and Kosfeld/Dreger (2006) with their spatial SUR model for spatial analysis of Okun`s and Verdoorn`s law for German regions.

[23] The χ^2-values are presented in the Appendix B.

particular. The parameters for FIS in eastern Germany are not significant in contrast to the western results. The same holds true for the crisis-dummy. This might be carefully interpreted as evidence that the economic crisis hit the western regions harder than the eastern ones.[24] The positive coefficient indicates a positive employment effect during 2008/2009 without influencing economic growth. It is notable that in this model the long-term interest rate is the factor price that has an effect on employment growth. Changes in regional average wages have a negative effect, as suggested in (b).

Table 2: Sectorial Growth effect on total employment growth

Variable		Coeff.	z-Value
Agriculture	AGR_west	0.01266	5.10 ***
	AGR_west_vp	0.00798	3.56 ***
	AGR_east	0.00985	3.38 ***
	AGR_east_vp	-0.00133	-0.49
Construction	CONST_west	0.02681	3.70 ***
	CONST_west_vp	0.03932	6.49 ***
	CONST_east	0.07288	11.83 ***
	CONST_east_vp	0.06966	9.08 ***
Production	PROD_west	0.01721	3.70 ***
	PROD_west_vp	0.01279	2.20 **
	PROD_east	0.01340	2.06 **
	PROD_east_vp	0.01592	2.35 **
Trade, Hospitality, Transportation	THT_west	0.09351	8.12 ***
	THE_west_vp	0.01803	1.40
	THT_east	0.02019	1.44
	THT_east_vp	-0.04175	-2.30 **
Finance, Insurance, Services	FIS_west	0.01964	1.87 *
	FIS_west_vp	0.01611	2.14 **
	FIS_east	0.00832	0.47
	FIS_east_vp	-0.00860	-0.76
Public and private services	PPS_west	0.05622	2.46 **
	PPS_west_vp	-0.00287	-0.22
	PPS_east	0.14340	6.24 ***
	PPS_east_vp	0.02372	0.80
Crisis	crisis west	0.48657	4.20 ***
	crisis east	-0.07798	-0.43
Factor Prices	gwage_	-0.08359	-2.57 **
	interst rate	0.64172	7.92 ***
	_cons	0.05382	0.64

Observations = 1090 $R^2 = 0.5779$
Wald chi2(34) = 4631.21 Prob > chi2 = 0.0000
$\chi^2 = 2.12$ Prob > chi2 = 1.000
***, **, *: Significant at 1, 5, 10%-level*

This "atypical" labour market effect suggested by the crisis-west-dummy has been accordingly identified concerning the unemployment rate, as fewer employees had been dismissed than in previous years. The IMF (2010) took apart the cumulated changes of the unemployment rate during 2008 and 2009. For Germany, it found a predictable (using Okun´s Law) increase in the rate of unemployment. But, simultaneously, there had been an unexplained component, which reduced the unemployment rate. This component compensates for the Okun-effect, leading finally to a stable labor market during the Great recession. Both effects meanwhile are called "Germany´s Job miracle".[25]

It is not likely that all sectors face the production-function mentioned above and hence won´t show additional results for the factor prices. This will be checked in the next step. Equation (6.1a) can be estimated for each sector leading to (6.1b):

[24] Information about regional differentiated impact of the economic crisis can be found in Möller (2010) and Burda/Hunt (2011).
[25] This idiom is referred to by Paul Krugman (2009). A detailed explanation of this "miracle" is given by Möller (2010), Schneider (2012) and Boysen-Hogref/Groll (2010).

$$gE_t^{r,s} = \propto + \rho^r + \beta_1^s gGVA_t^{r,s} * (1 - D^r) + \beta_2^s gGVA_{t-1}^{r,s} * (1 - D^r) + \beta_3^s gGVA_t^{r,s} * D^r + \beta_4^s gGVA_{t-1}^{r,s} * D^r + \gamma_1 g.w^s + \gamma_2 g.lt\_ir + \mu_1 C * (1 - D^r) + \mu_2 C * D^r + \varepsilon_t. \quad (6.1b)$$

Employment and economic growth is included at the sectoral level analogous to (5), Table 1. Results are presented in Table 3. The model is estimated with fixed effects, excluding the construction sector. Here, random effect estimation is evident:[26]

Table 3: Sectorial GVA growth rate on sectorial employment growth rates

		Agriculture (Fixed Effects)		Construction (Random effects)		Production (Fixed Effects)		Trade, Hospitality, Transportation (Fixed Effects)		Finance, Insurance, Services (Fixed Effects)		Public and private services (Fixed Effects)	
		Coeff.	t-Value	Coeff.	t-Value	Coeff.	t-Value	Coeff.	t-Value	Coeff.	t-Value	Coeff.	t-Value
Agriculture	AGR_west	0.07287	7.3 ***										
	AGR_west_vp	0.04466	5.09 ***										
	AGR_east	0.07036	6.33 ***										
	AGR_east_vp	0.00217	0.18										
Construction	CONST_west			0.22647	9.01 ***								
	CONST_west_vp			0.09101	6.76 ***								
	CONST_east			0.42631	13.05 ***								
	CONST_east_vp			0.33098	9.47 ***								
Production	PROD_west					0.07548	4.42 ***						
	PROD_west_vp					0.05799	4.14 ***						
	PROD_east					0.07876	3.92 ***						
	PROD_east_vp					0.10352	5.3 ***						
Trade, Hospitality, Transportation	THT_west							0.25546	12.51 ***				
	THT_west_vp							0.09466	5.78 ***				
	THT_east							0.13182	5.24 ***				
	THT_east_vp							0.03160	0.97				
Finance, Insurance, Services	FIS_west									-0.00599	-0.2		
	FIS_west_vp									0.12657	3.51 ***		
	FIS_east									0.02946	0.94		
	FIS_east_vp									0.11256	3.44 ***		
Public and private services	PPS_west											-0.05908	-1.06
	PPS_west_vp											0.16611	2.24 **
	PPS_east											-0.13785	-3.8 ***
	PPS_east_vp											0.57379	12.58 ***
Crisis	crisiswest	2.07137	5.27 ***	1.13623	3.91 ***	1.75046	8.77 ***	0.99806	12.03 ***	1.18339	4.56 ***	0.18606	0.99
	crisisost	3.71892	6.17 ***	-1.13280	-2.54 **	2.11360	4.53 ***	0.98657	5.87 ***	2.26451	5.76 ***	0.16464	0.64
Factor Prices	gwage_	-0.06633	-0.77 **	-0.03579	-0.45	-0.02458	-0.29	-0.40305	-8.97 ***	1.35505	14.20 ***	0.11298	1.26
	interest rate	0.43139	1.02	1.34794	7.28 ***	1.75564	14.45 ***	0.90143	8.56 ***	-0.19512	-1.10	0.17607	2.74 ***
	_cons	-1.37387	-29.37 ***	-1.73203	-13.91 ***	-1.03688	-6.65 ***	0.19388	6.00 ***	0.16618	0.78	0.41119	2.91 ***
	Observations	*1090*		*1090*		*1090*		*1090*		*1090*		*1090*	
	R²	*0.1510*		*0.5148*		*0.3056*		*0.4473*		*0.1409*		*0.2172*	
	χ²	*39.7300*		*12.5100*		*41.2100*		*31.8600*		*46.7300*		*119.7200*	
	Prob > chi2	*0.0000*		*0.1298*		*0.0000*		*0.0000*		*0.0000*		*0.0000*	
	F (8,108)|Wald chi2 (8)	*34.91*		*1906.6*		*79.02*		*74.97*		*36.51*		*33.64*	

The separation of employees into their sectoral affiliation results in positive relations of sectoral economic growth to sectoral employment growth in almost all cases. It is only the coefficient of growth in the public service sector in eastern Germany that has obviously negative effects on employment in that sector; this would require further investigations. As the connection between sectoral output and sectoral employment is greater than overall employment, the coefficients show higher values than in 6.1a. Especially the construction sector has notable values – again with higher elasticity in eastern Germany. In the sector FIS a time-lag is required to identify the positive growth effect. Note, the explanatory power of this model is rather weak for the FIS sector, as the R^2 = 14,09 is comparatively low. The same holds true for the AGR. Besides the sector PPS the crisis-dummies are significant, with a surprising negative sign for eastern Germany in the construction sector. This indicator has by far the highest amount of the growth-coefficients, again indicating the extraordinary behavior of the labour market in 2008/2009. Regarding the factor prices, signs are expected to be, with FIS as exception. This positive effect of growing average wages here stresses the necessity of

[26] Corresponding random and fixed effects estimations are presented in Appendix G.

model specification in further research.[27] It might be argued, that growing wages induces migration. As high-skilled workers are more mobile in general and the skill level in the FIS-sector is comparatively high, employees might be attracted by rising wages.[28]

Estimation results here are quite satisfying, as coefficients are as assumed. Nonetheless, there is space for further model improvements. Besides quarterly data more specific information about cost- and production function at the sectoral level should be implemented. Regional characteristics could be more precise, too. The differentiation between Eastern and Western Germany is one possibility, but additional aspects, like infrastructure or degree of agglomeration[29], could be of interest.[30] An important element is the lag regarding regional sectoral wage-data. As Blien/Suedekum (2007) found, differences in regional wage levels in neighboring regions have an influence on a region´s level of employment.

Estimation results – Employees differentiation

Besides the necessity to differentiate between sectors concerning economic growth, it is also useful to shed light on different forms of employees and employment *(e)*. Using equation (6), the normal employment growth rate is substituted with the following variables E^e, each in growth rates and each at the regional level for district k[31]:

- foreign workers, measured as employed foreign worker per 100 foreigners able to work,
- employees with low education per 100 inhabitants in working age,
- employees with high education per 100 inhabitants in working age,
- employees in part-time per 100 inhabitants in working age.

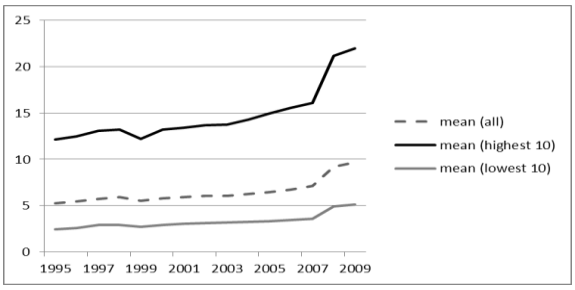
This is expressed in estimation (6.2)

$$\begin{aligned} gE_t^{r,e} = \propto + \rho^r + \beta_1^s gGVA_t^{r,s} * (1 - D^r) + \beta_2^s gGVA_{t-1}^{r,s} * (1 - D^r) + \\ \beta_3^s gGVA_t^{r,s} * D^r + \beta_4^s gGVA_{t-1}^{r,s} * D^r + \gamma_1 g.w^r + \gamma_2 g.lt\_ir + \\ \mu_1 C * (1 - D^r) + \mu_2 C * D^r + \varepsilon_t. \end{aligned} \quad (6.2)$$

Unfortunately, information about mixtures of these types of employment, e.g. what kind of education foreign workers have and if they are part-time workers, is not available for the regional and sectoral levels. Foreign workers are assumed to have a relatively low or inadequate level of education. Thus, foreign and less educated workers face relatively high responses to growth within the construction and agricultural sectors as the required skill level tends to be rather low here. Low-income groups thus benefit from a rising average wage level *(see (g))*, as they have relative cost advantages in this case, because their wage demand would be below the average wage rate illustrated by the variable (*gwage_*). Part-time workers should be found in most sectors. This form of atypical employment increased significantly during the crisis, as shown in Figure 4, which presents the share of part-time workers as an average for all districts, and as an average for those 10 districts with the highest and lowest rates. The extreme increase in 2008 is obvious especially in those districts with a "natural" high rate of part-time workers.

[27] The results are in line with Henderson (1997), who argues that this result might reflect "the absence of a specific wage variable for highly skilled workers" (Henderson (1998), p. 468). An alternative approach to estimating regional wage levels is presented in Blien et al. (2006).
[28] The relation between wage flexibility and mobility of workers is discussed in Topel (1986).
[29] Agglomerations seem to have a strong and dynamic growth, as found in Dauth (2010).
[30] Further aspects are discussed in Zierahn (2011).
[31] These variables have been aggregated analogously to (1).

Figure 4: Part-time workers (% of inhabitants in working age)



The regression-results are presented in Table 4.[32] The estimation for highly-educated workers has been done with random effects, the other ran with fixed effects. The model fitting with regard to the R^2 is fine and most signs are as expected.

Table 4: Estimation results: Differentiation of employment

Variable		foreign workers (fixed effects)		low educated workers (fixed effects)		high educated worker (random effects)		part-time workes (fixed effects)	
		Coeff.	*t-Value*	Coeff.	*t-Value*	Coeff.	*t-Value*	Coeff.	*t-Value*
Agriculture	AGR_west	0.02110	*1.78* *	0.00292	*2.30* **	-0.01345	*-1.83* *	0.00666	*0.51*
	AGR_west_vp	0.00991	*0.93*	0.00155	*1.38*	0.01201	*1.37*	0.13809	*8.93* ***
	AGR_east	0.02304	*0.76*	0.00769	*7.16* ***	-0.01146	*-1.90* *	0.03207	*1.85* *
	AGR_east_vp	0.06429	*1.20*	0.00177	*1.47*	0.00399	*0.58*	0.02542	*1.72* *
Construction	CONST_west	0.15263	*4.68* ***	0.00070	*0.24*	0.07308	*4.67* ***	-0.11249	*-2.70* ***
	CONST_west_vp	0.07438	*2.92* ***	0.00491	*1.94* *	0.02935	*1.79* *	-0.11893	*-3.12* ***
	CONST_east	0.60729	*5.52* ***	0.02690	*6.52* ***	0.11719	*5.87* ***	0.15890	*3.90* ***
	CONST_east_vp	-0.18148	*-0.93*	0.00909	*2.59* **	0.07916	*2.86* ***	0.19750	*3.91* ***
Production	PROD_west	0.03805	*1.64*	-0.00324	*-1.89* *	-0.00186	*-0.16*	0.18979	*4.87* ***
	PROD_west_vp	0.04807	*2.17* **	0.00372	*2.31* **	0.02733	*2.56* **	0.09590	*3.55* ***
	PROD_east	-0.10754	*-1.37*	-0.00255	*-0.99*	-0.01323	*-0.88*	0.05157	*1.32*
	PROD_east_vp	0.08262	*0.91*	-0.00032	*-0.14*	-0.00801	*-0.57*	0.07589	*2.61* **
Trade, Hospitality, Transportation	THT_west	0.13874	*3.01* ***	-0.00043	*-0.09*	0.03547	*1.62*	0.60908	*7.81* ***
	THT_west_vp	0.09893	*3.08* ***	0.03009	*5.98* ***	0.04886	*1.69* *	-0.14650	*-2.04* **
	THT_east	-0.17826	*-0.65*	-0.03167	*-3.69* ***	-0.03528	*-1.31*	0.20968	*3.04* ***
	THT_east_vp	-0.01384	*-0.07*	-0.00134	*-0.10*	-0.05237	*-0.93*	-0.14079	*-1.19*
Finance, Insurance, Services	FIS_west	0.10009	*2.16* **	0.00730	*1.49*	0.02365	*1.05*	0.02264	*0.46*
	FIS_west_vp	-0.03488	*-1.27*	-0.00063	*-0.13*	0.00093	*0.04*	0.06356	*1.42*
	FIS_east	-0.01982	*-0.07*	0.00059	*0.09*	-0.01318	*-0.45*	0.04556	*0.67*
	FIS_east_vp	0.13981	*0.86*	0.00491	*0.95*	-0.06342	*-2.12* **	-0.09835	*-1.67* *
Public and private services	PPS_west	0.04479	*0.78*	0.00939	*1.34*	0.04107	*1.07*	-0.31156	*-2.70* ***
	PPS_west_vp	-0.03338	*-0.72*	0.01191	*1.95* *	0.07855	*2.14* **	-0.03285	*-0.53*
	PPS_east	-0.01641	*-0.03*	0.00873	*0.70*	-0.20271	*-1.58*	-0.11234	*-0.52*
	PPS_east_vp	-0.55329	*-2.03* **	0.01784	*1.59*	-0.02581	*-0.41*	-0.47579	*-3.60* ***
Crisis	crisiswest	4.03664	*8.24* ***	0.92097	*14.48* ***	1.54917	*5.54* ***	21.54280	*21.40* ***
	crisisost	2.19934	*1.25*	1.32754	*9.75* ***	1.41330	*2.59* **	7.33504	*5.99* ***
Factor Prices	gwage_	0.13592	*0.70*	0.10344	*6.72* ***	-0.03082	*-0.43*	0.59774	*3.88* ***
	interest rate	2.69041	*4.78* ***	0.13353	*3.89* ***	1.10508	*5.77* ***	2.98264	*5.89* ***
	_cons	-0.48650	*-0.80*	13.22349	*373.90* ***	2.47672	*15.80* ***	2.46334	*6.62* ***
	Observation	*1090*		*1090*		*1090*		*1090*	
	R^2	*0.2849*		*0.6585*		*0.5021*		*0.7308*	
	χ^2	*43.9400*		*52.1900*		*39.8100*		*45.9500*	
	Prob > chi2	*0.0294*		*0.0031*		*0.0688*		*0.0176*	
	F(28.108)	*28.07*		*45.34*		*21.51*		*157.28*	

****, **, *: Significant at 1, 5, 10%-level*

Foreign workers benefit most from growth within the construction sector with higher elasticity evident in eastern Germany. This observation holds true for all estimations in this study. Positive effects can also be identified for the sectors production (time-lagged in western Germany), THT in Western Germany and FIS. The negative coefficient for the time-lagged coefficient in PPS in Eastern Germany is however unexpected. The high value of the Dummy variable "crisiswest" (4.03) indicates a labor market situation for foreign-workers which has been far more robust than it could have been assumed. The reagibility to factor prices shows a significant positive and high (2.69) amount. While

[32] Again, fixed- and random effects are used for these estimations. The analogue results using fixed- and random-effects are presented in the Appendix H.

the sign is expected, the level is surprising and should be part of further investigations. Low-educated workers benefit from growth in the agriculture- and construction-sector with Eastern German regions showing higher elasticity. Negative indicators are seen in the production sector (west) and THT (east). The FIS-sector does not react to the hiring or firing of low educated workers as a response to output changes. The PPS-sector has a positive but low significant coefficient for the time-lagged parameter in Western Germany. This group of employees was hit by the economic crisis to a lesser extent than expected. As assumed in (*g*), rising average wages has positive effects on the labor demand for less-educated and, therefore, comparatively cheap workers, as their wages lie below average. The extreme value of the constant (13.22), however, raises doubts about the suitability of this calculation approach. The same holds true for highly educated workers, as negative signs appear for the sectors agriculture (low significance) and FIS. Especially the latter is unexpected; the finance sector generally requires workers with comparably high levels of education. Here, there is either no reaction to output growth or a negative one. Positive effects for the sectors Construction, THT, PPS and the crisis-dummies suit well on the other hand. The labor market situation for highly educated workers obviously does not depend on the average wage level, but is instead positively correlated to the interest rate.

The results for part-time worker are ambiguous. The agricultural sector shows positive results, as well as the construction sector in Eastern Germany and the production sector in Western Germany. In sector THT, the impact of output growth on part-time employment without time-lag is relatively high in Western (0.61) and Eastern (0.21) Germany, which is explainable by the structure of the hospitality sector. The negative sign of the parameter for the time-lagged Western Germany coefficient, however, is rather atypical. The same holds true for results in FIS (east, time-lag) and PPS (west and time-lagged east). The construction sector reveals negative signs in western Germany as well. It might be argued that part-time workers turned into full time employees when the sectors faced economic growth. This, however, cannot be proved with the data set used here. The effect of factor prices is similar to low educated employees, as the labour demand for part-time-workers increases, if the factor labor and capital become more expensive on average. The extreme value for the Dummy “crisiswest” indicates the enormous importance of atypical employment as answer to the recession in 2008/2009. But indeed, the coefficient of 21.54 here might indicate inappropriate model-fitting. While multicollinearity cannot be identified,[33] this special group of employment should be part of more intense investigations, as sector affiliation, skill level and further aspects are highly relevant for this group. This requires a more complex data-set, which is not available for this study.

The estimations concerning different characteristics of employees do not show satisfying results in general. Most coefficients are assumed in the theoretical foundation, but obviously the chosen data set and methodology do not provide appropriate estimations. One important improvement would be to take into account intermixtures of employment information. Furthermore, processes for periods of less than a year, i.e. quarterly data, would deliver more detailed insights. Specifically, the seasonable impacts in the sectors of agriculture, construction and hospitality might become clear. Thus, time-lagged data would show adjustment processes more precisely. Note that structural variables might influence labor market effects of different employment groups as well. Increasing the share of high educated workers in the labor market positively affects the less educated in particular (Blien et al., 2006; Bauer, 1998).

[33] The variance inflation factor (VIF) is presented in Appendix I.

4. Conclusion

The rate of employment growth is a major factor in labor market policy and discussions. To understand the relationship between economic output and how the regional labor markets react, several aspects have to be taken into account. First, the suspected correlation at the national level, which is more general, does not necessarily hold true on the regional scale. Differences can be identified by separating the common value of economic growth into its sectoral components. Some sectors, like construction and production, do react more strongly to labor markets and output growth than e.g. the financial and service sectors. The impact of the labor market on the latter does not seem to depend on its regional economic growth directly. Thus, regional economic structure will have an influence on employment elasticity. Labour markets in regions with a dominating financial sector might not have a high business cycle dependency, whereas the labor market in regions with a dominating second sector will be more sensitive. On the other hand, stimulating the regional labour market in the short term will be most successful in the construction sector, as it is very sensitive to changes in output growth. But the direct effect is not prolonged (see also Blien et al., 2006). This is evident in Spain, where a breakdown in the construction sector has had directly negative impacts on the labour market.

When investigating the sectorial impact on the labor market, the inhomogeneity of employees has to be considered as well. Skill requirement differs between sectors. The cost function used here regards the average demand for labor and thus a mean employee. It is not tailored to different skill levels and further characteristics. Thus, the results presented here confirm the structural break due to the financial crisis and the different reagibility to factor prices. As several parameters show unexpected results, the suitability of the model appears to be unsatisfactory. Here, some model and data specification are required to deliver more substantial results. Regarding sectorial differentiation, improvements will be generated by using quarterly data. The necessity to choose spatial econometric approaches has been discussed and left out here as the global spatial indicator “Moran´s I” does not confirm the use of spatial lag or spatial error processes. This, however, might be another aspect for further research.

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Appendix A

The average development of total and sectorial growth of output and employment can be seen in Table 5.

Table 5: Descriptive statistics

	g.GVA		g.EMPL	
	Mean	Std. Err.	Mean	Std. Err.
total	1.743	0.093	0.291	0.041
Agriculture	-1.440	0.465	-1.046	0.117
Construction	-0.390	0.187	-2.361	0.123
Production	1.123	0.292	-0.637	0.078
Trade, Hospitality, Transportation	1.557	0.123	0.431	0.052
Finance, Insurance, Services	3.059	0.114	3.144	0.095
Public and private services	2.205	0.076	0.894	0.049

Appendix B

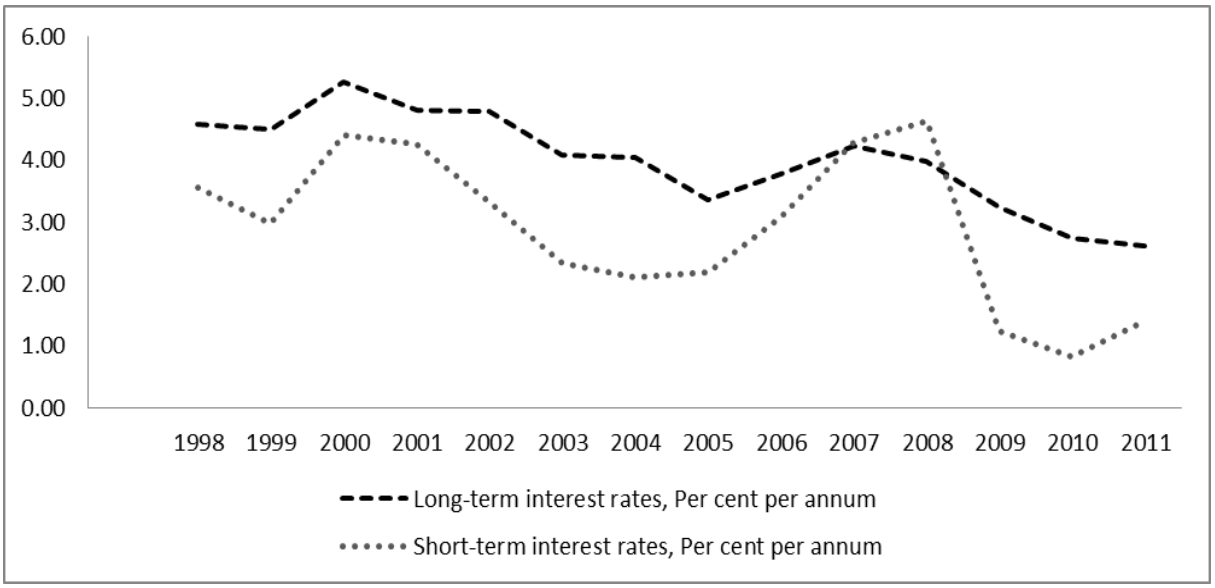
Estimation of model 2-5 with random effects and χ^2 of Hausman-tests.

		Effects on employment in total ot sector…									
		(A)		(B)			(C)				
	Model	(2) | (3)		(4)			(5)				
	Random Effects						*West*		*East*		
		t		*t*	*t-1*		*t*	*t-1*	*t*	*t-1*	
	coef	β_1	α	β_1	β_2	α	β_1	β_2	β_3	β_4	α
	(t) | (R^2)	***z-value***	***R^2***	***z-value***	***z-value***	***R^2***	***z-value***	***z-value***	***z-value***	***z-value***	***R^2***
Economic growth in….	**total GVA**	0.1655	0.0023	0.1683	0.1304	-0.3041	0.1789	0.1548	0.1283	0.0488	-0.3021
		14.460	*0.167*	*15.37*	*9.79*	*0.235*	*14.7*	*10.53*	*5.19*	*1.89*	*0.216*
	Aggriculture (AGR)	0.0586	-0.9615	0.0697	0.4534	-0.9433	0.0673	0.0543	0.0745	0.0303	-0.9440
		7.990	*0.058*	*9.36*	*5.96*	*0.0878*	*7.22*	*5.69*	*5.87*	*2.34*	*0.090*
	Contruction (CONS)	0.4141	-2.1990	0.3590	0.2054	-2.1420	0.2803	0.1299	0.4322	0.3127	-1.8972
		24.210	*0.366*	*25.14*	*15.73*	*0.4586*	*16.69*	*8.58*	*15.91*	*12.05*	*0.487*
	Production (PROD)	0.0753	-0.7212	0.0761	0.7460	-0.9270	0.0779	0.0619	0.6667	0.1094	0.9385
		10.080	*0.082*	*10.54*	*8.66*	*0.1373*	*9.42*	*6.2*	*4.53*	*6.83*	*0.144*
	Trade, Hospitality, Transportation (THT)	0.2241	0.0820	0.2387	0.0928	0.1326	0.2626	0.1060	0.1180	0.0215	-0.1229
		21.130	*0.275*	*22.73*	*7.70*	*0.2927*	*23.52*	*8.35*	*4.98*	*0.85*	*0.310*
	Finance, Insurance, Services (FIS)	0.0099	3.1140	0.0186	0.1437	2.5947	0.0235	0.1597	0.0127	0.1050	2.5824
		0.390	*0.002*	*0.75*	*6.02*	*0.031*	*0.83*	*5.98*	*0.3*	*2.61*	*0.030*
	Public and private services (PPS)	-0.0159	0.9294	-0.0204	0.2532	0.4262	0.0208	0.2273	-0.2647	0.4258	0.4283
		-0.820	*0.008*	*-1.14*	*13.62*	*0.1422*	*1.12*	*11.73*	*-6.48*	*10.25*	*0.169*

Hausman Test	(A) χ^2 *Prob>chi2*	(B) χ^2 *Prob>chi2*	(C) χ^2 *Prob>chi2*
total GVA	11.46 *0.001*	11.95 *0.003*	86.47 *0.000*
Aggriculture (AGR)	72.06 *0.000*	3.18 *0.204*	-33.18
Contruction	150.16 *0.000*	31.91 *0.000*	25.10 *0.000*
Production	67.25 *0.000*	14.18 *0.001*	29.87 *0.000*
Trade,	-192.32	57.98 *0.000*	54.21 *0.000*
Finance,	2.96 *0.085*	1.92 *0.384*	14.08 *0.007*
Public and	1437.42 *0.000*	28.24 *0.000*	109.6 *0.000*

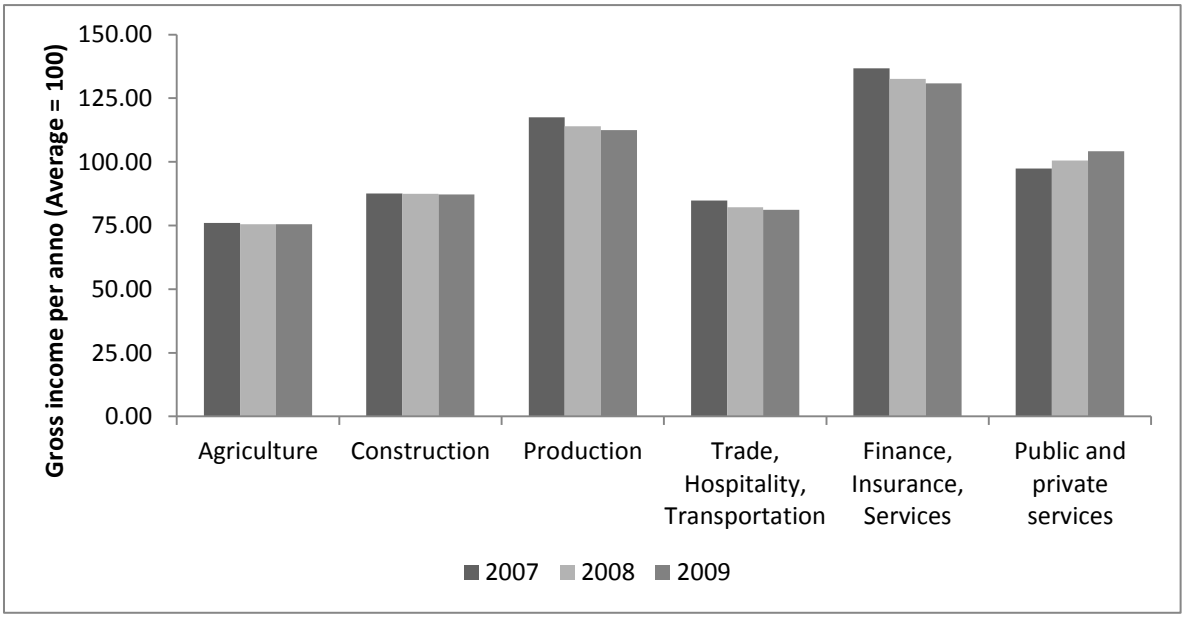
Appendix C

Figure 5: Long-term and short-term interest rate



Source: OECD, Monthly Monetary and Financial Statistics (MEI)

Appendix D


Gross income per anno (Average = 100)
150.00
125.00
100.00
75.00
50.00
25.00
0.00
Agriculture
Construction
Production
Trade, Hospitality, Transportation
Finance, Insurance, Services
Public and private services
2007
2008
2009

Appendix E

Moran´s I of the variables

	year	I	*p-value**		year	I	*p-value**
Employment	2000	-0.101	*0.071*	Gross value added	2000	-0.010	*0.496*
	2001	-0.043	*0.293*		2001	0.046	*0.182*
	2002	0.014	*0.355*		2002	-0.077	*0.135*
	2003	0.014	*0.354*		2003	0.053	*0.156*
	2004	-0.067	*0.176*		2004	0.006	*0.401*
	2005	-0.022	*0.421*		2005	0.033	*0.243*
	2006	0.058	*0.134*		2006	0.038	*0.223*
	2007	-0.049	*0.262*		2007	-0.019	*0.439*
	2008	0.07	*0.102*		2008	0.054	*0.157*
	2009	0.051	*0.169*		2009	-0.037	*0.325*
Employment agriculture	2000	-0.044	*0.280*	Employment Trade, Hospitality, Transportation	2000	0.004	*0.414*
	2001	-0.007	*0.485*		2001	-0.026	*0.393*
	2002	0.062	*0.111*		2002	0.141	***0.008***
	2003	-0.152	***0.010***		2003	-0.131	***0.025***
	2004	0.125	***0.015***		2004	-0.072	*0.158*
	2005	-0.051	*0.248*		2005	-0.029	*0.373*
	2006	-0.01	*0.495*		2006	0.023	*0.301*
	2007	0.017	*0.330*		2007	0.03	*0.263*
	2008	-0.011	*0.486*		2008	0.069	*0.101*
	2009	-0.028	*0.381*		2009	0.01	*0.377*
Employment construction	2000	-0.063	*0.194*	Employment Finance, Insurance, Services	2000	-0.145	***0.015***
	2001	-0.023	*0.414*		2001	-0.095	*0.084*
	2002	-0.066	*0.184*		2002	-0.04	*0.313*
	2003	-0.065	*0.185*		2003	-0.026	*0.391*
	2004	-0.062	*0.200*		2004	-0.139	***0.019***
	2005	-0.02	*0.428*		2005	-0.043	*0.293*
	2006	-0.101	*0.071*		2006	-0.093	*0.090*
	2007	0.091	*0.054*		2007	0.082	*0.061*
	2008	-0.002	*0.456*		2008	0.017	*0.335*
	2009	-0.042	*0.299*		2009	0.053	*0.156*
Employment production	2000	-0.045	*0.284*	Employment Public and private services	2000	0.012	*0.357*
	2001	-0.055	*0.231*		2001	0.014	*0.355*
	2002	-0.023	*0.415*		2002	-0.095	*0.079*
	2003	0.072	*0.095*		2003	0.001	*0.436*
	2004	-0.034	*0.345*		2004	-0.058	*0.217*
	2005	-0.077	*0.138*		2005	0.024	*0.296*
	2006	0.01	*0.379*		2006	-0.093	*0.086*
	2007	0.03	*0.264*		2007	0.042	*0.199*
	2008	-0.04	*0.311*		2008	0.06	*0.127*
	2009	0.114	***0.025***		2009	-0.04	*0.308*

* p-values below ***0.05*** or below *0.1* are highlighted

Moran´s I of the Estimation´s residuals 6.1a, 6.1b and 6.2

Model 6.1a						Model 6.2			
	year	I	*p-value**	year	I	*p-value**		2000	-0.045	*0.276*
	2000	-0.010	*0.496*	2005	-0.017	*0.453*		2001	0.032	*0.236*
	2001	0.015	*0.347*	2006	0.068	*0.109*		2002	0.072	*0.083*
	2002	-0.046	*0.276*	2007	-0.046	*0.278*	foreign workers	2003	-0.121	***0.034***
	2003	0.027	*0.282*	2008	0.056	*0.147*		2004	0.137	***0.009***
	2004	-0.026	*0.396*	2009	0.027	*0.281*		2005	-0.058	*0.214*
								2006	-0.020	*0.429*
								2007	0.060	*0.122*
Model 6.1.b								2008	-0.012	*0.481*
	year	I	*p-value**	year	I	*p-value**		2009	-0.036	*0.334*
	2000	-0.045	*0.276*	2000	-0.020	*0.434*		2000	-0.013	*0.473*
	2001	0.032	*0.236*	2001	0.050	*0.168*		2001	0.024	*0.296*
	2002	0.072	*0.083*	2002	0.085	*0.065*		2002	-0.068	*0.173*
Aggriculture	2003	-0.121	***0.034***	2003	-0.116	***0.043***	low educated	2003	-0.078	*0.134*
	2004	0.137	***0.009***	HGV 2004	-0.050	*0.256*		2004	-0.092	*0.091*
	2005	-0.058	*0.214*	2005	-0.056	*0.225*		2005	0.113	***0.023***
	2006	-0.020	*0.429*	2006	0.066	*0.115*		2006	-0.086	*0.110*
	2007	0.060	*0.122*	2007	0.034	*0.244*		2007	0.028	*0.276*
	2008	-0.012	*0.481*	2008	0.000	*0.440*		2008	0.000	*0.442*
	2009	-0.036	*0.334*	2009	-0.022	*0.418*		2009	0.000	*0.444*
	2000	-0.013	*0.473*	2000	-0.130	***0.026***		2000	-0.024	*0.404*
	2001	0.024	*0.296*	2001	-0.077	*0.138*		2001	0.022	*0.302*
	2002	-0.068	*0.173*	2002	-0.047	*0.274*		2002	0.080	*0.065*
Construction	2003	-0.078	*0.134*	2003	-0.040	*0.306*	high educated	2003	0.008	*0.387*
	2004	-0.092	*0.091*	FVU 2004	-0.153	***0.011***		2004	-0.053	*0.240*
	2005	0.113	***0.023***	2005	-0.044	*0.287*		2005	0.002	*0.428*
	2006	-0.086	*0.110*	2006	-0.071	*0.159*		2006	0.006	*0.404*
	2007	0.028	*0.276*	2007	0.079	*0.069*		2007	-0.112	***0.049***
	2008	0.000	*0.442*	2008	0.009	*0.386*		2008	0.004	*0.416*
	2009	0.000	*0.444*	2009	0.046	*0.185*		2009	0.110	***0.028***
	2000	-0.024	*0.404*	2000	-0.012	*0.480*		2000	-0.012	*0.480*
	2001	0.022	*0.302*	2001	0.054	*0.155*		2001	0.054	*0.155*
	2002	0.080	*0.065*	2002	-0.106	***0.048***		2002	-0.106	***0.048***
Production	2003	0.008	*0.387*	2003	-0.004	*0.468*	part tim worker	2003	-0.004	*0.468*
	2004	-0.053	*0.240*	OEPR 2004	-0.036	*0.334*		2004	-0.036	*0.334*
	2005	0.002	*0.428*	2005	0.032	*0.255*		2005	0.032	*0.255*
	2006	0.006	*0.404*	2006	-0.087	*0.104*		2006	-0.087	*0.104*
	2007	-0.112	***0.049***	2007	0.008	*0.392*		2007	0.008	*0.392*
	2008	0.004	*0.416*	2008	-0.007	*0.485*		2008	-0.007	*0.485*
	2009	0.110	***0.028***	2009	-0.063	*0.196*		2009	-0.063	*0.196*

* p-values below ***0.05*** or below *0.1* are highlighted

Appendix F

Model 6.1a estimated with random effects

Variable		Coeff.	t-Value
Agriculture	AGR_west	0.01219	4.93 ***
	AGR_west_vp	0.00854	4.01 ***
	AGR_east	0.00956	3.56 ***
	AGR_east_vp	-0.00309	-1.22
Construction	CONST_west	0.02464	3.22 ***
	CONST_west_vp	0.03792	6.11 ***
	CONST_east	0.06799	11.17 ***
	CONST_east_vp	0.06069	6.84 ***
Production	PROD_west	0.01458	3.33 ***
	PROD_west_vp	0.01103	2.00 **
	PROD_east	0.02011	2.54 **
	PROD_east_vp	0.02138	2.91 ***
Trade, Hospitality, Transportation	THT_west	0.08656	7.57 ***
	THE_west_vp	0.01221	1.05
	THT_east	0.00151	0.10
	THT_east_vp	-0.05348	-2.51 **
Finance, Insurance, Services	FIS_west	0.01064	1.06
	FIS_west_vp	0.00664	0.95
	FIS_east	0.01815	0.98
	FIS_east_vp	0.00046	0.04
Public and private services	PPS_west	0.04087	1.89 *
	PPS_west_vp	-0.01407	-1.11
	PPS_east	0.14898	5.49 ***
	PPS_east_vp	0.03067	1.12
Crisis	crisis west	0.48614	4.08 ***
	crisis east	0.22990	1.07
Factor Prices	gwage_	-0.06596	-2.15 **
	interst rate	0.67711	8.36 ***
	_cons	0.10275	1.70 *

Observations = 1090 $R^2 = 0.5823$

F(28,108) = 155.85 corr(u_i, Xb) = 0.1235

****, **, *: Significant at 1, 5, 10%-level*

Appendix G

Model 6.1b estimated with fixed effects

Random effects	Agriculture		Construction		Production		Trade, Hospitality, Transportation		Finance, Insurance, Services		Public and private services	
	Coeff.	*t-Value*	Coeff.	*t-Value*	Coeff.	*t-Value*	Coeff.	*t-Value*	Coeff.	*t-Value*	Coeff.	*t-Value*
AGR_west	0.07712	*7.68* ***										
AGR_west_vp	0.04474	*5.02* ***										
AGR_east	0.07416	*6.3* ***										
AGR_east_vp	0.01798	*1.51*										
CONST_west			0.22121	*8.37* ***								
CONST_west_vp			0.08609	*60.5* ***								
CONST_east			0.41292	*13.19* ***								
CONST_east_vp			0.27109	*6.44* ***								
PROD_west					0.08121	*4.68*						
PROD_west_vp					0.06348	*4.5*						
PROD_east					0.07641	*3.78*						
PROD_east_vp					0.10295	*6.14*						
THT_west							0.28009	*1.85* ***				
THT_west_vp							0.11805	*6.58* ***				
THT_east							0.14762	*6.46* ***				
THT_east_vp							0.04710	*2.36* **				
FIS_west									0.01057	*0.4*		
FIS_west_vp									0.14768	*4.54* ***		
FIS_east									-0.00487	*-0.16*		
FIS_east_vp									0.07817	*2.4* **		
PPS_west											0.00371	*-1.05*
PPS_west_vp											0.22745	*2.38* ***
PPS_east											-0.27044	*-4.1* ***
PPS_east_vp											0.41327	*12.93* ***
crisiswest	2.49942	*6.23* ***	1.08570	*3.70* ***	1.84060	*8.96* ***	1.05663	*12.22* ***	1.23400	*4.81* ***	0.21690	*2.25*
crisisost	1.88852	*3.33* ***	0.59309	*0.11*	2.01868	*5.26* ***	0.81970	*5.22* ***	1.98415	*4.88* ***	-0.14845	*1.28*
gwage_sectors	-0.05400	*-0.62*	-0.03524	*-0.44*	-0.02004	*-0.24*	-0.44307	*-9.44* ***	1.35856	*14.10* ***	0.12024	*0.73*
interest rate	0.34190	*0.81*	1.42165	*7.52* ***	1.73127	*14.21* ***	0.87240	*8.52* ***	-0.20244	*-1.14*	0.27682	*-1.26* ***
_cons	-1.36131	*-9.47* ***	-1.83707	*-14.79* ***	-1.06576	*-5.81* ***	0.14539	*2.67* ***	0.13176	*0.59*	0.33423	*2.30* **
Observations	*1090*		*1090*		*1090*		*1090*		*1090*		*1090*	
R²	*0.1377*		*0.5293*		*0.4187*		*0.4449*		*0.1392*		*0.1811*	
Wald chi2 (8)	*287.37*		*156.34*		*92.72*		*678.22*		*278.31*		*237.8*	

Appendix H

Model 6.2 estimated with fixed effects

Variable		foreign workers *(fixed effects)*		low educated workers *(fixed effects)*		high educated worker *(random effects)*		part-time workes *(fixed effects)*	
		Coeff.	*t-Value*	Coeff.	*t-Value*	Coeff.	*t-Value*	Coeff.	*t-Value*
Agriculture	AGR_west	0.02352	*2.06* **	0.00293	*2.29* **	-0.01401	*-1.87* *	-0.03880	*-4.40* ***
	AGR_west_vp	0.01715	*1.74* *	0.00145	*1.29*	0.01209	*1.36*	-0.04954	*-6.30* ***
	AGR_east	0.03198	*1.05*	0.00757	*7.22* ***	-0.01363	*-2.33* **	-0.02863	*-2.04* **
	AGR_east_vp	0.03232	*0.59*	0.00241	*2.08* **	0.00139	*0.22*	-0.03876	*-2.88* ***
Construction	CONST_west	0.11808	*3.51* ***	0.00071	*0.25*	0.07185	*4.52* ***	0.06846	*2.93* ***
	CONST_west_vp	0.04761	*2.00* **	0.00478	*1.89* *	0.02671	*1.54*	-0.06048	*-3.30* ***
	CONST_east	0.50530	*4.35* ***	0.02846	*6.90* ***	0.11301	*5.32* ***	0.15697	*4.43* ***
	CONST_east_vp	-0.36897	*-1.90* *	0.01217	*3.25* ***	0.07116	*2.46* **	0.10864	*2.39* **
Production	PROD_west	0.02844	*1.34*	-0.00301	*-1.74* *	-0.00554	*-0.46*	0.04314	*2.55* **
	PROD_west_vp	0.03912	*1.89* *	0.00394	*2.45* **	0.02377	*2.12* **	0.04894	*3.63* ***
	PROD_east	-0.02067	*-0.28*	-0.00430	*-1.67* *	-0.00612	*-0.35*	0.06623	*2.02* **
	PROD_east_vp	0.17097	*1.98* **	-0.00218	*-0.97*	-0.00444	*-0.28*	0.00160	*0.06*
Trade, Hospitality, Transportation	THT_west	0.09718	*2.35* **	0.00033	*0.07*	0.03769	*1.65*	-0.13054	*-4.33* ***
	THT_west_vp	0.04899	*1.31*	0.03087	*6.03* ***	0.04960	*1.52*	-0.12131	*-3.00* ***
	THT_east	-0.03435	*-0.11*	-0.03178	*-3.56* ***	-0.05523	*-1.76* *	-0.00502	*-0.06*
	THT_east_vp	0.33812	*1.70* *	-0.00387	*-0.30*	-0.06206	*-1.14*	-0.03160	*-0.48*
Finance, Insurance, Services	FIS_west	0.03445	*0.81*	0.00848	*1.70* *	0.01057	*0.43*	0.07831	*2.64* ***
	FIS_west_vp	-0.09669	*-2.77* ***	0.00044	*0.09*	-0.01519	*-0.69*	0.04661	*1.51*
	FIS_east	0.16423	*0.82*	-0.00335	*-0.51*	-0.00131	*-0.04*	0.15419	*2.40* **
	FIS_east_vp	0.30898	*1.45*	0.00106	*0.19*	-0.05286	*-1.46*	0.05409	*0.74*
Public and private services	PPS_west	-0.02498	*-0.42*	0.01123	*1.56*	0.02685	*0.68*	0.12164	*1.92* *
	PPS_west_vp	-0.10971	*-2.26* **	0.01370	*2.19* **	0.06627	*1.75* *	-0.19111	*-3.24* ***
	PPS_east	0.13574	*0.33*	0.00397	*0.30*	-0.22999	*-1.70* *	-0.01182	*-0.10*
	PPS_east_vp	-0.40522	*-1.99* **	0.01346	*1.15*	-0.04732	*-0.79*	0.02235	*0.17*
Crisis	crisiswest	4.23801	*8.00* ***	0.92571	*14.51* ***	1.55424	*5.39* ***	3.69227	*12.85* ***
	crisisost	7.86963	*5.97* ***	1.22982	*8.82* ***	1.79487	*3.04* ***	5.89865	*5.92* ***
Factor Prices	gwage_	0.05893	*0.31*	0.10298	*6.68* ***	-0.04763	*-0.66*	-0.67153	*-8.00* ***
	interest rate	3.07160	*5.48* ***	0.13164	*3.82* ***	1.15951	*6.07* ***	1.29221	*11.08* ***
	_cons	-0.94667	*-2.29* **	13.23269	*54.30* ***	2.59405	*15.68* ***	4.47987	*16.15* ***
	Observation	*1090*		*1090*		*1090*		*1090*	
	R^2	*0.3095*		*0.6576*		*0.5021*		*0.3462*	
	F(28.108)	*32.16*		*1275.55*		*21.51*		*853.81*	

****, **, *: Significant at 1, 5, 10%-level*

Appendix I

Variance inflation factor (VIF), estimation part-time employment.

Variable	VIF	1/VIF
crisisost	2.68	0.373243
ostbau_p	2.35	0.425565
g_lt_ir_	2.17	0.460175
crisiswest	2.10	0.475850
ostoepr	2.01	0.498326
ostoepr_p	1.98	0.503951
ostbau	1.81	0.551282
westprod	1.67	0.598600
ostfvu_p	1.63	0.611820
ostprod	1.58	0.631966
westland	1.58	0.631986
ostfvu	1.57	0.637992
westhgv	1.47	0.682090
osthgv	1.42	0.705349
ostland_p	1.40	0.713660
osthgv_p	1.40	0.714436
ostland	1.36	0.733668
westoepr	1.34	0.748465
westland_p	1.33	0.753086
westbau_p	1.33	0.753242
westbau	1.33	0.754156
westhgv_p	1.23	0.813958
ostprod_p	1.22	0.817713
gwage_	1.22	0.821177
westfvu_p	1.20	0.833632
westoepr_p	1.19	0.840311
westfvu	1.17	0.856592
westprod_p	1.12	0.893694
Mean VIF	1.57	

Appendix J

Labor Market	District
Aachen	Aachen
Aachen	Aachen
Aachen	Düren
Aachen	Heinsberg
Ahrweiler	Ahrweiler
Altenburger Land	Altenburger Land
Altötting	Altötting
Altötting	Mühldorf a. Inn
Altötting	Rottal-Inn
Amberg	Amberg
Amberg	Amberg-Sulzbach
Ansbach	Ansbach
Ansbach	Ansbach
Ansbach	Weißenburg-Gunzenhausen
Aschaffenburg	Aschaffenburg
Aschaffenburg	Aschaffenburg
Aschaffenburg	Miltenberg
Augsburg	Aichach-Friedberg
Augsburg	Augsburg
Augsburg	Augsburg
Augsburg	Dillingen a.d. Donau
Augsburg	Donau-Ries
Bad Kreuznach	Bad Kreuznach
Bamberg	Bamberg
Bamberg	Bamberg
Bayreuth	Bayreuth
Bayreuth	Bayreuth
Bayreuth	Kulmbach
Berchtesgadener Land	Berchtesgadener Land
Berchtesgadener Land	Traunstein
Berlin	Barnim
Berlin	Berlin
Berlin	Brandenburg an der Havel
Berlin	Dahme-Spreewald
Berlin	Frankfurt (Oder)
Berlin	Havelland
Berlin	Märkisch-Oderland
Berlin	Oberhavel
Berlin	Oder-Spree
Berlin	Potsdam
Berlin	Potsdam-Mittelmark
Berlin	Teltow-Fläming
Birkenfeld	Birkenfeld
Bremen	Bremen
Bremen	Delmenhorst
Bremen	Diepholz
Bremen	Osterholz
Bremen	Rotenburg (Wümme)
Bremen	Verden
Bremerhaven	Bremerhaven
Bremerhaven	Cuxhaven
Calw	Calw
Chemnitz	Chemnitz
Chemnitz	Erzgebirgskreis
Chemnitz	Mittelsachsen
Chemnitz	Vogtlandkreis
Chemnitz	Zwickau
Coburg	Coburg
Coburg	Coburg
Coburg	Kronach
Coburg	Lichtenfels
Coburg	Sonneberg
Cottbus	Cottbus
Cottbus	Elbe-Elster
Cottbus	Oberspreewald-Lausitz
Cottbus	Spree-Neiße
Deggendorf	Deggendorf
Deggendorf	Dingolfing-Landau
Deggendorf	Regen
Deggendorf	Straubing
Deggendorf	Straubing-Bogen
Dessau	Anhalt-Bitterfeld
Dessau	Dessau-Roßlau
Dessau	Wittenberg
Dithmarschen	Dithmarschen
Dresden	Bautzen
Dresden	Dresden
Dresden	Görlitz
Dresden	Meißen
Dresden	Sächsische Schweiz-Osterzgebirge
Düsseldorf	Duisburg
Düsseldorf	Düsseldorf
Düsseldorf	Kleve
Düsseldorf	Krefeld
Düsseldorf	Mettmann
Düsseldorf	Mönchengladbach
Düsseldorf	Rhein-Kreis Neuss
Düsseldorf	Solingen
Düsseldorf	Viersen
Düsseldorf	Wesel
Düsseldorf	Wuppertal
Emden	Aurich
Emden	Emden
Emden	Leer
Emden	Wittmund
Emsland	Emsland
Emsland	Grafschaft Bentheim
Erfurt	Erfurt
Erfurt	Gotha
Erfurt	Ilm-Kreis
Erfurt	Kyffhäuserkreis
Erfurt	Sömmerda
Erfurt	Unstrut-Hainich-Kreis
Essen	Bochum
Essen	Bottrop
Essen	Dortmund
Essen	Ennepe-Ruhr-Kreis
Essen	Essen
Essen	Gelsenkirchen
Essen	Hagen
Essen	Herne
Essen	Recklinghausen
Essen	Unna
Flensburg	Flensburg
Flensburg	Nordfriesland
Flensburg	Schleswig-Flensburg
Frankfurt am Main	Darmstadt
Frankfurt am Main	Darmstadt-Dieburg
Frankfurt am Main	Frankfurt am Main
Frankfurt am Main	Groß-Gerau
Frankfurt am Main	Hochtaunuskreis
Frankfurt am Main	Main-Kinzig-Kreis
Frankfurt am Main	Main-Taunus-Kreis
Frankfurt am Main	Mainz
Frankfurt am Main	Mainz-Bingen
Frankfurt am Main	Offenbach
Frankfurt am Main	Offenbach am Main
Frankfurt am Main	Rheingau-Taunus-Kreis
Frankfurt am Main	Wetteraukreis
Frankfurt am Main	Wiesbaden
Freiburg im Breisgau	Breisgau-Hochschwarzwald
Freiburg im Breisgau	Emmendingen
Freiburg im Breisgau	Freiburg im Breisgau
Freiburg im Breisgau	Ortenaukreis
Freudenstadt	Freudenstadt
Fulda	Eisenach
Fulda	Fulda
Fulda	Fulda
Fulda	Hersfeld-Rotenburg
Fulda	Wartburgkreis
Garmisch-Partenkirchen	Garmisch-Partenkirchen
Gera	Gera
Gera	Greiz
Gera	Jena
Gera	Saale-Holzland-Kreis
Gera	Saale-Orla-Kreis
Gera	Saalfeld-Rudolstadt
Gießen	Gießen
Gießen	Lahn-Dill-Kreis
Gießen	Marburg-Biedenkopf
Goslar	Goslar
Göttingen	Eichsfeld
Göttingen	Göttingen
Göttingen	Nordhausen
Göttingen	Northeim
Göttingen	Osterode am Harz
Greifswald	Greifswald
Greifswald	Ostvorpommern
Halle	Burgenlandkreis
Halle	Halle (Saale)
Halle	Mansfeld-Südharz
Halle	Saalekreis
Hamburg	Hamburg
Hamburg	Harburg
Hamburg	Herzogtum Lauenburg
Hamburg	Lüneburg
Hamburg	Pinneberg
Hamburg	Segeberg
Hamburg	Stade
Hamburg	Stormarn
Hamm	Hamm
Hannover	Celle
Hannover	Hameln-Pyrmont
Hannover	Hildesheim
Hannover	Region Hannover
Hannover	Schaumburg
Heilbronn	Heilbronn
Heilbronn	Heilbronn
Heilbronn	Hohenlohekreis
Heilbronn	Neckar-Odenwald-Kreis
Hof	Hof
Hof	Hof
Holzminden	Holzminden
Holzminden	Höxter
Ingolstadt	Eichstätt
Ingolstadt	Ingolstadt
Ingolstadt	Neuburg-Schrobenhausen
Ingolstadt	Pfaffenhofen a.d. Ilm
Kaiserslautern	Kaiserslautern
Kaiserslautern	Kaiserslautern
Kaiserslautern	Kusel
Karlsruhe	Baden-Baden
Karlsruhe	Enzkreis
Karlsruhe	Karlsruhe
Karlsruhe	Karlsruhe
Karlsruhe	Pforzheim
Karlsruhe	Rastatt
Kassel	Kassel
Kassel	Kassel
Kassel	Schwalm-Eder-Kreis
Kassel	Waldeck-Frankenberg
Kassel	Werra-Meißner-Kreis
Kaufbeuren	Kaufbeuren
Kaufbeuren	Ostallgäu
Kempten	Kempten (Allgäu)
Kempten	Oberallgäu
Kiel	Kiel

Kiel	Neumünster	Nienburg (Weser)	Nienburg (Weser)	Schwerin	Ludwigslust
Kiel	Plön	Nürnberg	Erlangen	Schwerin	Nordwestmecklenburg
Kiel	Rendsburg-Eckernförde	Nürnberg	Erlangen-Höchstadt	Schwerin	Parchim
Koblenz	Cochem-Zell	Nürnberg	Forchheim	Schwerin	Schwerin
Koblenz	Koblenz	Nürnberg	Fürth	Schwerin	Wismar
Koblenz	Mayen-Koblenz	Nürnberg	Fürth	Siegen	Altenkirchen (Westerwald)
Koblenz	Neuwied	Nürnberg	Neumarkt i.d. OPf.		
Koblenz	Rhein-Hunsrück-Kreis	Nürnberg	Neustadt a.d. Aisch-Bad Windsheim	Siegen	Olpe
Koblenz	Rhein-Lahn-Kreis			Siegen	Siegen-Wittgenstein
Koblenz	Westerwaldkreis	Nürnberg	Nürnberg	Sigmaringen	Sigmaringen
Köln	Bonn	Nürnberg	Nürnberger Land	Sigmaringen	Zollernalbkreis
Köln	Euskirchen	Nürnberg	Roth	Soest	Hochsauerlandkreis
Köln	Köln	Nürnberg	Schwabach	Soest	Märkischer Kreis
Köln	Leverkusen	Oberhausen	Mülheim an der Ruhr	Soest	Soest
Köln	Oberbergischer Kreis	Oberhausen	Oberhausen	Soltau-Fallingbostel	Soltau-Fallingbostel
Köln	Rhein-Erft-Kreis	Odenwaldkreis	Odenwaldkreis	Steinburg	Steinburg
Köln	Rheinisch-Bergischer Kreis	Oldenburg	Ammerland	Stendal	Altmarkkreis Salzwedel
		Oldenburg	Cloppenburg	Stendal	Lüchow-Dannenberg
Köln	Rhein-Sieg-Kreis	Oldenburg	Oldenburg	Stendal	Stendal
Landau in der Pfalz	Germersheim	Oldenburg	Oldenburg (Oldenburg)	Stendal	Uelzen
Landau in der Pfalz	Landau in der Pfalz	Oldenburg	Vechta	Stralsund	Nordvorpommern
Landau in der Pfalz	Südliche Weinstraße	Oldenburg	Wesermarsch	Stralsund	Stralsund
Landsberg am Lech	Landsberg am Lech	Ostablkreis	Heidenheim	Stuttgart	Böblingen
Landshut	Landshut	Ostablkreis	Ostalbkreis	Stuttgart	Esslingen
Landshut	Landshut	Ostablkreis	Schwäbisch Hall	Stuttgart	Göppingen
Leipzig	Leipzig	Paderborn	Bielefeld	Stuttgart	Ludwigsburg
Leipzig	Leipzig	Paderborn	Gütersloh	Stuttgart	Rems-Murr-Kreis
Leipzig	Nordsachsen	Paderborn	Herford	Stuttgart	Reutlingen
Limburg-Weilburg	Limburg-Weilburg	Paderborn	Lippe	Stuttgart	Stuttgart
Lörrach	Lörrach	Paderborn	Minden-Lübbecke	Stuttgart	Tübingen
Lörrach	Waldshut	Paderborn	Paderborn	Suhl	Hildburghausen
Lübeck	Lübeck	Passau	Freyung-Grafenau	Suhl	Schmalkalden-Meiningen
Lübeck	Ostholstein	Passau	Passau		
Magdeburg	Börde	Passau	Passau	Suhl	Suhl
Magdeburg	Harz	Pirmasens	Pirmasens	Trier	Bernkastel-Wittlich
Magdeburg	Jerichower Land	Pirmasens	Südwestpfalz	Trier	Eifelkreis-Bitburg-Prüm
Magdeburg	Magdeburg	Pirmasens	Zweibrücken	Trier	Trier
Magdeburg	Salzlandkreis	Prignitz	Ostprignitz-Ruppin	Trier	Trier-Saarburg
Mannheim	Bad Dürkheim	Prignitz	Prignitz	Trier	Vulkaneifel
Mannheim	Bergstraße	Ravensburg	Bodenseekreis	Uckermark	Uckermark
Mannheim	Frankenthal (Pfalz)	Ravensburg	Konstanz	Uckermark	Uecker-Randow
Mannheim	Heidelberg	Ravensburg	Lindau (Bodensee)	Ulm	Alb-Donau-Kreis
Mannheim	Ludwigshafen am Rhein	Ravensburg	Ravensburg	Ulm	Biberach
Mannheim	Mannheim	Regensburg	Cham	Ulm	Günzburg
Mannheim	Rhein-Neckar-Kreis	Regensburg	Kelheim	Ulm	Neu-Ulm
Mannheim	Rhein-Pfalz-Kreis	Regensburg	Regensburg	Ulm	Ulm
Mannheim	Speyer	Regensburg	Regensburg	Vogelsbergkreis	Vogelsbergkreis
Memmingen	Memmingen	Regensburg	Schwandorf	Weiden i.d. Opf.	Neustadt a.d. Waldnaab
Memmingen	Unterallgäu	Remscheid	Remscheid	Weiden i.d. Opf.	Tirschenreuth
München	Bad Tölz-Wolfratshausen	Rosenheim	Rosenheim	Weiden i.d. Opf.	Weiden i.d. OPf.
		Rosenheim	Rosenheim	Weiden i.d. Opf.	Wunsiedel i. Fichtelgebirge
München	Dachau	Rostock	Bad Doberan		
München	Ebersberg	Rostock	Güstrow	Weilheim-Schongau	Weilheim-Schongau
München	Erding	Rostock	Rostock	Weimar	Weimar
München	Freising	Rügen	Rügen	Weimar	Weimarer Land
München	Fürstenfeldbruck	Saarbrücken	Merzig-Wadern	Wilhelmshaven	Friesland
München	Miesbach	Saarbrücken	Neunkirchen	Wilhelmshaven	Wilhelmshaven
München	München	Saarbrücken	Saarlouis	Wolfsburg	Braunschweig
München	München	Saarbrücken	Saarpfalz-Kreis	Wolfsburg	Gifhorn
München	Starnberg	Saarbrücken	St. Wendel	Wolfsburg	Helmstedt
Münster	Borken	Saarbrücken	Stadtverband Saarbrücken	Wolfsburg	Peine
Münster	Coesfeld			Wolfsburg	Salzgitter
Münster	Münster	Schwarzwald-Baar-Kreis	Rottweil	Wolfsburg	Wolfenbüttel
Münster	Osnabrück			Wolfsburg	Wolfsburg
Münster	Osnabrück	Schwarzwald-Baar-Kreis	Schwarzwald-Baar-Kreis	Worms	Alzey-Worms
Münster	Steinfurt			Worms	Donnersbergkreis
Münster	Warendorf	Schwarzwald-Baar-Kreis	Tuttlingen	Worms	Worms
Neubrandenburg	Demmin	Schweinfurt	Bad Kissingen	Würzburg	Kitzingen
Neubrandenburg	Mecklenburg-Strelitz	Schweinfurt	Haßberge	Würzburg	Main-Spessart
Neubrandenburg	Müritz	Schweinfurt	Rhön-Grabfeld	Würzburg	Main-Tauber-Kreis
Neubrandenburg	Neubrandenburg	Schweinfurt	Schweinfurt	Würzburg	Würzburg
Neustadt an der Weinstraße	Neustadt an der Weinstraße	Schweinfurt	Schweinfurt	Würzburg	Würzburg