ECONSTOR

WWW.ECONSTOR.EU

Der Open-Access-Publikationsserver der ZBW – Leibniz-Informationszentrum Wirtschaft
The Open Access Publication Server of the ZBW – Leibniz Information Centre for Economics

Kowalewski, Julia

Working Paper

Specialisation and employment development in Germany: Analysis at regional level

HWWI Research Paper, No. 1-28

Provided in cooperation with:
Hamburgisches WeltWirtschaftsInstitut (HWWI)

ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Mitglied der
Leibniz-Gemeinschaft

Specialisation and Employment Development in Germany
— Analysis at regional level —

Julia Kowalewski

Julia Kowalewski
Hamburg Institute of International Economics (HWWI)
Heimhuder Str. 71 | 20148 Hamburg | Germany
Phone +49 (0)40 34 05 76 - 673 | Fax +49 (0)40 34 05 76 - 776
kowalewski@hwwi.org

Specialisation and Employment Development in Germany

– Analysis at regional level –

Julia Kowalewski[*][†]

Abstract

While the number of employees subject to social insurance contributions in Germany remained nearly constant from 1998 to 2007, there have been strong differences in regional and sectoral growth rates. The aim of this paper is to analyse the impact of the sector structure of a region on employment growth in Germany during this period. It will provide new findings about the impact of sector specific localisation effects on employment growth. If specialisation affects regional employment growth it is expected to be important for regional and labour market policies. Moreover, the paper deals with the question weather the sectoral structure of the regions fosters convergence or divergence, i.e. increasing specialisation of the regions. The empirical results show that the economic structures in Germany slowly converge.

Keywords: regional specialisation; German regions; shift-share regression

1 Introduction

The number of employees subject to social insurance contribution in Germany declined between 1998 and 2007 about 1 percent. This average development hides strong regional and sectoral growth differences. While the employment in the region Ingolstadt increased by nearly 12 percent, especially East German regions suffered from job losses up to 20 percent (Oberlausitz-Lower Silesia). The sectoral disparities are even more pronounced. They reflect the structural change in the economy, that is characterized by a broad shift from industry to services sectors. This can be illustrated, for example, by comparing the growth rates of the branch computer and related activities and the manufacture of wearing apparel. The number of employees in the former increased by remarkable 70 percent, whereas it declined in the latter by 50 percent.

The aim of this paper is to shed light on the question as to what has caused the regional and sectoral growth differences in Germany between 1998 and 2007. The objective of this paper is to provide new insights to the extent of branch specific localisation advantages on employment development. How does the sectoral specialisation of a region impact its employment development? Connected with this question is the investigation whether the sectoral economic structures of the regions adjusted during the investigation period or if structural divergence, i.e. increasing specialisation of regions, can be observed. Regarding the great differences between the former East Germany and West Germany the question of convergence of the sectoral structure is of particular interest. Have the structural disparities declined more than 15 years after the beginning of the transformation process in the eastern German economy?

The empirical analysis builts on the regression-analytical analogue of the traditional shift-share analysis that was launched by Patterson (1991) and augmented by Möller and Tassinopoulos (2000), Blien and Wolf (2002), Blien

2

et al. (2003) and Südekum et al. (2006). Unlike the classical shift-share analysis this approach allows for the examination of causalities and the inclusion of all kinds of theoretical meaningful variables - in addition to the influence of the economic structure. In this paper, the methodology proposed by Möller and Tassinopoulos (2000) for western German regions and Blien and Wolf (2002) for eastern German regions is used to analyse the relation between regional specialisation and regional employment growth. Furthermore, the sector and settlement structures as well as the regional conditions will be included in order to control for their impact on employment growth. As individual branches experience very different development patterns during the observation period, the sector structure of a region strongly affects the regional employment development. Sectors, that promote the creation of new jobs, will be identified by the regression appoach.

The paper complements findings of earlier studies in two respects. Firstly, the analysis is based on a high sectoral disaggregation (60 branches). Secondly, it applies the regression approach for Germany as a whole as well as for eastern and western Germany separately. Möller and Tassinopoulos (2000) observe convergence of regional industrial structures based on eleven major industries for the period 1987 to 1996. Only for the food and beverage sector they find positive specialisation tendencies. However, their study is restricted to western German regions and their data only allows the observation of eleven major sectors. Similar findings for eastern German regions are provided by Blien and Wolf (2002) for the period 1993 to 1999. Examining 27 industries, they find that employment decreased to a larger extent if an industry was locally concentrated. They argue, that the new communication technologies as well as other technological developments permit a more decentralized organization of production so that the regional monostructures prominent in eastern Germany were no longer functional. Blien and Südekum (2005) analyse the development of the economic structure from 1993 to 2001 on the basis of regional employment data for 28 industries. The authors find

3

evidence for significant localisation advantages in the field of higher value services (e.g. business services, education). Thus, local overrepresentation in the base year 1993 led to significantly faster growth of service industries. Evidence for the USA, inter alia, comes from Glaeser et al. (1992). Their dataset covers the six largest industrial sectors on the basis of employment data for the period 1956 to 1987 in the 170 largest cities of the USA. The results show that sectoral employment growth is higher in regions with industrial diversity. Glaeser et al. (1992) acknowledge that the results could change if also new industries were included in the analysis. For them spatial proximity might be more important for the transmission of knowledge.

The estimation results in this paper are in many points in line with the earlier findings. The local industry structure has a significant impact on employment growth. Whereas, almost all industries showed higher employment growth in regions with a relative backwardness. The finding suggest that the structures of the German regions converged during the observation period.[1] Furthermore, the results show, that growth does not exclusively take place in agglomerated areas. They rather confirm the long observed deconcentration tendencies of employment (Bade and Niebuhr 1999). The dynamic development of rural areas with higher density refers not only to suburbanisation of employment but also to a wide-area relocation. Lastly, the quantitative importance of the regional fixed effects suggest that individual regions differ markedly in their capacity to generate employment growth.[2]

The rest of the paper is structured as follows. Section 2 includes the background of economic theory. The data set used for the econometric model

---

[1]It is important to distinguish between structural convergence and the so called β-convergence. The β-convergence aims to verify the convergence hypothesis by regarding the impact of the base level of the per capita income on the growth rate in the following periods. The relation between both convergence concepts is vague. The advantage of relative backwardness as pre-condition for β-convergence may be found in using non-exhausted sector growth potentials as well as in taking advantage of specialisation opportunities.

[2]As Südekum et al. (2006) showed, location characteristics seem to be even more important for the explanation of growth disparities across districts.

will be described in section 3. Section 4 follows with the introduction of the estimation approach and the presentation of the results. Section 5 concludes.

2 Theoretical background

The priority objective of the estimation approach introduced in section 4 is to identify regional specialisation tendencies and their effects on regional employment growth. However, the analysis takes into account additional determinants for regional growth in order to attach appropriate importance to the specialisation effect. The rational of the included variables will be discussed in the following.

Thinking about specialisation and the omnipresent structural change from heavily industrialised economies to economies dominated by services, requires the implementation of individual branches into the analytical approach. This is because they experience very different development patterns during the observation period. Traditional neoclassical approaches often disregard the role of individual branches. But works by Krueger and Summers (1988) and Appelbaum and Schettkat (1999) showed that branches play an important role in the structural development of an economy. This is due to the fact that industries are subject to specific business cycles and are characterised by specific supply and demand conditions. Therefore, labour market effects of productivty changes can be very different depending on the considered branch. They can either lead to labour displacement or to compensation effects. As industries reflect the processes on product markets as well as product-specific productivity developments to an appropriate degree (Blien and Wolf 2002), they were used for numerous shift-share analyses and regressions in which the regional employment development is related to the regional industry structure (e.g. Bröcker 1989, Möller and Tassinopoulos 2000, Blien et al. 2003).

Not only the overall development of a particular branch but also the re-

gion's degree of specialisation is important for regional employment growth. But why do regions specialise in specific industries? The question on regional specialisation processes is strongly connected with the existence of localisation advantages, i.e. positive agglomeration effects, that result from the spatial concentration of one branch. In agglomeration theory starting from Marshall (1890) the availability of public goods and the size of the local market are decisive for spatial agglomeration of economic activity. Moreover, the establishment of networks between suppliers and customers and a specialised labour supply as well as the transfer of knowledge play a decisive role for regional specialisation. In a slightly modified way these localisation advantages are found again in the cluster theory of Porter (1991). However, regional specialisation, which in general goes along with the concentration of certain production activities[3], could lead to economic disadvantages. Firstly, there are higher transportation costs in relation to a decentral supply. Secondly, the concentration of strongly expanding branches could be accompanied by a cost increase in production factors. Furthermore, an increasing specialisation could increase the region's vulnerability to crises, as a diversified sector structure has a better ability to absorb branch specific shocks (Bröcker 1989, Möller and Tassinopoulos 2000).

Agglomeration effects still play an important role in the New Economic Geography (NEG), which primarily refers to Krugman (1991). While the neoclassical theory neglects the existence of agglomeration advantages and implies economic convergence across regions, the NEG approaches allow for concentration as well as spatial dispersion of production activities. On the basis of his centre-periphery model Krugman (1991) states that the level of transportation costs, a high mobility of the factor of labour and high returns to scale in production, influence the concentration of economic activity. But the theory gives no evidence, how industries will locate in space,

---

[3]In this context Molle (1997) writes: "When there is a trend towards lower concentration of branches, the degree to which regions are specialised in certain sectors is likely to show a decreasing trend too." (p.

because branch specifics have to be taken into account. Furthermore, changing conditions could lead to different behaviour patterns in different points in time. For example modern communication technologies might reduce the importance of direct face-to-face contact and a higher regional dispersion becomes more likely. Therefore, empirical investigations are necessary to explore wether there is a trend towards increasing specialisation or structural convergence. However, wether structural convergence goes along with a convergence of the regional per capita income (in the sense of ß-convergence) remains unanswered. But as Venables (1997) points out, neoclassical approaches are in general based on the assumption that converging per capita incomes are accompanied by diverging regional economic structures due to increasing specialisation.

As the sectoral structure is not the only decisive factor for regional employment development, further variables are included as fixed effects to control for cyclical developments and local preconditions. The fact that regional specifics affect emploment development can be explained by restricted mobility of factors of production and by the regional labour markets specifics. The endogenous growth theory starting from Lucas (1988) implemented the connection of human capital and economic growth. Human capital is considered as an alternative and a complement to technical progress in its function as a driving force for growth. Thus, many empirical studies include the qualification structure of employment in their estimation approach and find positive impacts on regional (employment) growth (Farhauer and Granato 2006, Südekum et al. 2006, Green 2002). Qualified labour is a central precondition for the adoption of product or process innovations. They represent an "innovative potential" which can give important impulses to the regional development. According to this the existence and the quality of local educational and research institutes, which are important for household as well as for companies, are drivers for regional growth. At least also hard factors constitute the local conditions for employment growth, e.g. infrastructure

7

such as the transport connections (see e.g. Zarth and Crome 1999) or the accessibility of suppliers and consumers (Bröcker 1989, Blien et al. 2003).

3 Data

The data for the study are provided by the German Federal Employment Agency. This official information is based on a complete inventory count and therefore, highly reliable and far more accurate than survey data. The data contain all employees subject to social insurance contribution by workplace. Excluded from the observation are fractionally employed, civil servants and self-employed. Thus, the analysis covers about 65 percent of the working population. The employment data are available annually for the period 1998 to 2007 measured at the 30th June of each year which is close to the yearly average (German Federal Employment Agency 2008).

The regional employment data distinguish between 60 branches based on the sector classification of the German Federal Statistical Office WZ 2003, which in turn is based on the statistical classification of sectors in the European Community. The choice of this sector classification involves consequences for the length of the investigation period, because comparable data for the WZ 2003 is not available before 1998. Previous analyses of regional specialisation processes had to choose a relatively high sectoral aggregation level due to data restrictions. Möller and Tassinopoulos (2000) emphasize, however, that a differentiated classification is generally preferable because the factors, which influence the spatial concentration or deconcentration, presumably differ substantially among different industries. Especially for the investigation of sector-specific location advantages the chosen sector classification provides high potential for the analysis.

The employment data are at the district level and are aggregated to the 97 planning regions defnded by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR 2008). The definition of

the planning regions is based on the analysis of commuter linkages between districts, i.e. districts and towns independent of a district, which are linked by very close commuter movements, are combined to one planning region. Thus, unlike previous studies, which usually use administrative territorial units like districts, this analysis is based on functionally defined regions. This seems preferable because the regional sector structures are significantly influenced by the selection of the territorial units. The differences of sectoral structures are likely to be much greater for small area levels than for the planning regions. Therefore, the latter seem appropriate for the study of regional specialisation, as the use of administrative area units might distort the results. The paper uses the classification of seven different region types, that is based on population density and the size of the regional centre: Agglomerated areas with high population density, agglomerated areas with huge centres, urbanized areas of higher density, urbanized areas of medium density with high-level centres, urbanized areas of lower density without high-level centres, rural areas of higher density and rural areas of lower density (BBSR 2008).

4 Model specification

4.1 The model

Dunn (1960) developed the so-called shift-share analysis and it has become a popular instrument in regional economics. The estimation approach implemented in this analysis is an analytical regression analogue of the shift-share analysis. It was developed by Patterson (1991) and augmented by Möller and Tassinopoulos (2000), Blien and Wolf (2002), Blien et al. (2003) and Südekum et al. (2006).[4] As the data has got a panel structure the estimation could also be carried out as a regional panel model with fixed sector effects.

---

[4]The advantages of the analytical regression analogue over the traditional shift-share analysis are e.g. presented by Wolf (2002).

But the regression approach provides the opportunity of greater precision because the unit of analysis is a local sector i in region r and thus, the number of observations is i times larger than in a panel model.[5]

The estimation is pooled over the observation period with additional time period fixed effects. The dependent variable is the annual employment growth rate of sector i in region r at time t:

$$g_{irt} = \frac{E_{irt} - E_{irt-1}}{E_{irt-1}} \tag{1}$$

with E_{irt} the number of employees in sector i and region r at time t. It is dependent on the specialisation or structural adjustment effect, the time period effect, the sector effect, the region specific effect and the settlement structure effect. The regression model, which incorporates these effects, is illustrated in the following equation:

$$g_{irt} = \pi_t + \alpha_i + \beta_r + \delta_j + \gamma_i SP_{ir,1998} + \tilde{\varepsilon}_{irt} \tag{2}$$

The time period effects π_t, represented by dummy-variables for nine periods, control for business cycle movements that affect employment development in the specific year equally in all units.

The sector effects α_i, represented by dummy-variables for 60 industries, indicate how the employment of the specific branch developed. Thus, it captures systematic differences in sector employment growth rates, as suggested e.g. by standard structural change thoeries (e. g. by Richardson 1969). For example, differences in the competitiveness of branches can be found here as far as they are constant over the entire observation period. A positive (negative) sign means that the branch developed better (worse) relative to the overall economy.

In contrast, the region specific effects β_r, represented by dummy-variables

---

[5]A comparision of the two estimation approaches can be found in Blien et al. (2003).

10

for 97 planning regions, allow for inferences on local qualities. They include all factors which affect the employment development in all sectors of a region over the entire period in the same way (Wolf 2002), e.g. the qualification and infrastructure of a region or disadvantages of boundary regions.

Regional growth differences due to the settlement structure are isolated from the region specific effects. The shift-share technique enables to include seven dummy-variables for each settlement structure type to capture regional growth differences due to different types of regions. These effects are included because - as Möller and Tassinopoulos (2000) argue - the observed structural convergence of a sector might be due to the fact that the sector is concentrated in a specific region type, which is characterized by a lower dynamic.

Finally, the impact of the relative importance of a sector in a region and the region's employment growth is reflected by the specialisation effects. More precisely, the effect of specialisation in the base year on the subsequent sector growth will be evaluated. Specialisation[6] of a region is measured for sector i and region r in the base year 1998 by:

$$SP_{ir,1998} = \frac{E_{ir,1998}}{E_{.r,1998}} - \frac{E_{i.,1998}}{E_{..,1998}} \qquad , \qquad (3)$$

The specialisation measure describes the extent of a region's specialisation in a particular sector. A value of zero indicates that the sector i in region r has an equally large share of employment as in the area as a whole. There is no specialisation. If the measure becomes greater than zero, there is a specialisation of the region. This holds all the more, the greater the value. If a region shows a value less than zero, the sector is represented below average in this region. A positive sign of the parameter δ_i implies that the employment growth of this sector is positive (negative), if the sector has an

---

[6]The methodology behind this measure follows the idea of the location quotient method. The location quotient is defined as $LQ_{ir} = \frac{E_{ir}}{E_{.r}} / \frac{E_{i.}}{E_{..}}$.

above average importance in the considered region. This indicates that the specific sector benefits from localisation advantages. If the regression provides predominantly positive effects, the German regions are characterised by specialisation, i.e. structural divergence. On the other hand, predominantly negative effects are an indication for converging structures, which in turn would reject the existence of localisation advantages in large parts of the economy.

Two problems arise with the above model. The first problem is that within sectors, that are only weakly represented in a region, exorbitant leaps in growth rate may occur, although the absolute amount of change is small. This results in inherent heteroscedasticity[7] in the model. This problem is often referred to as "shipbuilding in the midlands". Furthermore, the average of growth rates is not equal to the value of the superior unit (Blien et al. 2003). Therefore, weakly represented industries in a region are weighted less than strongly represented ones, i.e. in the regression the industries are represented according to their overall economic importance.[8] The introduced weighting factor $w_{ir,1998}$ is the share of sector i and region r in all employees in the base year 1998 :

$$w_{ir,1998} = \frac{E_{ir,1998}}{E_{..,1998}} \qquad . \tag{4}$$

The whole model equation is multiplied by this factor, while the underliying assumption is that $\varepsilon := \tilde{\varepsilon}_{irt} w_{ir,1998}$ and $cov(\varepsilon) = \Omega$.

The second problem occurs because of the perfect multi-collinearity[9] of

---

[7]Heteroscedasticity occurs when the scattering of the residual is influenced by the level or sequence of the observations of the independent variables, i.e. that the dispersion is not constant (Backhaus et al. 1994).

[8]A weighted estimation approach similar to the one used in this paper was implemented by Möller and Tassinopoulos (2000), and later adapted by Blien et al. (2003) and Südekum et al. (2006).

[9]Perfect multi-collinearity occurs if the values of one or more independent variables can be exactly predicted by other independent variables. This leads to a situation where the estimators can not be identified (Backhaus et al. 1994).

the model. A typical solution is the definition of a reference region or a reference sector respectively. In this case the results have to be interpreted in relation to the excluded reference category. A more elegant solution is th implementation of restrictions for the estimated coefficients. Then the included fixed effects are measured in relation to their particular mean value and so they can be interpreted in common terms as percentage deviations. A subsequent adaption neither of the effects nor of the significance tests will be necessary. In particular, the sum of the weighted coefficients of the industry fixed effects is set equal to zero:

$$\sum_{r=1}^{R} \sum_{i=1}^{I} \alpha_i w_{ir,1998} = 0 \tag{5}$$

and the same applies for the region specific effects:

$$\sum_{r=1}^{R} \sum_{i=1}^{I} \beta_r w_{ir,1998} = 0 \tag{6}$$

Thus, the sector effect of branch i represents the development of this branch compared to the overall development. A positive (negative) sign implies, that branch i developed better (worse) than the overall economy. The same applies for the region specific effects. A positive (negative) sign here awards the region an above (below) average development.

Further the effects of the settlement structure have to be separated from the region specific dummies. Therefore the implementation of a condition is necessary which states that the sum of all region specific effects of each type of region corresponds to the overall effect for this type of region:

$$\sum_{r=1}^{R} \sum_{i=1}^{I} \varphi_j w_{ir,1998} \beta_r = \delta_j \quad , \tag{7}$$

with φ_j as a selection variable, which takes a value of one for a particular type of region j and zero otherwise. In other words: $\varphi_j = 1$ for each region

type $RT_r = j$ and $\varphi_j = 0$ otherwise, with $j = 1, 2, \ldots, S$ for the $S = 7$ different settlement structures or $S = 6$ in the case of the eastern German regression. The region specific effects can then be interpreted as the deviation from the mean growth rate of the specific region type, i.e. the region specific effects represent the regional specifics which are not attributed to settlement structure conditions. The complete region specific effect then results as the sum of the region specific effect and the settlement structure effect.

Because of the mentioned problems the model has to be estimated as constrained weighted least square without an intercept. The regression for Germany as a whole is based on 52 380 observations ($60\,sectors \times 97\,regions \times 9\,periods$). To investigate, whether there are still differences in the development of eastern and western Germany two more regression will be implemented: one for the whole federal territory and one for western and eastern Germany, respectively. The western and eastern German regressions contain 39 960 and 12 213 observations. For the latter the mining industry of thorium and uranium had to be excluded from the analysis, since no values are observed in eastern regions.

5 Results

5.1 Model fit

The F-tests of the regression analysis indicate significant relation between the development of the overall employment and the branch-structure in a region. Furthermore, the settlement structure - albeit not highly significant - and region specific factors are also affecting the employment development. And finally, the regression results provide significance for a convergence process and only very little positive localisation effects. As a constant is not included in the regression, the common R^2 is not available. An estimation without constraints, which reproduces the chosen appraoch most precisely, reaches

a R^2 of 34 percent. The eastern German model reaches a coefficient of determination of 60 percent, which exeeds the one of Blien et al. (2003), while the one for western German regions amounts to 17 percent.

As Niebuhr (2000) showes spatial proximity affects the intensity of autocorrelation of employment growth rates. Thus, in order to estimate the effects within regions correctly, the model was tested for sector specific autocorrelation by using the Moran coefficient I (Moran´s I).[10] The Moran test identifies spatially autocorrelated residuals or endogenous spatial lag variables, which are neglected in the model. If the test statistics indicate that spatial autocorrelatet residuals are relevant for the regression model, the estimation would lead to inefficient estimators. If relevant spatial lags of the endogenous variables are neglected in the model, the estimation would further lead to inefficient estimators (Eckey et al. 2006). The test results suggest that sector specific spatial autocorrelation is not decisive in this model. The sectors showing tendencies of spatial autocorrelation vary from 8 to 17 in the different observation years.

5.2 Sector and specialisation effects in Germany

The sector effects describe the development of each branch compared to the national average. The results show that some branches have grown significantly faster than the German average, even after controlling for all variables mentioned before. Almost half of the 30 significant sector effects at one percent level (and 38 at five and ten percent level) are positive. Table 1 shows the ten highest and the ten lowest effects.[11]

The majority of the fast growing branches belongs to the service sector.

---

[10]The weighting matrix is a binary 0/1-matrix, with one if the regions have a border in common and zero otherwise. Empirical studies show that spillover effects strongly decrease with increasing spatial distance (e.g. Bretschger 1999; Audretsch and Feldman 2004). Thus, the chosen weighting matrix seems a feasible approximation.

[11]A table with all estimated sector effects for Germany, eastern Germany and western Germany can be found in the appendix Table 5.

The sector air transport achieved an enormous employment growth of 22 percentage points above average. Furthermore, the branches computer and related activities and other business activities as well as the more established branches like education or health and social work have grown more rapidly than the average. This shows, that the increasing importance of services is not solely due to an increasing demand of private households but is rather borne by an increasing demand of companies for services (DIW Berlin 2009). But also two manufacturing sectors performed very well in the observation period: the manufacture of other transport equipment and the manufacture of electrical motors and apparatus. As both belong to the skill-intensive industries[12], the results indicate not only the structural change from industrial to service sectors but also to research- and skill-intensive industries.

A large number of sectors, however, rapidly declined in the observation period. At least six of them belong to the service sector, but the negative effects are comparatively low. While the most negative effect in services is recorded for publishing, printing and reproduction of record media with - 2.3 percentage points below average, the manufacture of wearing apparel and the mining of coal and lignite declined about three times stronger (- 9 percentage points). It has to be mentioned that employment decreases in the manufacturing sector do not always go along with actual job losses. Often companies simply displace employment by outsourcing into other (service)companies. This might be one of the reasons that also high-skilled industries like the office machinery and the chemical production lost employment between 1998 and 2007. But especially low-skill industries like the wearing apparel and textile industry and the manufacture of furniture or paper strongly compete with countries or regions, that have a large labour force and relatively low costs of labour (Peters et al. 2006, Kowalewski and Stiller (2009)). That is one explaination of their rapid decline.

---

[12]According to the definition of Legler and Frietsch (2007).

16

Table 1: The ten highest and the ten lowest estimated sector effects

positive sector effects			negative sector effects		
sector	α_i		sector	α_i	
Air transport	0.2163	***	Manufacture of wearing apparel	-0.0869	***
Computer and related activities	0.0839	***	Mining of coal and lignite; extraction of peat	-0.0852	***
Other business activities	0.0498	***	Manufacture of textiles	-0.0697	***
Real estate activities	0.0397	***	Manufacture of office machinery and computers	-0.0471	***
Activities auxiliary to financial intermediation	0.0393	**	Construction	-0.0452	***
Research and development	0.0367	***	Manufacture of furniture, manufacturing n.e.c.	-0.0379	***
Manufacture of other transport equipment	0.0340	***	Manufacture of wood (except furniture)	-0.0353	***
Manufacture of electrical motors and apparatus	0.0319	***	Manufacture of pulp, paper and paper products	-0.0245	**
Hotels and restaurants	0.0217	***	Publishing, printing and reproduction of record media	-0.0230	***
Post and telecommunication	0.0206	***	Manufacture of chemicals and chemical products	-0.0207	***

Note: *** statistically significant at the 0.01-level, ** statistically significant at the 0.05-level, * statistically significant at the 0.1-level.

While significant sector effects are estimated for over half of the industries, significant specialisation effects are observable only for one third of the branches.[13] Almost exclusively negative effects are estimated. This means,

---

[13]Table 6 in the appendix shows all estimated specialisation effects for Germany, East Germany and West Germany.

if the share of a sector in a region in the base year was higher (lower) than in Germany as a whole, the employment growth rate of this sector in the region tends to be lower (higher). This leads to the conclusion that Germany is in the midst of a structural convergence process where the regional structures adapt to the structure of Germany as a whole. Especially sectors with an above average development, i.e. a positive sector effect, improved in regions where they were underrepresented in the base year. This is true for branches of the manufacturing sector as well as of the service sector. Particularly strong negative specialisation and concurrently positive sector effects emerge for air transport and manufacture of other transport equipment (Table 5 and 6). Accordingly, regions with a relative backwardness in these industries were able to strongly improve the employment shares in these economic sectors. Further enormous negative specialisation effects emerge for collection, purification and distribution of water (-31 percentage points) and manufacture of radio, television and communication equipment (-4.0 percentage points).

Only in one sector the specialisation effect turns out positive, namely financial intermediation. Although the effect of 0.5 percentage points is very low, the branch seems to benefit from regional specialisation (Table 6). The significant employment losses in this sector affect especially those regions starting with a relatively low sector share, while regions with a large share might compensate the negative sector effect. Regions, where financial intermediation is overrepresented, are especially high agglomerated areas like Fankfurt, Hamburg, Munich or Stuttgart.

In the sectors without significant impact of specialisation one can presume a balancing of specialisation forces and structural adjustment forces. This applies to most of the industries in this estimation, so that the existence of localisation advantages can neither be proved nor disproved.

5.3 Sector and specialisation effects in eastern and western Germany

Turning to the seperated regression of the formerly divided parts of Germany, there are only 26 (21) significant sector effects at one percent level and 31 (25) at ten percent level for western (eastern) Germany. The sector effects resulting from the western German regression are very similar to the ones for Germany as a whole. However, some peculiarities arise for eastern Germany (see Table 2 and Table 5 in the appendix).

Different from the German regression the manufacture of motor vehicles and trailers performed relatively favourable in the former East Germany, as the employment growth was 4.5 percentage points above the average. But the eastern regions did not benefit from the enormous growth of the air transport sector, which is indicated by the insignificant sector effect. Moreover, they stronger suffered from the decline in the construction sector, the branch electricity, gas, steam and hot water supply and the manufacture of furniture in comparison to western Germany. The large shares of construction in eastern Germany and the downsizing of excess capacity, i.e. the numerous job losses, cause a structural convergence, based on the adjustment of the eastern and western German structures. Confining the estimation to western regions, the tendency towards structural convergence in the construction sector becomes even weaker. Another development, that is not reflected in the German regression, is the decline of the agricultural sector in eastern Germany. Somewhat suppringly, Südekum et al. (2006) found a positive effect for the period 1993 to 2001. However, the general estimation results are fairly in line with their findings.

Table 2: The highest and the ten lowest estimated sector effects for eastern Germany

positive sector effects			Negative sector specific effects		
sector	α_i^{East}		sector	α_i^{East}	
Computer and related activities	0.0845	***	Manufacture of wearing apparel	-0.0980	**
Manufacture of motor vehicles, trailers and semi-trailers	0.0449	***	Construction	-0.0894	***
Education	0.0429	***	Mining of coal and lignite; extraction of peat	-0.0871	**
Other business activities	0.0300	***	Electricity, gas, steam and hot water supply	-0.0589	***
Activities of membership organisations	0.0228	***	Manufacture of furniture, manufacturing n.e.c.	-0.0522	***
Hotels and restaurants	0.0108	***	Financial intermediation	-0.0471	***
Health and social work	0.0067	***	Insurance and pension funding	-0.0409	***
			Sewage and refuse disposal, sanitation and similar activities	-0.0384	***
			Manufacture of other non-metalic mineral products	-0.0375	***
			Agriculture and hunting	-0.0322	***

Note: *** statistically significant at the 0.01-level, ** statistically significant at the 0.05-level, * statistically significant at the 0.1-level.

The scope for localisation advantages seems to differ substantially between eastern and in western Germany (see Table 6 in the appendix). Both regressions have 14 significant specialisation effects at least at the 10 percent level. It can be assumed that in all the rest of the branches the specialisa-

tion and structural adjustment forces are balanced. The estimated effects in western Germany are again similar to the effects for Germany, but they differ substantially from the observations for the eastern economy. Specialisation forces seem to be at work in almost the same manner than adjustment forces in eastern Germany. However, this might be an adjustment to western German regions, as structural convergence was observed in the nation-wide regression. For this reason, the findings of Blien and Wolf (2002) of a converging process in eastern Germany cannot be fully confirmed. Table 3 shows the estimated specialisation effects for eastern Germany. Manufacture of radio and television is mostly affected by localisation effects. Interestingly, this branch has a negative effect in western Germany and Germany as a whole. This fact, which also applies for the constuction sector, underlines the converging structures of the two German parts. Altogether there are seven positive specialisation effects, which are not valid for western Germany. Amongst others these are machinery and fabricated metal production and the manufacture of food products and baverage. For the latter Möller and Tassinopoulos (2000) found a positive specialisation effect in western Germany in an earlier observation period (1987 to 1996). As there is no significant effect observed in the later period of this analysis, the findings indicate the process of catching-up of eastern Germany to the western German structures. Moreover, the deconcentration tendencies of the above branches are to some extent attributed to their characteristics. Their focus is to a large extent on the local market and, thus, they seek the proximity to the consumer (food and baverage production, fabricated metal production). Because of the customer-oriented products, even the eastern German manufacture of machinery focuses relatively strong on local markets. Precisely because the customers of the machinery production are more often other industries, the spatial main foci are in Saxony and Thuringia (Maretzke and Kawka 2007).

21

Table 3: Estimated specialisation effects, eastern Germany

positive specialisation effects			negative specialisation effects		
sector	δ_i^{East}		sector	δ_i^{East}	
Manufacture of radio, television and communication equipment and apparatus	0.1039	***	Post and telecommunication	-0.0466	***
Manufacture of rubber and plastic products	0.0697	*	Activities of membership organisations	-0.0369	*
Manufacture of food products and beverqage	0.0177	***	Manufacture of electrical motors and apparatus	-0.0282	***
Manufacture of fabricated metal products	0.0159	***	Education	-0.0199	***
Manufacture of machinery and equipment	0.0149	**	Publilc administration and defence; compulsary social security	-0.0058	*
Hotels and restaurants	0.0092	**	Agriculture and hunting	-0.0058	***
Construction	0.0006	**	Health and social work	-0.0035	*

Note: *** statistically significant at the 0.01-level, ** statistically significant at the 0.05-level, * statistically significant at the 0.1-level.

5.4 Settlement structure and region specific effects

In the following, the settlement structure effects and the region specific effects, that are implemented as control variables, will be presented. The settlement structure effects suggest systematic differences between area types during 1998 and 2007. Three of seven coefficients are statistically significant at five and ten percent level (Table 4). Positive employment development results for rural areas with higher density, as the growth rate was about 0.34 percentage points higher than the average. By contrast the growth rates in agglomerated areas lagged behind average growth (nearly -0.2 percentage

points).

Table 4: Estimated settlement structure effects

Settlement structure	γ_j	
Agglomerated areas with high population density	-0.0016	**
Agglomerated areas with huge centres	-0.0018	*
Urbanized areas of higher density	0.0006	
Urbanized areas of medium density with high-level centres	0.0003	
Urbanized areas of lower density without high-level centres	0.0018	
Rural areas of higher density	0.0034	**
Rural areas of lower density	-0.0020	

Note: *** statistically significant at the 0.01-level, ** statistically significant at the 0.05-level, * statistically significant at the 0.1-level.

The estimation results show that long-observed tendencies of deconcentration of employment (Bade and Niebuhr 1999) persist. The dynamic development of the rural areas with higher density refers to the observation of a wide-area relocation of employment. However, this observation does not give evidence for a general converging process as the effect for rural areas with lower density is not significant (Table 4).

The results for the separate regressions of the former East[14] and West Germany provides interesting insights. The results for western Germany support earlier findigs by Möller and Tassinopoulos (2000) of geographical employment de-concentration. A negative effect for agglomerated areas and a positive effect for rural areas of higher density are estimated. In the eastern part of Germany the agglomerated areas have grown more strongly than the

---

[14]There are no agglomerated areas with high population density in eastern Germany.

average, while urbanized areas significantly lost employment. Südekum et al. (2006) give the plausible explanation, that agglomeration externalities seem to be relatively more important in the catching-up process of the economically backward eastern regions. The diagnosis of unfavourable development in eastern German rural areas, which was made by Blien and Hirschenauer (1999) and later confirmed by several studies (Blien and Wolf 2002, Blien et al. 2003) can not be found in this later period.

Turning to the region specific effects also reflects the east-west disparities in Germany. Up to the ten percent level 41 planning regions were significant, while 21 were positive. The estimation results show that regions with a significant positive effect are without exception located in western Germany, while negative effects are mainly observed in regions of eastern Germany.[15] More than 15 years after the beginning of the transformation process in the former East Germany the regional conditions are on average much more disadvantageous than in western Germany. Comparing the group of western German planning regions, however, shows that the regional preconditions for employment growth are also significantly different. Clusters of areas with very favourable local conditions can be found particularly in Bavaria, Baden-Württemberg and in north-west Germany. In the centre of western Germany – in large parts of North Rhine-Westphalia and Hesse and in southern Lower Saxony – the region specific conditions on the other hand often had a negative impact on employment growth.

With the separated regression analyses for eastern and western regions the basic results hardly change. In both regressions, it should be noted that the local conditions get a much lower impact on regional employment development. Therefore, it can be concluded that the local specifics within eastern and western Germany are more similar than between. This finding underscores once again the still existing disparities between the two parts of Germany that once were seperated.

---

[15]Table 7 in the appendix shows the significant estimated region specific effects.

6 Conclusions

The paper focused on the impact of the sector structure on employment development on the level of the 97 planning regions during the period 1998 to 2007. The analysis showed highly differentiated developments – both in sectoral as well as in regional dimensions.

The regression analysis enabled to split the employment development in several components. Hence, it was possible to distinguish between cyclical, structural and region specific components and a component that reflects the influence of the settlement structure of the region. To consider the hypothesis of structural convergence the share of regional employment in each sector in comparison to Germany in the base year was implemented as an additional regressor.

The empirical findings concerning the specialisation effect emphasize the hypothesis of structural convergence in Germany. At least 20 industries grew significantly stronger in regions, where they were underrepresented in the base year. In only one sector, namely the financial intermediation, specialisation forces outweigh the deconcentration forces. But in most cases the specialisation effect was insignificant, so that a clear development direction can not be finally clarified. The very different findings for eastern Germany underline the structural convergence process of the two German parts. They seem to indicate the catching-up of the eastern regions. In this process both parts of Germany are subject to the general sructural change, as the results of the sector effects show. It is characterized by the change from the industrial sector to services and, moreover, from the labour-intensiv to the skill-intensive industries. The estimated region specific effects showed that even more than 15 years after reunification, the spatial preconditions of employment growth are shaped by differences between eastern and western Germany. None of the 23 eastern planning regions are characterized by significant growth supporting regional conditions.

With regard to regional policies and regional labour market policy the observed structural convergence and the employment effects of the economic structure, in particular, have to be observed. Policy of subsidies must refer to the economic structure of a region and still faces very different starting-points in eastern and western German regions. Furthermore, a development strategy, which continues from the sector focus of a region, like the regional cluster theory in the narrow sense, should take the negative specialisation effects of the branches into consideration. The findings of the regression analysis suggest that many industries realise a more dynamic employment development in a diversified economic environment than in a highly specialized area.

References

Appelbaum, E. and Schettkat, R. (1999). Are prices unimportant?, *Journal of post-keynesian economics* **21**(3): 387–398.

Audretsch, D. B. and Feldman, M. P. (2004). Knowledge spillovers and the geography of innovation, *Handbook of regional and urban economics*, Vol. 4: Cities and geography, Elsevier, Amsterdam, pp. 2713–2739.

Backhaus, K., Erichson, B., Plinke, W. and Weiber, R. (1994). *Multivariate Analysemethoden - Eine anwendungsorientierte Einführung*, Vol. 7, Springer, Berlin.

Bade, F.-J. and Niebuhr, A. (1999). Zur Stabilität des räumlichen Strukturwandels, *Jahrbuch für Regionalwissenschaften* **19**: 131–156.

BBSR (2008). Laufende Raumbeobachtung - Raumabgrenzung. Federal Institute for Building, Urban Affairs and spatial development.
URL: *http://www.bbsr.bund.de*

Blien, U., Blume, L., Eickelpasch, A., Geppert, K., Maierhofer, E., Vollkommer, D. and Wolf, K. (2003). *Die Entwicklung der ostdeutschen Regionen*, Vol. 267 of *Beiträge zur Arbeitsmarkt und Berufsforschung*, Nürnberg.

Blien, U. and Hirschenauer, F. (1999). Regionale Disparitäten auf ostdeutschen Arbeitsmärkten, *in* E. Wiesmann (ed.), *Die arbeitsmarkt- und beschäftigungspolitische Herausforderung in Ost-Deutschland*, Vol. 223 of *Beiträge zu Arbeitsmarkt- und Berufsforschung*, pp. 139–161.

Blien, U. and Südekum, J. (2005). Local economic structure and industry development in germany, *IAB Discussion Paper* **1**.

Blien, U. and Wolf, K. (2002). Regional development of employment in eastern germany- an analysis with an econometric analogue to shift-share techniques, *Papers in Regional science* **81**(3): 391–414.

Bröcker, J. (1989). Determinanten des regionalen Wachstums im sekundären und tertiären Sektor der Bundesrepublik Deutschland 1970 bis 1982, *Schriften des Instituts für Regionalforschung der Universität Kiel* (10).

Bretschger, L. (1999). Knowledge diffusion and the development of regions, *Annals of Regional Science* **33**(3): 251–268.

DIW Berlin (2009). Studie: Wachstums- und Beschäftigungschancen in wissensintensiven Dienstleistungsmärkten in Ostdeutschland. Schlussbericht, *Studie im Auftrag des Bundesministeriums für Verkehr, Bau und Stadtentwicklung* .

Dunn, E. S. (1960). A statistical and analytical technique for regional analysis, *Papers of the Regional science association* **6**: 97–112.

Eckey, H.-F., Kosfeld, R. and Türck, M. (2006). Räumliche Ökonometrie, *Wirtschaftswissenschaftliches Studium* **35**(10): 548–554.

Farhauer, O. and Granato, N. (2006). Regionale Arbeitsmärkte in Westdeutschland. Standortfaktoren und Branchenmix entscheidend für Beschäftigung, *IAB-Kurzbericht* **4**.

German Federal Employment Agency (2008). *Beschäftigtenstatistik: 1998-2007.*

Glaeser, E. L., Kallal, H. D., Scheinkman, J. A. and Shleifer, A. (1992). Growth in cities, *The journal of political economy* **100**(6): 1126–1152.

Green, A. E. (2002). The importance of skill in regional development: Evidence from the united kingdom, *European spatial research and policy* **2**: 17–33.

Kowalewski, J. and Stiller, S. (2009). Strukturwandel im deutschen Verarbeitenden Gewerbe, *Wirtschaftsdienst* **89**(8): 548–555.

Krueger, A. B. and Summers, L. H. (1988). Efficiency wages and the inter-industry wage structure, *Econometrica* **56**(2): 259–293.

Krugman, P. (1991). *Geography and trade*, Gaston Eyskens lecture series, Leuven.

Legler, H. and Frietsch, R. (2007). Neuabgrenzung der Wissenswirtschaft - forschungsintensive Industrien und wissensintensive Dienstleistungen, *Studien zum deutschen Innovationssystem*, Vol. 22, BMBF, Bonn.

Lucas, R. E. J. (1988). On the mechanics of economic development, *Journal of Monetary Economics* **22**(3): 3–42.

Maretzke, S. and Kawka, R. (2007). *Regionalbarometer neue Länder: Sechster zusammenfassender Bericht*, Vol. 28 of *Berichte*, Bonn.

Marshall, A. (1890). *Principles of economics*, MacMillan, London.

Möller, J. and Tassinopoulos, A. (2000). Zunehmende Spezialisierung oder Strukturkonvergenz? Eine Analyse der sektoralen Beschäftigungsentwicklung auf regionaler Ebene, *Jahrbuch für Regionalwissenschaften* (20): 39–54.

Molle, W. (1997). The regional economic structure of the European Union: an analysis of long-term developments, *in* K. Peschel (ed.), *Regional growth and regional policy within the framework of European Integration*, Physica-Verlag, Heidelberg.

Niebuhr, A. (2000). Räumliche Wachstumszusammenhänge - Empirische Befunde für Deutschland, *HWWA Discussion Paper* **84**.

Patterson, M. G. (1991). A note on the formulation of a full-analogue regression model of the shift-share method, *Journal of Regional science* **31**(2): 211–216.

Peters, S., Reinhardt, K. and Seidel, H. (2006). *Wissen verlagern: Risiken und Potentiale von Standortverlagerungen*, Wiesbaden.

Porter, M. E. (1991). *Nationale Wettbewerbsvorteile: erfolgreich konkurrieren auf dem Weltmarkt*, Droemer Knaur, München.

Richardson, H. W. (1969). *Regional Economics: Location Theory, Urban Structure and Regional Change*, Weidenfeld and Nicolson, London.

Südekum, J., Blien, U. and Ludsteck, J. (2006). What has caused regional employment growth differences in eastern germany?, *Jahrbuch für Regionalwissenschaften* **26**: 51–73.

Venables, A. J. (1997). Economic integration and centre-periphery inequalities: The view from trade theory, *Zeitschrift für Wirtschafts- und Sozialwissenschaften* (Beiheft 5): 33–51.

Wolf, K. (2002). *Analyse regionaler Beschäftigungsentwicklung mit einem ökonometrischen Analogon zu Shift-Share-Techniken*, IAB-Kompendium Arbeitsmarkt- und Berufsforschung.

Zarth, M. and Crome, B. (1999). Die regionale Infrastrukturausstattung als Indikator für die Auswahl regionalpolitischer Fördergebiete, *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung* **32**: 618–630.

Appendix

Table 5: Sector effects for Germany, western Germany and eastern Germany

sector	Germany	western Germany	eastern Germany
Agriculture and hunting	-0.0053	-0.0053	-0.0322 ***
Forestry and logging	-0.0255	-0.0255	-0.0325
Fishing and fish farming	-0.0200	-0.0200	-0.0365
Mining of coal and lignite; extraction of peat	-0.0852 ***	-0.0852 ***	-0.0871 **
Extraction of crude petroleum and natural gas	-0.0361	-0.0361	-0.0592
Mining of uranium and thorium ores	0.0952	0.0952	
Mining metal ores	-0.0121	-0.0121	-0.0681
Other mining and quarrying	-0.0390	-0.0390	-0.0409
Manufacture of food products and beverqage	-0.0151 ***	-0.0151 ***	-0.0188 ***
Manufacture of tobacco products	-0.0193	-0.0193	0.0234
Manufacture of textiles	-0.0697 ***	-0.0697 ***	-0.0605
Manufacture of wearing apparel	-0.0869 ***	-0.0869 ***	-0.0980 **
Tenning and dressing of leather	-0.0592	-0.0592	-0.0200
Manufacture of wood (except furniture)	-0.0353 ***	-0.0353 ***	-0.0159
Manufacture of pulp, paper and paper products	-0.0245 **	-0.0245 **	-0.0111
Publishing, printing and reproduction of record media	-0.0230 ***	-0.0230 ***	-0.0212 ***
Manufacture of coke	-0.0003	-0.0003	0.1447
Manufacture of chemicals and chemical products	-0.0207 ***	-0.0207 ***	0.0004
Manufacture of rubber and plastic products	-0.0091 *	-0.0091 *	0.0398 ***
Manufacture of other non-metalic mineral products	-0.0336 ***	-0.0336 ***	-0.0375 ***
Manufacture of basic metals	-0.0113 *	-0.0113 *	-0.0062
Manufacture of fabricated metal products	-0.0089 ***	-0.0089 ***	-0.0009
Manufacture of machinery and equipment	-0.0104 ***	-0.0104 ***	0.0225
Manufacture of office machinery and computers	-0.0471 ***	-0.0471 ***	-0.0031
Manufacture of electrical motors and apparatus	0.0319 ***	0.0319 ***	-0.0316 ***
Manufacture of radio, television and communication equipment and apparatus	0.0094	0.0094	-0.0104
Manufacture of medical, pprecision and optical instruments	-0.0009	-0.0009	0.0111
Manufacture of motor vehicles, trailers and semi-trailers	0.0030	0.0030	0.0449 ***
Manufacture of other transport equipment	0.0340 ***	0.0340 ***	-0.0106
Manufacture of furniture, manufacturing n.e.c.	-0.0379 ***	-0.0379 ***	-0.0522 ***
Recycling	0.0285	0.0285	0.0053
Electricity, gas, steam and hot water supply	-0.0165 **	-0.0165 **	-0.0589 ***
Collection, purification and distribution of water	0.0454	0.0454	-0.0228
Construction	-0.0452	-0.0452 ***	-0.0894 ***
Sale, maintenance and repair of motor vehicles and motorcycles; retail of automotive fuel	0.0065 **	0.0065 **	-0.0102 **
Wholesale trade and commission trade (except motore vehicles)	-0.0077 ***	-0.0077 ***	-0.0243 ***
Retail trade	-0.0039 ***	-0.0039 ***	-0.0193 ***
Hotels and restaurants	0.0217 ***	0.0217 ***	0.0108 ***
Land transport; transport via pipelines	0.0048	0.0048	-0.0277 ***
Water transport	-0.0014	-0.0014	-0.0234
Air transport	0.2163 ***	0.2163 ***	0.0839
Supporting and auxiliary transportactivities	0.0186 ***	0.0186 ***	0.0075
Post and telecommunication	0.0206 ***	0.0206 ***	0.0076
Financial intermediation	-0.0139 ***	-0.0139 ***	-0.0471 ***
Insurance and pension funding	-0.0142	-0.0142	-0.0409 ***
Activities auxiliary to financial intermediation	0.0393 **	0.0393 **	0.0170
Real estate activities	0.0397 ***	0.0397 ***	0.0191
Renting of machinery and equipment without operator and of personal and household goods	0.0265	0.0265	0.0015
Computer and related activities	0.0839 ***	0.0839 ***	0.0845 ***
Research and development	0.0367 ***	0.0367 ***	0.0217
Öther business activities	0.0498 ***	0.0498 ***	0.0300 ***
Publilc administration and defence; compulsary social security	-0.0047 ***	-0.0047 ***	-0.0169 ***
Education	0.0183 ***	0.0183 ***	0.0429 ***
Health and social work	0.0163 ***	0.0163 ***	0.0067 ***
Sewage and refuse disposal, sanitation and similar activities	-0.0130	-0.0130	-0.0384 ***
Activities of membership organisations	0.0080 **	0.0080 **	0.0228 ***
Recreational, cultural and sporting activities	0.0203 ***	0.0203 ***	-0.0043
Other service activities	0.0155 ***	0.0155 **	0.0085
Private households with employed persons	0.0049	0.0049	-0.0132
Extra-territorial organisations and bodies	-0.0382	-0.0382	0.5342

Note: *** statistically significant at the 0.01-level, ** statistically significant at the 0.05-level, * statistically significant at the 0.1-level.

Table 6: Specialisation effects for Germany, western Germany and eastern Germany

sector	Germany	western Germany	eastern Germany
Agriculture and hunting	-0.0099 ***	-0.0026	-0.0058 *
Forestry and logging	-0.0216	-0.0823	0.0084
Fishing and fish farming	-0.1166	-0.1386	-0.3450
Mining of coal and lignite; extraction of peat	-0.0006	0.0003	0.0139
Extraction of crude petroleum and natural gas	0.0033	0.0071	0.0632
Mining of uranium and thorium ores	-102.5001	-45.7209	
Mining metal ores	-0.6892	-0.6837	0.7380
Other mining and quarrying	0.0089	0.0099	0.0229
Manufacture of food products and beverqage	0.0020	0.0019	0.0177 ***
Manufacture of tobacco products	0.0273	0.0561	-0.3553
Manufacture of textiles	0.0004	0.0017	0.0129
Manufacture of wearing apparel	0.0121	0.0124	0.0073
Tenning and dressing of leather	-0.0058	-0.0073	-0.1719
Manufacture of wood (except furniture)	-0.0097	-0.0058	-0.0422
Manufacture of pulp, paper and paper products	0.0020	0.0023	0.1483
Publishing, printing and reproduction of record media	-0.0001	0.0059	-0.0355
Manufacture of coke	-0.0147	-0.0106	-0.0929
Manufacture of chemicals and chemical products	-0.0006 *	-0.0005	-0.0005
Manufacture of rubber and plastic products	0.0016	0.0028	0.0697 *
Manufacture of other non-metalic mineral products	-0.0017	-0.0008	-0.0013
Manufacture of basic metals	-0.0013	-0.0006	0.0014
Manufacture of fabricated metal products	-0.0003	0.0000	0.0159 ***
Manufacture of machinery and equipment	0.0003	0.0009	0.0149 **
Manufacture of office machinery and computers	0.0060	0.0081	-0.0253
Manufacture of electrical motors and apparatus	-0.0021 *	-0.0051 ***	-0.0282 *
Manufacture of radio, television and communication equipment and apparatus	-0.0399 ***	-0.0396 ***	0.1039 ***
Manufacture of medical, pprecision and optical instruments	-0.0017	-0.0010	0.0207
Manufacture of motor vehicles, trailers and semi-trailers	0.0001	0.0003	0.0106
Manufacture of other transport equipment	-0.0143 ***	-0.0149 ***	-0.0243
Manufacture of furniture, manufacturing n.e.c.	-0.0024	-0.0023	-0.0047
Recycling	-0.1190	0.0039	-0.0924
Electricity, gas, steam and hot water supply	-0.0022	-0.0024	0.0006
Collection, purification and distribution of water	-0.3111 ***	-0.2964 **	-0.0617
Construction	-0.0039 ***	-0.0007	0.0006 **
Sale, maintenance and repair of motor vehicles and motorcycles; retail of automotive fuel	-0.0083	-0.0069	-0.0020
Wholesale trade and commission trade (except motore vehicles)	0.0003	0.0001	0.0007
Retail trade	-0.0020 ***	-0.0022 **	0.0009
Hotels and restaurants	-0.0013	-0.0048 *	0.0092 **
Land transport; transport via pipelines	-0.0071 ***	-0.0110	0.0005
Water transport	0.0273	0.0297	0.0317
Air transport	-0.2650 ***	-0.4522 ***	-0.2838
Supporting and auxiliary transportactivities	-0.0062 ***	-0.0065 ***	0.0053
Post and telecommunication	-0.0291 *	-0.0003	-0.0466 *
Financial intermediation	0.0051 ***	0.0047 ***	-0.0143
Insurance and pension funding	0.0101	0.0085	-0.0627
Activities auxiliary to financial intermediation	-0.0079	-0.0107	-0.0211
Real estate activities	-0.0101	0.0052	-0.0101
Renting of machinery and equipment without operator and of personal and household goods	-0.0522	-0.0547	-0.0766
Computer and related activities	-0.0211 ***	-0.0192 ***	-0.0076
Research and development	-0.0248 *	-0.0099	0.0062
Other business activities	-0.0008 *	-0.0010 **	-0.0013
Publilc administration and defence; compulsary social security	-0.0051 ***	-0.0058 ***	-0.0058 ***
Education	-0.0057 ***	-0.0084 ***	-0.0199 ***
Health and social work	-0.0010 ***	-0.0010 **	-0.0035 ***
Sewage and refuse disposal, sanitation and similar activities	-0.0143	-0.0337	-0.0098
Activities of membership organisations	-0.0052 *	-0.0039	-0.0369 ***
Recreational, cultural and sporting activities	0.0003	-0.0016	0.0051
Other service activities	-0.0199	-0.0525	-0.0259
Private households with employed persons	-0.2299	-0.2136	-0.3219
Extra-territorial organisations and bodies	0.0116	0.0121	4.2621

Note: *** statistically significant at the 0.01-level, ** statistically significant at the 0.05-level, * statistically significant at the 0.1-level.

Table 7: Significant region specific effects

region	region specific effects	
Emsland	0.0177	***
Ingolstadt	0.0159	***
South environs of Hamburg	0.0151	***
Regensburg	0.0127	***
Oldenburg	0.0123	**
Danube-Iller (BY)	0.0118	**
Upper Palatinate-North	0.0112	*
Danube-Wald	0.0101	**
Lake Constance-Upper Swabia	0.0098	**
Franconia	0.0096	***
Munich	0.0094	***
Black Forrest Baar-Heuberg	0.0091	*
Muenster	0.0082	***
Osnabrueck	0.0075	*
South Upper Rhine	0.0071	***
Central Upper Rhine	0.0070	***
Southeast Upper Bavaria	0.0068	*
Augsburg	0.0065	*
Hamburg	-0.0029	*
Dusseldorf	-0.0047	***
Rhine-Main	-0.0048	***
Braunschweig	-0.0052	*
Bochum/Hagen	-0.0058	***
Arnsberg	-0.0079	*
Chemnitz-Erzgebirge	-0.0080	***
Oberes Elbtal/Osterzgebirge	-0.0096	***
North Thuringia	-0.0099	*
Mittelthüringen	-0.0112	***
Magdeburg	-0.0126	***
Berlin	-0.0129	***
West Saxony	-0.0130	***
Mecklenburgische Seenplatte	-0.0139	**
East Thuringia	-0.0143	***
Lusatia-Spreewald	-0.0154	***
South Thuringia	-0.0158	***
Mittleres Mecklenburg/ Rostock	-0.0167	***
West Pomerania	-0.0189	***
Halle/S.	-0.0192	***
Dessau	-0.0199	***
Southwest Saxony	-0.0217	***
Upper Lusatia-Lower Silesia	-0.0219	***

Note: *** statistically significant at the 0.01-level, ** statistically significant at the 0.05-level, * statistically significant at the 0.1-level.

HWWI Research Papers
by the HWWI Research Programmes
"Economic Trends" and "Hamburg and Regional Development"

The **Hamburg Institute of International Economics (HWWI)** is an independent economic research institute, based on a non-profit public-private partnership, which was founded in 2005. The University of Hamburg and the Hamburg Chamber of Commerce are shareholders in the Institute .

The HWWI's main goals are to:
• Promote economic sciences in research and teaching;
• Conduct high-quality economic research;
• Transfer and disseminate economic knowledge to policy makers, stakeholders and the general public.

The HWWI carries out interdisciplinary research activities in the context of the following research programmes: Economic Trends, Hamburg and Regional Development, World Economy and the Migration Research Group.