

Blien, Uwe; Eigenhueller, Lutz; Promberger, Markus; Schanne, Norbert

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The Shift-Share Regression: An Application to Regional Employment Development

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Uwe Blien

Institut fuer Arbeitsmarkt- und Berufsforschung (IAB)
Regensburger Str. 104
D-90478 Nuernberg
Germany

& Professor at Otto-Friedrich-University of Bamberg
uwe.blien@iab.de

Lutz Eigenhüller

Institut fuer Arbeitsmarkt- und Berufsforschung (IAB)
lutz.eigenhueller@iab.de

Markus Promberger

Institut fuer Arbeitsmarkt- und Berufsforschung (IAB)
markus.promberger@iab.de

Norbert Schanne

Institut fuer Arbeitsmarkt- und Berufsforschung (IAB)
norbert.schanne@iab.de

The Shift-Share Regression: An Application to Regional Employment Development

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1. Introduction

The so-called Shift-Share-Regression is used to analyse the development of employment. This does not imply a deterministic decomposition such as in classical Shift-Share-Analysis (Dunn 1960, Loveridge, Selting 1997). Instead, Shift-Share-Regression is a powerful and flexible econometric tool, which is especially suitable for testing theory-based hypotheses. In a basic version it was introduced by Patterson (1991) as a method for analysing and testing regional industrial developments. In contrary to the deterministic Shift-Share-Analysis employment development was examined in a linear model. In Patterson's analysis the industrial sector structure was used as the sole determining factor alongside the location effects and the national trend, parallel to those of the deterministic analysis. Möller and Tassinopoulos (2000) extended Patterson's approach by an additional variable for regional concentration. Further theory-based influences were then integrated in various IAB analyses (Blien, Wolf 2002). Some results of these studies are presented below, following an overview of the method.

Looking at the still widely used deterministic Shift-Share Method, the employment growth rate is disaggregated into several determinants. The so-called structural effect (also called "industry mix effect" or "proportional shift") shows how a region will develop when all its industrial sectors grow with the same rate as they do in a superordinate reference area (here: Western Germany). A location effect (also called "regional competitive effect" or "differential shift") represents the total "remainder" of development. Those who use this approach expect the splitting of employment development into components attributed to the industry structures and the regions themselves.

This procedure has often been criticised (Knudsen, Barff 1991), since it does not permit a model-based analysis. The detection of causal effects is at least problematic and the inclusion of additional explanatory variables is possible only in special cases needing a modification of the method (see e.g. Chiang's inclusion of the net export ratio into the method, Chiang 2012). A major problem is the nature of the method as a deterministic procedure which excludes significance tests and the estimation of the contribution of the "explained variance" in the approach.

Following Patterson's ideas instead of the deterministic approach, a regression model can be used if panel data is available. This regression approach can provide significance tests for a number of important influencing variables. In the following, we will explain this method in an overview. Additionally, an example of a regional analysis for a part of Germany shows what kind of results can be obtained from this enhanced approach. In this case, the influence of industrial sector structures, establishment size and qualification structures together with the regional determinants on employment growth are investigated. The regional units used are districts of Western Germany ("Landkreise" and "kreisfreie Städte"), especially in our context the districts of the federal State of Bavaria.

The analysis is motivated by theoretical considerations of different sources. The most important one refers to theoretical analyses of structural change. According to a theorem which can be traced back to Neisser (1942), the employment effect to technological progress depends on the elasticity of product demand. If demand is inelastic the direct labour saving effect of technological progress is dominating and the effect is negative. Then it is profitable for a firm to reduce its labour force.

If, however, demand is elastic a compensating effect dominates. In this case price decreases following higher productivity lead to an extension of product demand which (over-)com-

pensates the direct labour saving effect. Then, it is profitable for a firm to increase the size of its labour force (for formal models of the two effects see Appelbaum, Schettkat 1999, Cingano, Schivardi 2004, Blien, Sanner 2006).

It can be assumed that in different industries of an economy different demand elasticities are dominating. Therefore, an empirical analysis of employment effects should focus on the industries of an economy. Apart from this, the locational advantages and disadvantages of the different regions can be related to (dis-)agglomeration effects discussed in important theoretical approaches following Krugman (Krugman 1991 and Fujita, Krugman Venables 1999) and tested in a huge amount of empirical literature (Glaeser, Gottlieb 2009, Blien, Suedekum, Wolf 2006 and many others). Therefore the two main dimensions emphasized in deterministic Shift-Share Analysis and in Shift-Share Regression are justified by important contributions. The other sets of variables included in the recent Shift-Share Regressions e.g. concerning the qualification structure are important for controlling purposes which can also be justified by a bulk of literature we will introduce later.

Investigations oriented towards the Shift-Share Regression were done within the IAB projects "Development of East German Regions" (ENDOR Project, see Blien et al. 2003, see also Blien, Suedekum 2007) and "Comparative Analysis of German Federal State Labour Markets" (VALA)¹ see Amend, Otto (2006) for the theoretical background and Ludsteck (2006), Schanne 2011 on the econometric model, see also Suedekum, Blien, Ludsteck 2006 for a variation). Apart from the work of the present authors and the already mentioned IAB projects, Kowalewski (2011), Farhauer, Kröll (2012) and Dauth (2012) used the Shift-Share Regression to tackle other research questions. Zierahn (2012) presents an extension that includes the effects of spatial autocorrelation.

2. The Method

The structural effect of the classical Shift-Share-Analysis is defined as the regional development that would be expected if all the industries in the region would grow with the rates they show in the reference area, here Western Germany. The location effect identifies the development that deviates from this expected rate, and thus signifies the local characteristics of a region. A number of local factors which are advantageous or disadvantageous to the employment trend potentially show up in the location effect.

In contrast to the classical approach, Patterson (1991) used the following equation for his analytical tool:

$$\hat{N}_{irt} = \alpha_i + \lambda_t + \kappa_r + \varepsilon_{irt} \quad (1)$$

Here:

$$\hat{N}_{irt} = \frac{N_{ir(t+1)} - N_{irt}}{N_{irt}}, \quad \text{the regional employment growth in sector } i$$

α_i : effect of the economic sector i

λ_t : the period effect at particular time t

¹ The analyses of the federal states were published in 2006 in issues 11 and 12 of the journal „Sozialer Fortschritt“ (volume 55). A special analysis was dedicated to Bavaria which could be regarded as a brief predecessor (with a shorter data base from 1993 to 2001) of the analysis presented here (Eigenhüller 2006, see also Böhme, Eigenhüller 2005).

κ_r : the location effect of region r

ε_{irt} : a stochastic error term

Evidently, Patterson transferred the deterministic Shift-Share approach directly into a regression model. The employment trend is decomposed into two determinants, of which one reflects the sectoral development, whereas the other corresponds to the location effect mentioned above, representing the specific development of the respective region. The advantage of this regression analysis approach is that this location effect is separated from random developments in the region which are reflected in the error term.

If the estimation is carried out in the usual way as a regression with dummy variables, then the effect of a sector could only be measured in relation to another one which serves as a reference. To avoid a case of perfect multicollinearity, a fixed effect is excluded in every set referring to regions or sectors. Since the fixed effects are then measured relative to these excluded reference categories, subsequently a re-calculation not only of the effects, but also of the levels of significance is necessary, since the population mean is far more important as a reference than is any special region (Haisken-DeNew, Schmidt 1997, Möller 1995). A comparatively 'elegant' alternative is the use of identifying restrictions resorted to by Patterson (1991). This approach is called a restricted regression (Greene, Seaks 1991). The restrictions are defined in the following way:

$$\sum_{r=1} \sum_{i=1} g_{ir} \kappa_r = 0 \quad (2)$$

$$\sum_{r=1} \sum_{i=1} g_{ir} \alpha_i = 0 \quad (3)$$

Two reasons are relevant to the inclusion of weightings in the restrictions: on the one hand, exorbitant boosts in growth rates of small sectors in a region (called "shipbuilding in the midlands"-problem) are possible, resulting in outliers and heteroscedasticity problems. On the other hand, the growth rate of global parameters cannot simply be formed from the aggregation of subunits. A weighting is necessary for the correct application of the analysis, not only multiplying the restrictions but also multiplying the equation with the square root of the employment weighting (1):

$$g_{ir} = \sqrt{\frac{N_{ir}}{\sum_i \sum_r N_{ir}}} \quad (4)$$

This implies that the estimation must be carried out by means of weighted least squares. The estimating equation then reads as follows:

$$g_{ir} \hat{N}_{irt} = g_{ir} \alpha_i + g_{ir} \lambda_t + g_{ir} \kappa_r + g_{ir} \varepsilon_{irt} \quad (5)$$

The weights g_{ir} are set as constants calculated as means of the observation time period. Two deviations can be observed when comparing equation (5) with Patterson's (1991) estimating equation. The first consists of the fact that Patterson used linear weightings, that is, he dispensed with forming the square roots in (4). The second deviation consists of him not weighting the left hand side of the equation, that is, the response variable. The latter appears to be consequent and necessary within a Weighted Least Squares approach and was already applied by Möller and Tassinopoulos (2000). The use of the square root has its justification in the fact that the use of linear restrictions in a least squares estimation would lead to a dis-

proportionate weighting of large values. Simulations showed that only an estimation with square roots as weights leads to an approximation of global growth rates through the addition of the terms in (5).

This basically summarizes the entire approach, and Patterson also described it equally briefly in his original publication. What is important, however, is that this approach can be expanded, as Möller and Tassinopoulos (2000) were the first to show. Their somewhat generalised empirical equation for regional development is defined as follows (for brevity and clarity we drop the weights):

$$\hat{N}_{irt} = \alpha_i + \lambda_t + \delta_y + \kappa_r + \mu_i (a_{ir,0} - a_{i,0}) + \varepsilon_{irt} \quad (6)$$

Values of $\mu_i < 0$ showed the progress of deconcentration processes (whereas δ stood for several regional types). This was an extension with which concentration processes were to be measured. In the following, the equations are expanded with variables that are considered to be important in economic theory:

$$\hat{N}_{irt} = \alpha_i + \lambda_t + \kappa_r + \sum_{j=1}^3 \beta_j^Q Q_{jirt} + \sum_{z=1}^3 \beta_z^B B_{zirt} + \beta^W W_{irt} + \varepsilon_{irt} \quad (7)$$

with:

Q_{jirt} : The proportion of qualification group j among all employees of sector i , region r and at time t

B_{zirt} : The proportion of establishments of size range z among all employees in unit irt

W_{irt} : Wage deviation from the expected wage in irt

β : Regression coefficients

With weightings, equation (7) is extended to:

$$g_{ir} \hat{N}_{irt} = g_{ir} \alpha_i + g_{ir} \lambda_t + g_{ir} \kappa_r + g_{ir} \sum_{j=1}^3 \beta_j^Q Q_{jirt} + g_{ir} \sum_{z=1}^3 \beta_z^B B_{zirt} + g_{ir} \beta^W W_{irt} + g_{ir} \varepsilon_{irt} \quad (8)$$

The model is calculated for the whole of West Germany, as in Möller and Tassinopoulos (2000), that is, it is based on 326 regions, divided into 26 sectors. The following restrictions were set for the additional variables:

$$\sum_{j=1}^3 g_j \beta_j^Q = 0 \quad (9)$$

$$\sum_{z=1}^3 g_z \beta_z^B = 0 \quad (10)$$

Of course the sets of restrictions (2) and (3) were also included. The procedure applied again leads to a restricted weighted least squares estimation without an absolute term. In contrast to the unweighted estimation, there are two additional parameters to be calculated for each set of fixed effects compared to the usual strategy which leaves out dummies. Firstly, one more coefficient has to be determined, and secondly, for the restriction a Lagrange multiplier has to be calculated.

Relative wages are estimated to include wage levels which are interpreted as deviations from expected regional wages. Therefore, wage level equations are estimated in which the exogenous variables consist of industries, proportion of men, average age, establishment size and qualification proportions. The coefficients are determined in annual estimations, i.e. not for the whole data with a panel analysis for several years. The deviations of measured wages from the calculated expectations are then used in equation (8). The purpose of this approach

was to include an indication whether a region has an exceptionally high or low wage level. Since the effects found for equation (8), however, turned out to be very small and were not significant, an interpretation of the wage effects and an enhanced presentation of the procedure is not included in this text.

For the analysis an excellent data basis was available: The data from the Employment Statistics of the Federal Employment Agency, which was integrated in the Employment History Dataset developed by the Institute for Employment Research (IAB) for the time period of 1993 to 2008, was used for the analysis of employment developments. This was a quite extensive data base, since data were available for each year and each employment relationship liable to social security. The applied employment data consisted of volume data, that is, the average number of employees per establishment per year. To avoid distortions caused by the increase in part-time employment, working hours were aggregated to full-time equivalents to analyse the number of employees. There was no detailed information on actual working times, only a classification of employees into three groups (18 hours per week, 18 hours per week to full-time, and full-time). Therefore, average values of 16, 24 and 39 hours per week were assumed and these working times were then converted into full-time equivalents.

3. Analysis of Regional Disparities in Employment Growth in Bavaria

3.1 On the Influence of Various Determinants on Employment Development

The basic model (8) was estimated as described above. Before presenting the results, a short explanation is given concerning the hypotheses about the influence of the respective variables on employment development. Then, the results for West Germany are presented, since these form the basis for presenting and interpreting the results at the regional level for the federal state of Bavaria.

Sectoral structure

Since certain industrial sectors are often concentrated in a region, employment growth in the region strongly depends on the development of labour demand of the respective sectors (see Longhi, Nijkamp, Traistaru 2005 about the consequences of sectoral diversification). Consequently, the sectoral structure is an important determinant of a region's employment trend. As we have seen in the introduction, the elasticity of demand is important for employment in the different industries. This can also be integrated in an analysis of the product cycle, as is argued in Appelbaum, Schettkat (1999) and in Blien, Sanner (2006). They show that employment growth results rather from industries which are at the beginning of their product (life) cycle, whereas sectors at the end of their product cycle exhibit decreasing employment. The reason for this is a shift in the values of demand elasticities due to the progress of product cycles. It can be assumed that these elasticities are being larger (in absolute terms) at the beginning of the cycle. Since productivity increases result in price cuts for the customers at least in competitive markets, and demand is not yet saturated at the beginning of an industry's life cycle, the markets generate an increase in demand leading to additional employment. Conversely, productivity increases followed by price cuts do hardly generate additional demand in a saturated market. Instead, higher productivity only leads to job losses.

Therefore, the dynamics of technical progress and demand for products explain the growth and decline of industries and the regions in which they are located. In general, the development of various industrial sectors in Germany evolved very differently. Whereas the propor-

tion of employees in the service sector mostly increased due to structural change, the proportion of employees in manufacturing industries and agriculture usually decreased.

During the period analysed, service sectors mainly exhibited a positive effect in the quantitative employment trend. Table 1 shows the individual effects for 26 sectors² in West Germany. By far the strongest positive effect (coefficient) is provided by “temporary work”, which experienced a boom, especially in the second half of the investigation period, even though its proportion in relation to the total number of employees was still comparatively small. Other examples of sectors with a relatively strong positive quantitative effect are business related services as well as “health and social work”. The quality of work (working conditions, income, etc.) must also be considered in the “growth sectors”, especially in relation to the strong positive effect of temporary work, since this quality determines the living standard in the broader sense and influences the opportunities for social participation in society.

A predominantly negative effect is calculated for manufacturing, especially in the “Textiles and Leather” sector. The “Wood” and “Glass, Ceramics and Mineral Products” industries also show a significant negative effect. The only manufacturing industry to exhibit a significant positive effect on employment trend is “Motor Vehicle Construction”.

Table 1: Industrial Structure – the effect of industries on employment growth and the average proportion of employees for the time period of 1993 to 2008 according to sectors in West Germany

	West Germany		
	Coefficient	Significance	Proportion in%
1 Agriculture and Fisheries	-0.83	**	0.83
2 Mining, Mineral Oil & Coal, Energy	-1.66	***	1.86
3 Food, Beverages & Tobacco	-1.27	***	2.78
4 Textiles & Leather	-6.06	***	1.03
5 Wood	-2.04	***	0.70
6 Paper, Publishing	-1.62	***	2.25
7 Chemicals and Plastics	0.02		4.00
8 Glass, Ceramics, Mineral Products	-2.30	***	1.06
9 Metal Goods and Metal Processing	-0.01		4.91
10 Mechanical Engineering	0.16		4.85
11 Electrical Engineering	-0.35	**	4.73
12 Motor Vehicle Construction	1.72	***	4.01
13 Other Processing Industries, including Recycling	-2.14	***	1.21
14 Building Industry	-3.81	***	7.03
15 Trade & Repair	-0.95	***	15.12
16 Hotel and Restaurant Industry	-0.82	***	2.33
17 Transport and Telecommunications	1.05	***	5.44
18 Finance Industry	0.05		4.28

² The sectoral classification is based on the NACE classification (revision 1.1), with the exception of Group KA at the level of double letters, which remained almost identical to other industrial classifications (WZ93 and WZ03 in Germany). Additionally, a distinction is made between simple, scientific (or higher valued) corporate services and temporary work in the KA group, due to their heterogeneous structure.

19 Simple Business-Related Services	3.16	***	2.47
20 Knowledge-intensive Business-Related Services	2.47	***	6.47
21 Temporary Work	14.30	***	1.24
22 Social Security, State, Extraterritorial Bodies	-0.59	***	5.79
23 Education & Training	0.49	*	2.38
24 Health & Social Work	1.63	***	9.32
25 Other Service Activities	0.15		3.77
26 Private Households	-1.99	**	0.14

Source: Statistics of the Federal Employment Agency and IAB Employment History; own calculations. Significance level: * 95 %, ** 99 %, *** 99.9 %.

In the following, a summarised sectoral effect for the districts is calculated and shown in Table 8 in the Annex. This sectoral effect then displays the extent to which employment growth in the districts deviates from the average West German employment growth, because the industrial mix differs from the West German industrial mix. A positive (negative) sectoral effect is given when industries exerting a positive (negative) effect on employment growth are disproportionately represented in a region. In the same way the other basic components of the model are treated.

Establishment size structure

In the following we discuss establishments as the local production units of a firm. A growing significance of small to medium-size establishments can be observed in Western industrial nations in recent decades. Various developments have contributed to this. Technological change has led to a significant decrease in costs of transport and communications, and at the same time, the pressure of international competition has grown, exerting considerable adjustment pressures on establishments due to rapidly changing demand. Larger establishments reacted by introducing new, lean and more flexible organisational and management structures, for instance. Also special production and processing techniques such as just-in-time systems are used. Additionally, many establishments have outsourced services, leading to a more decentralised production structure favouring small and medium-sized units. This flexible specialisation enables rapid response to changing demand and specific customer requirements, so that these small and medium establishments can react more adequately to the general changes mentioned above. The increase in business start-ups and the expansion of employment in the service sector with many small establishments could also explain the growing significance of smaller establishments (cf. Amend, Otto 2006 for more extensive explanations and literature).

The establishments were divided into three categories of size for the quantitative analysis: smaller establishments (up to 50 employees), medium size establishments (51 to 250 employees) and larger establishments (more than 250 employees).

Table 2: Establishment size structure: the effect of establishment size on employment growth (“coefficient”) and the average proportion of employees in the time period 1992 to 2008 according to establishment size in West Germany.

	West Germany		
	Coefficient	Significance	Proportion in%
Smaller establishments (up to 50 employees)	1.28	***	36.19

Medium establishments (51 to 250 employees)	0.39	*	25.98
Larger establishments (more than 250 employees)	-1.49	***	37.83

Source: Statistics of the Federal Employment Agency and IAB Employment History; own calculations.
Significance level: * 95 %. ** 99 %. *** 99.9 %.

The results of the regression analysis for West Germany correspond to expectations to the extent that they exhibit a significant positive effect of small and medium-size establishments, as well as a significant negative effect for larger establishments with respect to employment trends. The effect of establishment size for a region indicates the extent to which regional increase in employment deviates from the average West German increase in employment when the company size structure in the respective district or city deviates from the average West German company size structure.

Qualification structure

As in many other countries, a shift in labour demand towards a relatively high qualified work force can also be seen in Germany. The so-called “Skill Biased Technological Change” provides an explanatory approach, according to which technical progress towards increasingly complex technologies in production and procedures leads to an increased demand for a (highly) qualified work force (cf. Acemoglu 2002). Increasing international trade is also seen as a cause of the trend to a highly qualified work force in developed countries. This consideration is also based on the fact that trade intensification promotes product specialisation, whereby industrialised countries mainly produce products requiring highly qualified workers while other countries produce products with low-skilled workers. Newer approaches also consider that technical progress not only leads to a loss or relocation of low-skilled jobs – especially in manufacturing industries – but also affects routine activities of medium-qualified employees (see Autor et al. 2003).

Therefore, the availability of qualified labour can be seen as an important factor in regional development (cf. Badinger, Tondl 2005, see also contributions in Acs, de Groot & Nijkamp 2002), which is the reason why qualification structure has been included as an additional variable in the regression equation. A differentiation is made between low-skilled (without completed vocational training), medium-skilled (completed apprenticeship, technical college degree, foreman or technician) and highly-skilled (university or polytechnic degree). In addition, those without specified qualification in the employment statistics are also considered. A result of the calculation is that there is a strong positive effect for those classified as “highly qualified” and a positive effect is also found for those with unknown qualification, as well as a significant negative effect for low-skilled employees and those with a completed apprenticeship. The results for the low-skilled and the highly qualified certainly agree with expectations. At first sight, the significant negative effect for the medium-skilled is a surprise. However, the effect is relatively small in comparison to the effects for other qualification groups and can be partially explained by the loss of routine jobs for this qualification level. Another possibility is that the effect might be due to polarization tendencies in the economy. The effect for those with unknown qualification is difficult to interpret.³

³ The positive effect may indicate that not only low-skilled employees are in this category, but also persons from all qualification levels, including highly qualified. This assumption is confirmed by analyses that examine the occupations of those whose “qualifications are unknown“. This not only includes unskilled labour.

It should be mentioned that the occurrence of skill-biased technological change does not exclude the existence of (partial) over-qualification in the economy, since the labour market is segmented. Higher demand for high-qualified people might not improve the situation of many workers who are over-qualified for their specific jobs. In the German economy segments according to occupations are of special importance.

Table 3: Qualification structure – effect of the qualification structure on employment growth (“coefficient”) and the average proportion of employees for the period 1993 to 2008 in West Germany

	West Germany		
	Coefficient	Significance	Proportion in%
Without completed apprenticeship	-2.18	***	14.47
Completed apprenticeship	-0.34	**	66.81
Highly qualified (polytechnic or university degree)	3.82	***	8.45
Qualification unknown	2.16	***	10.27

Source: Statistics of the Federal Employment Agency and IAB Employment History; own calculations. Significance level: * 95 %. ** 99 %. *** 99.9 %.

Local conditions

The location effect encompasses a systematic influence of the respective region which cannot be explained by other variables. This covers a constellation of specific regional conditions. This can, for example, be an especially favourable combination of industrial sectors in the region which leads to the regional economy benefiting from spill-over effects. Another example concerns special qualifications of employees which are not represented in the categories of formal education included in the regressions. Also population development, the question whether we are dealing with an immigration or emigration region has to be considered within the context of the location determinant.

Other local factors concern the geographical location of regions. This can be the proximity to large sales markets or procurement markets, available infrastructure, the accessibility of a region and the availability of research and development institutions. The geographical situation and natural environment of a region, the opening of a border, the closure or establishment of important establishments in the region can also play a role. Additionally, special economic or labour market measures and “soft” location factors such as quality of life or the reputation of a region with respect to being business-friendly are also important.

3.2 Employment developments and influences of the determinants in the Bavarian districts

In the period of 1993 to 2008, the federal state of Bavaria exhibited an average annual employment growth of 0.01%. Conversely, all other West German federal states experienced a decrease in employment. A previous version of the following analysis was included in a report in German language (Blien et al. 2011).

However, the calculations also exhibit large differences between the Bavarian districts (see Map 1⁴). Nevertheless, a positive effect was registered for the majority of the regions be-

⁴ In forming the class categories, the starting point was the mean value for all West German districts, and a half and one standard deviation was added or subtracted to each.

tween 1993 and 2008. A more or less distinct increase in employment occurred in 54 of the 96 districts. A table with the values of increase in employment of all the districts as well as the individual determinants is given in the Annex of this article (Table 8). Employment in the district of Erlangen-Höchstadt and Freising increased to the largest extent – by an annual average of more than 2 percent. These are also the two largest growth rates in West German comparison. In some of these districts the level of full employment (for a discussion of the term see Promberger 2012) is reached. In almost all parts of Bavaria there are districts with an increase in employment. At the same time, there are also regions where employment has developed unfavourably. The most severely affected region was North Eastern Bavaria. There, the most significant employment loss occurred in the district of Wunsiedel in the Fichtelgebirge, where employment dropped by an annual average of almost two percent.

There is a gap in the employment development between South and North Bavaria for the years 1993 to 2008. On the one hand, comparatively many regions in Northeastern Bavaria experienced the greatest employment losses, and on the other hand, seven of the ten districts with the strongest employment increases were located in South Bavaria.

No overall distinction can be found for the employment trend between cities and rural areas. It can be seen, however, that Munich is working as a powerful “economic machine”, which gives rise to many employment relationships not only in this city, but in the whole area of Southern Bavaria. There may be spill-overs from this centre which may reach as far as the commuting area of Munich extends. This area includes the southern part of Bavaria completely. On the other hand, in the city of Munich also some signs of “over-agglomeration” are visible. Some of the districts with the best employment development can be found in the surrounding area. These districts may profit from agglomeration disadvantages of the city, such as high real estate prices and rents. Therefore, some firms may prefer locations outside the centre of the agglomeration.

The situation in the Nuremberg agglomeration in Northern Bavaria is not as favourably. Nuremberg is smaller and has some problems with a partly obsolete industry structure. This city cannot generate as many positive spill-overs as Munich does. The urban units of Nuremberg, Fürth and Schwabach, and also the adjacent districts of Fürth and Nuremberg Land show bad figures of employment development. The positive influence of the smaller Nuremberg agglomeration on other regions is limited in comparison to the Munich agglomeration. On the other hand, there are also some districts with a pronounced favourable development e.g. in Erlangen and especially in the district of Erlangen-Höchstadt.

Following this overview of employment growth in the Bavarian regions, the next section will depict the influence of the already introduced variables of industrial structure, establishment size, qualification structure and location factors have on the various employment development.

The sectoral effect in Bavarian regions

The influence of the sectoral structure for employment growth in Bavaria turns out to be slightly negative (0.08 percentage points), whereby the differences in the sectoral structure concerning employment between Bavaria and West Germany are generally slight (cf. Table 4). The negative effect of the mix of trades and industry can be attributed to the fact that employment shares are above average in many sectors of the manufacturing sector and that these sectors are linked to substandard employment trends. The difference between Bavaria and West Germany is most distinctive in the “electrical engineering sector”, as the share of 6.8% in Bavaria is two percentage points higher than in West Germany. In addition, the ser-

vice sectors, which have a positive effect on employment trends, tend to be under-represented in Bavaria.

Table 4: Industrial structure – the average share of employees according to industry for the period 1993 to 2008 in Bavaria and the difference from West Germany

	Bavaria	
	Share in %	Difference from West Germany
1 Agriculture and Fisheries	0.72	-0.11
2 Mining, Mineral Oil & Coal, Energy	1.44	-0.43
3 Food, Beverages & Tobacco	3.22	0.45
4 Textiles & Leather	1.41	0.37
5 Wood	0.89	0.19
6 Paper, Publishing	2.41	0.17
7 Chemicals and Plastics	3.39	-0.62
8 Glass, Ceramics, Mineral Products	1.64	0.58
9 Metal Goods and Metal Processing	3.23	-1.68
10 Mechanical Engineering	5.27	0.42
11 Electrical Engineering	6.76	2.03
12 Motor Vehicle Construction	4.48	0.47
13 Other Processing Industries, including Recycling	1.47	0.26
14 Building Industry	7.47	0.44
15 Trade & Repair	14.53	-0.60
16 Hotel and Restaurant Industry	2.84	0.51
17 Transport and Telecommunications	4.76	-0.68
18 Finance Industry	4.33	0.05
19 Simple Business-Related Services	2.32	-0.15
20 Knowledge-intensive Business-Related Services	6.10	-0.37
21 Temporary Work	1.20	-0.04
22 Social Security, State, Extraterritorial Bodies	5.31	-0.48
23 Education & Training	2.27	-0.11
24 Health & Social Work	8.91	-0.40
25 Other Service Activities	3.45	-0.33
26 Private Households	0.18	0.04

Source: Statistics of the Federal Employment Agency and IAB Employment History; own calculations.

The “Health and Social Sector”, the „Scientific Corporate Services”, or the “Simple Business-Related Services”, for example, are strongly under-represented in Bavaria. “Temporary Work”, the sector with the highest positive coefficient, reveals a smaller share in employment than West Germany, but only by 0.04 percentage points. This deficit in the service sector and the employment shares that are above average in other sectors of the processing industry cannot be compensated with the more positive effect of a comparatively high share of employment in “Motor Vehicle Construction”.

Concerning the effects of the sectoral determinants on employment growth, there is a distinct difference between cities and rural districts (see Map 2). Cities mostly have a positive sectoral composition effect. The influence is strongest for Ingolstadt (+1.12 percentage points), Regensburg (+0.65 percentage points), and Munich (+0.55 percentage points). These positive results for cities can be primarily attributed to the fact that the service sector is over-represented. Examples of this are Munich and Nuremberg with significantly above average values for “Knowledge-intensive Business-Related Services” (12.4% or 10.4%). There is a distinctive “Financial Sector” with an employment share of slightly more than 16% in Coburg, and 16.4% and 15.1% of the employees in Würzburg and Straubing are in “Health and Social Work”. Temporary work also plays a role in some cities.

Bavaria gains much from the car production. Just under 45% of the employees in Ingolstadt work in the industry of “Motor Vehicle Construction”, and in Regensburg the figure is 10.6%. Three other districts, Freising, Starnberg and Munich, show a positive influence of the sectoral effect, favoured by their proximity to the capital, since there is a high proportion of “Knowledge-intensive Business-Related Services” in Munich and in Starnberg (16.4% and 12.1%), and the very large significance of the “Transport and Communications” sector with an employment share of 26.1% in Freising, the location of the Munich Airport.

Some North-eastern Bavarian districts are particularly affected by a bad industrial structure. The unfavourable development in this part of the country is at least partly explained by an outdated industry structure.

The establishment size effect in the Bavarian regions

The establishment structure in Bavaria hardly differs from the structure in West Germany and a minimal positive effect of +0.01 percentage points can be calculated for Bavaria in relation to Western Germany. Bavaria profits from a proportion of employees in smaller establishments that is above average, with a positive effect on the employment trend. This proportion compensates the smaller proportion of employees in medium-sized establishments and the slightly above average proportion of employees in large establishments with its negative effect on employment growth (see Table 5).

Table 5: Structure of establishment size: average proportion of employees by classes of establishment size for the period 1993 to 2008 in Bavaria, and the difference from West Germany

	Bavaria	
	Proportion in %	Difference from West Germany
Smaller establishments (up to 50 employees)	37.01	0.82
Medium-sized establishments (51 to 250 employees)	25.08	-0.90
Larger establishments (more than 250 employees)	37.91	0.08

Source: Statistics of the Federal Employment Agency and IAB Employment History; own calculations.

Concerning the influence of establishment size structure, there mainly is a difference between urban and rural regions (see Map 3). A generally positive effect is calculated for rural regions, since the proportion of small and medium-sized establishments is above average. In contrast, a negative effect is typically found for cities, because the share of employees in larger establishments is above average. Comparatively many people were employed in larger establishments in the cities, even though a suburbanisation of employment by relocation

of establishments or subdivisions of establishments to the surroundings took place during the observation period. The city of Erlangen, with -0.65 percentage points, is most strongly affected by the negative influence of an above average share of employees in larger establishments, followed by the cities of Ingolstadt (-0.61 percentage points) and Schweinfurt (-0.53 percentage points). Erlangen has 64.5% and Ingolstadt has 62.9% of employees in large establishments, and in Schweinfurt there are 58.9%.

The qualification effect in the Bavarian regions

The qualification structure of the employees has a very slight negative influence (-0.02 percentage points) on the employment trend in Bavaria. On the whole, the negative effect on employment growth resulting from the share of employees both without professional qualifications and with a medium qualification level being above average is almost compensated by the positive effect of the share of employees with a university education which is also above average (see Table 6).

Table 6: Qualification structure – average share of employees according to qualification level for the period 1993 to 2008 in Bavaria and the difference from West Germany

	Bavaria	
	Share in %	Difference from West Germany
Without completed apprenticeship or professional training	14.83	0.36
Completed apprenticeship or professional training	67.40	0.59
Highly qualified (technical university or university degree)	8.71	0.27
Qualification unknown	9.05	-1.22

Source: Statistics of the Federal Employment Agency and IAB Employment History; own calculations.

The distribution of the qualification effects (cf. Map 4) also shows the difference between cities and rural districts, and mirrors the functional division of labour between cities and rural areas to a certain extent. Management, administration and research divisions of establishments or universities (and universities of applied science) which employ a large amount of highly qualified personnel are often found in cities or surrounding areas because of the agglomeration economies, whereas manufacturing establishments with medium-qualified or even low-skilled employment are often located outside the cities.

Overall, there are only eleven districts in Bavaria with a positive or non-negative qualification effect. Six of these regions lie within the Munich agglomeration, and the rural district of Munich has the highest positive qualification effect (+0.7 percentage points). Erlangen follows in second place (+0.67 percentage points), the city of Munich, with +0.54 percentage points is in third place.⁵ This is due to the high proportion of highly qualified employees that is above average – the proportion is almost 25% in Erlangen, 18.5% in the city of Munich – and due to the relatively high proportion of employees of unknown qualification.

In general, shares of highly qualified employees that are below average as well as shares of employees without a completed professional training that are above average are decisive for the negative effect of the qualification structure. Comparatively strong negative qualification effects are to be found in peripheral regions of Northern and Eastern Bavaria.

⁵ Buch et al. (2010) demonstrate, for example, that Munich shows the most positive migration balance for highly qualified employees among large German cities with more than 500,000 inhabitants. The migration balance for this qualification group is also positive for Nuremberg, but to a much smaller degree than for Munich.

The location effect in the Bavarian regions

In the analysis of the growth rate as performed in the Shift-Share-Regression, the location remains as an important determinant. The location effect comprises all factors that are not included in other determinants, i.e. the sectoral determinant, qualification structures, etc., and concern the respective location relatively constantly over time. These factors include spatial conditions, local politics and coincidence. A separation of these individual sub-determinants is not possible with the available database.

Evidently, the overall location effect for the Federal State of Bavaria is relatively large and positive, with a value of +0.46%. This is the highest value of all West German Federal States. Apart from Bavaria, only Baden-Württemberg (+0.25 percentage points) and Rhineland-Palatinate (+0.19 percentage points) exhibit positive values for the location determinant.

Many of the aforementioned factors behind the location determinant provide explanations for the situation in Bavaria. Even comparatively better figures for Bavaria in relation to some “soft” location factors could be possible. For example, the quality of life within an area could be determined as positive and be significant for the establishment and for the choice of workplace and residence among employees. According to figures from the tourist sector, Bavaria's attractiveness is relatively high.

In addition, the settlement structure of Bavaria exerts a positive influence, due to its relatively large number of rural districts which have a more or less positive employment effect. Only eight Bavarian cities conform to the two city types in terms of area types as outlined by the German Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), for which the analysis yields a negative effect for employment (see Table 7).

Table 7: Districts of Bavaria according to their area types and their effects on employment growth

	Bavaria		
	Number of districts in this type	Effect	Significance
Regions with large agglomerations			
Districts with core cities	4	-0.65	***
Highly urbanised districts	3	-0.02	
Urbanised districts	8	0.29	**
Rural districts	2	0.42	
Regions with conurbational features			
Districts with central cities	4	-0.26	**
Urbanised districts	14	0.50	***
Rural districts	14	0.71	***
Regions of rural character			
Urbanised districts	34	0.59	***
Rural districts	13	0.26	

Source: BBSR, Statistics of the Federal Employment Agency and IAB Employment History; own calculations

Significance level: * 95 %, ** 99 %, *** 99.9 %.

The overall results show a positive effect for the location determinant of the Bavarian regions (see Map 5). In comparison to West Germany, a positive effect is obtained for more than three quarters of the Bavarian districts, which turns out to be relatively strong in some cases when compared to the other determinants. There also tends to be a structural difference between cities and other districts for the location determinant as can be seen from Table 7. Large cities show a negative location effect. Seven cities, including Munich (-0.64 percentage points) and the cities of the Nuremberg agglomeration (Nuremberg: -0.73 percentage points; Fürth: -0.57 percentage points; Schwabach: -0.39 percentage points) are among the ten regions with the largest negative figures. An exception is the city of Erlangen (+0.58 percentage points). Additionally, there are some districts in North and East Bavaria with a comparatively strong negative locational effect, and interestingly, also in Upper Bavaria. It is very remarkable, that the employment development in cities is worse than the one of other types of districts. Cingano and Schivardi (2004) discuss the possibility that the rates of technological progress are often higher in cities than elsewhere whereas the employment trend in agglomerations is often negative. This can be due to the labour saving effect of technological progress under the conditions of inelastic product demand as mentioned in the introduction of this article.

Since the location determinant always contains specific regional factors, a discussion of possible explanations cannot be given here for the 96 Bavarian districts. An initial point for interpreting the location determinants is in part offered by the factors mentioned for West Germany, among others, the advantages and disadvantages in agglomeration areas, population developments or migratory effects or the geographical position.

3.3 Discussion

The results of our analysis show that notable regional disparities exist with respect to employment development in Bavaria. This is due to the variation in the strength and direction of the influences of the various determinants on employment growth. The disparities have a structure on a large scale, since there is a North-South divide, with the North as the disadvantaged part. However, this does not entail that the entire Northern and Eastern Bavaria experienced an unfavourable employment trend or shows completely unfavourable constellations with respect to the determinants. On a small scale there are also important disparities. This is partly due to the industries located there and also partly due to the vibrancy effect of the capital, Munich, and its radiance extended recently. In contrast to this, the vibrancy effect of the agglomeration of Nuremberg, with its rather old industrial structure and also significantly smaller agglomeration is much weaker. This contributes to the fact that North Eastern Bavaria has the greatest problems of all Bavarian regions.

Bavaria benefited from a comparatively diverse and strongly export-oriented sectoral mix. This structure should also be of advantage in the future. At the same time, the very dynamic sector of corporate services could supply future potential, since the strong industrial base provides a favourable environment. In addition, there is the sector of Health and Social Work as well as Education and Training. Of course, the areas of scientific services in these sectors that require (highly) qualified personnel are especially promising for the future. It would be of advantage to reinforce these services in rural areas.

Nevertheless, the regions characterised by a rather old, traditional mix of industries should not be neglected. Even there, certain internationally well positioned subsectors and companies can be found. Therefore, such subsectors can also contribute to surviving painful readjustment processes and opening up prospects for the region, if they are supported by in-

vestment in qualified personnel and infrastructure. It is imperative for the regions to establish a promising industrial mix.

The analysis also shows that the location effect is significant for regional development. Correspondingly, it can also represent an important starting point for exerting an influence. For this, the regional competitive factors should be determined and their effects identified. This will provide possibilities to link differentiated local promotional concepts that will reinforce existing positive competitive factors or impede constellations or conditions that have negative effects. A comparative perspective can provide important new insights. This requires patience and the readiness for continuous efforts, since this is the only way to influence (path-dependent) local conditions.

4. Conclusion

This article has the objective, on the one hand, of presenting the Shift-Share-Regression method, and on the other hand, of showing how the application of this method can lead to theoretically and empirically substantial conclusions. The presentation demonstrates that this double objective can be met: a powerful “workhorse” is available in the form of the Shift-Share-Regression which is useful for many analytical assignments, and is especially suitable for regional labour market research. The example presented here for the German Federal State of Bavaria shows that numerous significant conclusions can be reached. An enormous amount of effects is revealed in the analytical results which can be related not only to theories of economic science but also implies relevant findings for economic policies. For social sciences, the analysis contributes to the explanation of employment and therefore to the distribution of social chances and (indirectly) to the emergence of poverty. Employment trends explain differences in unemployment levels, which are directly related.

We should not neglect that further extensions of the methodology could be useful for several reasons. One of these approaches has been done in the work of Zierahn (2012): this deals with the incorporation of methods of spatial econometrics. Other extensions could deal with problems of endogeneity, which, for example, could be related to the further inclusion of wage information. The Shift-Share-Regression is open to a further development in the direction of causal analysis.

Tests have shown that the Shift-Share-Regression permits much more detailed conclusions than is possible by considering regions as panels without sectoral differentiation. Of course, this is due to the fact that the differentiation according to sectors introduces a source of variation in the data which can be profitably analysed. In addition, sector differentiation is not only methodologically valuable, but also constitutes an economically and theoretically sensible classification which enables the analysis of relatively homogeneous units of observation. Due to these reasons, the use of Shift-Share-Regression is recommended for further analyses.

This is the contribution of the work which started from Patterson’s seminal paper: Shift-Share-Regression is not only a method to replicate the decomposition task of deterministic approaches in a linear model. Rather, it is a flexible econometric tool, which can integrate many theoretically meaningful variables.

Annex

Table 8: Employment trend for the period 1993 to 2008 (average annual growth rate in %) and the influence of various determinants in Bavarian districts (“Landkreise” are termed “Distr” and “kreisfreie Städte”. i.e. urban areas are termed “City”)

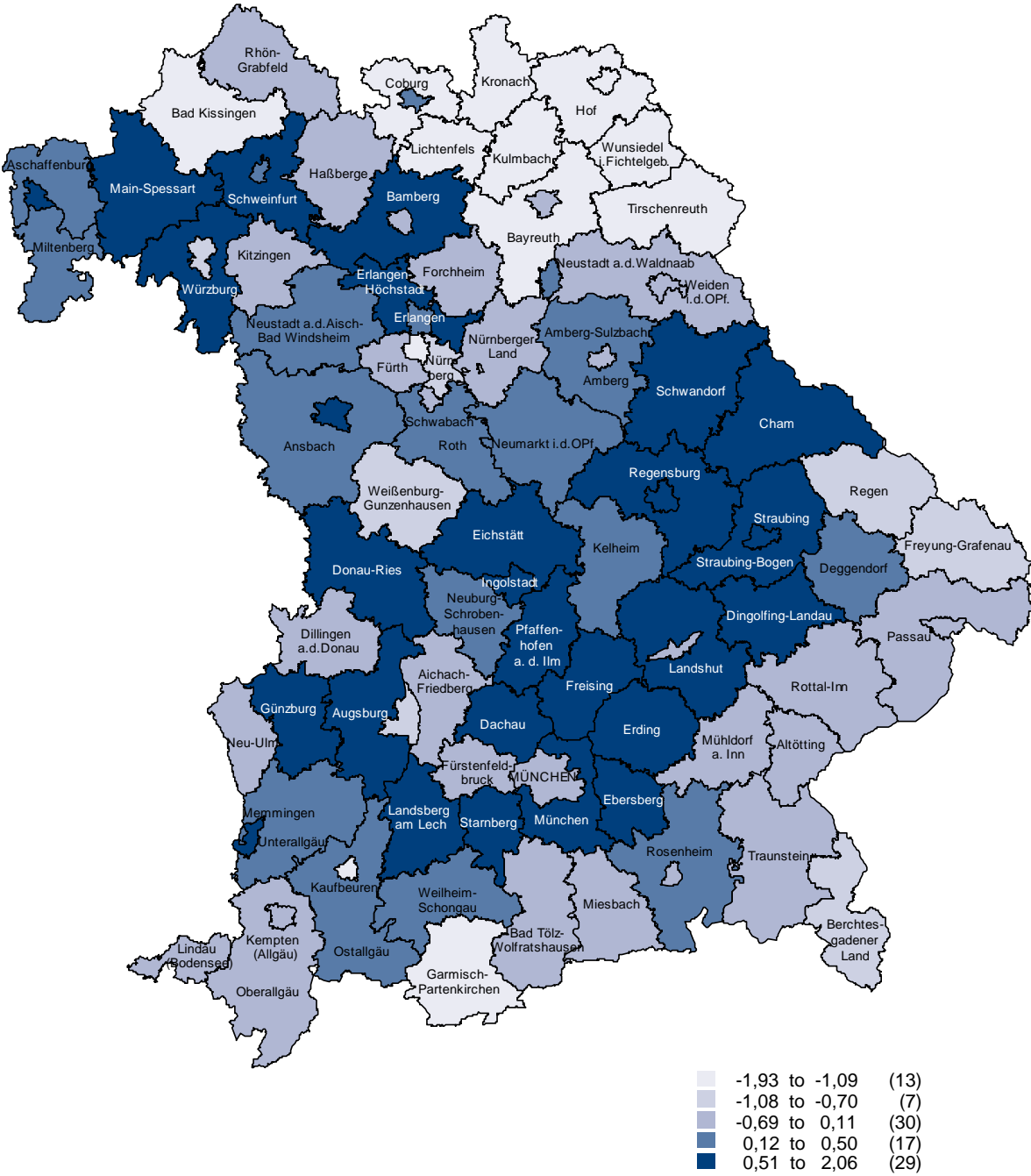
	Employment growth rate	Sectoral effect	Establishment size effect	Qualification effect	Location effect
Bavaria	0,01	-0,08	0,01	-0,02	0,46
Upper Bavaria					
Ingolstadt, City	1,18	1,12	-0,61	-0,08	1,07
Munich, Federal State Capital	-0.31	0.55	-0.40	0.54	-0.64
Rosenheim, City	-0.38	-0.08	0.08	-0.04	-0.04
Altötting, Distr.	-0.21	-0.11	-0.19	-0.19	0.62
Berchtesgadener Land, Distr.	-0.90	-0.41	0.66	-0.08	-0.71
Bad Tölz-Wolfratshausen, Distr.	-0.23	-0.25	0.59	-0.03	-0.15
Dachau, Distr.	1.16	-0.27	0.48	-0.03	1.32
Ebersberg, Distr.	1.31	-0.29	0.34	0.11	1.47
Eichstätt, Distr.	1.86	-0.66	0.47	-0.19	2.59
EDistritz, Distr.	0.89	-0.37	0.43	-0.10	1.28
Freising, Distr.	2.03	0.20	-0.18	0.07	2.22
Fürstenfeldbruck, Distr.	-0.13	-0.46	0.64	0.14	-0.08
Garmisch-Partenkirchen, Distr.	-1.44	-0.29	0.62	-0.14	-1.28
Landsberg am Lech, Distr.	0.95	-0.24	0.32	-0.20	1.39
Miesbach, Distr.	0.09	-0.41	0.60	-0.04	0.22
Mühldorf a.Inn, Distr.	-0.22	-0.50	0.39	-0.30	0.55
Munich, Distr.	1.84	0.11	0.01	0.70	1.24
Neuburg-Schrobenhausen, Distr.	0.14	-0.95	0.18	-0.32	1.58
Pfaffenhofen a.d.Ilm, Distr.	1.01	-0.41	0.32	-0.18	1.62
Rosenheim, Distr.	0.43	-0.43	0.47	-0.15	0.87
Starnberg, Distr.	0.80	0.15	0.33	0.42	0.21
Traunstein, Distr.	0.01	-0.43	0.21	-0.16	0.74
Weilheim-Schongau, Distr.	0.39	-0.28	0.17	-0.13	0.98
Lower Bavaria					
Landshut, City	-0.25	0.46	-0.07	-0.20	-0.07
Passau, City	0.05	-0.16	-0.08	-0.13	0.77
Straubing, City	0.67	0.21	0.18	-0.21	0.77
Deggendorf, Distr.	0.22	-0.61	0.19	-0.29	1.28
Freyung-Grafenau, Distr.	-0.83	-0.80	0.39	-0.58	0.53
Kelheim, Distr.	0.27	-0.33	0.16	-0.31	1.09

	Employment growth rate	Sectoral effect	Establishment size effect	Qualification effect	Location effect
Landshut, Distr.	0.95	-0.55	0.28	-0.19	1.75
Passau, Distr.	-0.16	-0.51	0.48	-0.40	0.64
Regen, Distr.	-0.87	-0.61	0.35	-0.47	0.20
Rottal-Inn, Distr.	-0.09	-0.94	0.51	-0.36	1.08
Straubing-Bogen, Distr.	0.77	-0.63	0.43	-0.34	1.65
Dingolfing-Landau, Distr.	0.81	1.00	-0.62	-0.49	1.27
Oberpfalz					
Amberg, City	-0.59	-0.11	-0.17	-0.22	0.26
Regensburg, City	0.70	0.65	-0.33	0.13	0.57
Weiden i.d.OPf., City	-0.56	-0.45	0.06	-0.32	0.50
Amberg-Sulzbach, Distr.	0.49	-0.77	0.17	-0.36	1.79
Cham, Distr.	0.87	-0.79	0.34	-0.39	2.04
Neumarkt i.d.OPf., Distr.	0.25	-0.84	0.10	-0.29	1.60
Neustadt a.d.Waldnaab, Distr.	-0.66	-0.55	0.16	-0.46	0.57
Regensburg, Distr.	1.40	-0.36	0.46	-0.20	1.83
Schwandorf, Distr.	0.63	-0.19	0.21	-0.41	1.38
Tirschenreuth, Distr.	-1.24	-1.09	0.24	-0.45	0.45
Oberfranken					
Bamberg, City	-0.34	-0.13	-0.24	-0.14	0.52
Bayreuth, City	-0.49	-0.02	0.09	-0.11	-0.10
Coburg, City	0.24	0.37	-0.24	-0.06	0.54
Hof, City	-1.72	-0.84	0.23	-0.20	-0.35
Bamberg, Distr.	0.61	-0.78	0.45	-0.33	1.64
Bayreuth, Distr.	-1.32	-0.81	0.34	-0.39	-0.03
Coburg, Distr.	-1.80	-1.18	0.11	-0.51	0.39
Forchheim, Distr.	0.01	-0.45	0.33	-0.27	0.76
Hof, Distr.	-1.86	-1.69	0.23	-0.34	0.45
Kronach, Distr.	-1.37	-0.76	0.21	-0.58	0.18
Kulmbach, Distr.	-1.61	-1.05	0.32	-0.32	-0.10
Lichtenfels, Distr.	-1.42	-0.87	-0.07	-0.54	0.57
Wunsiedel i.Fichtelgebirge, Distr.	-1.93	-0.94	0.17	-0.50	-0.28
Central Franconia					
Ansbach, City	0.52	0.50	-0.04	-0.25	0.66
Erlangen, City	0.41	0.19	-0.65	0.67	0.56
Fürth, City	-1.14	0.04	-0.14	-0.03	-0.57
Nuremberg, City	-0.90	0.50	-0.30	0.04	-0.73
Schwabach, City	-0.68	-0.07	0.35	-0.18	-0.39
Ansbach, Distr.	0.20	-0.86	0.30	-0.45	1.62
Erlangen-Höchstadt, Distr.	2.06	-0.59	-0.10	-0.10	3.19

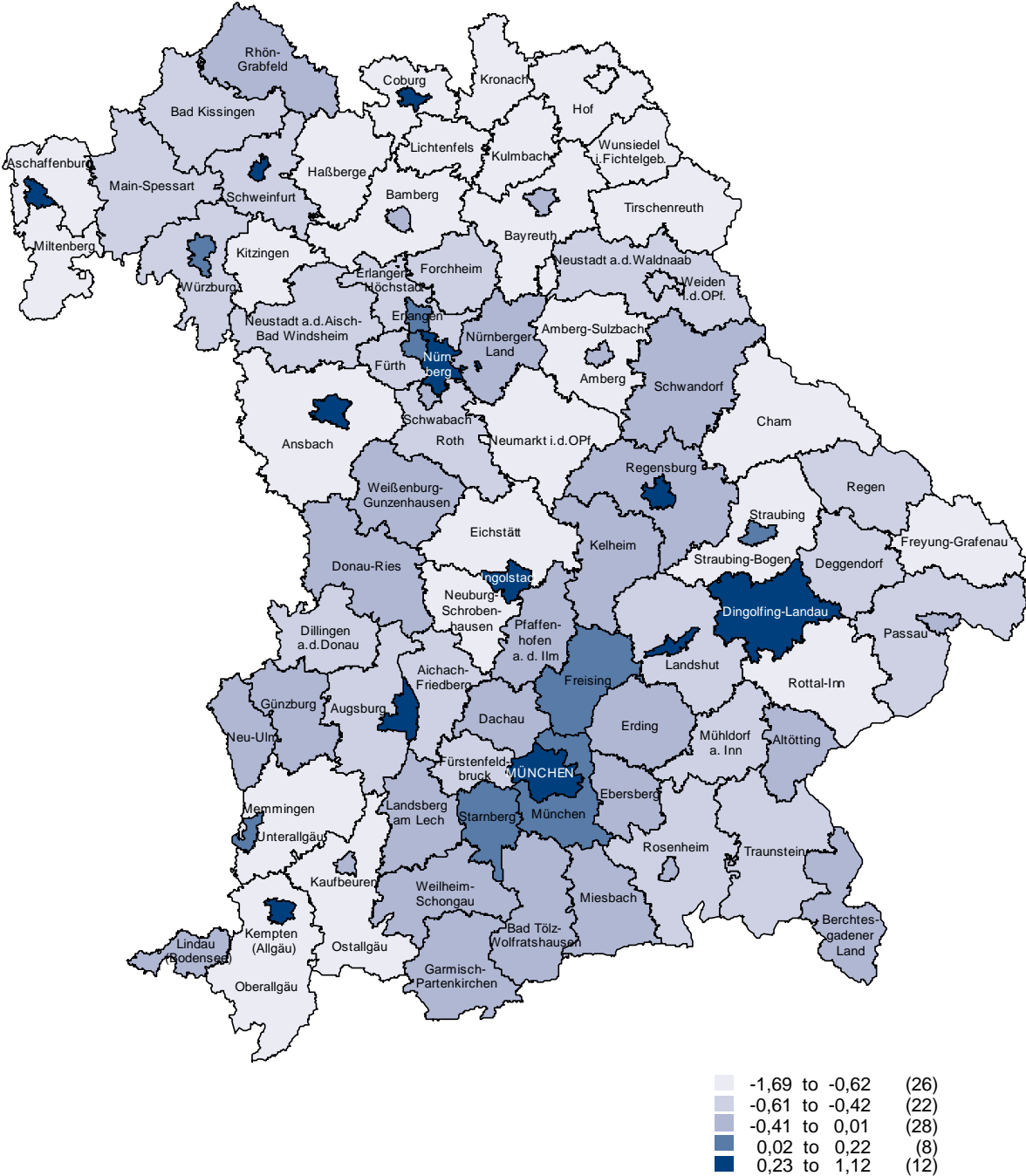
	Employment growth rate	Sectoral effect	Establishment size effect	Qualification effect	Location effect
Fürth, Distr.	-0.65	-0.48	0.59	-0.20	-0.16
Nuremberg Land, Distr.	-0.35	-0.27	0.14	-0.16	0.31
Neustadt a.d.Aisch-Bad Windsheim, Distr.	0.44	-0.56	0.55	-0.35	1.15
Roth, Distr.	0.18	-0.61	0.54	-0.23	0.82
Weißenburg-Gunzenhausen, Distr.	-0.85	-0.40	0.22	-0.41	0.11
Lower Franconia					
Aschaffenburg, City	0.64	0.50	-0.13	-0.14	0.75
Schweinfurt, City	0.49	0.29	-0.53	-0.14	1.23
Würzburg, City	-0.98	0.22	-0.11	0.03	-0.76
Aschaffenburg, Distr.	0.18	-0.65	0.25	-0.12	1.05
Bad Kissingen, Distr.	-1.18	-0.48	0.41	-0.31	-0.43
Rhön-Grabfeld, Distr.	-0.35	-0.41	0.11	-0.23	0.56
Haßberge, Distr.	0.11	-0.71	0.11	-0.42	1.51
Kitzingen, Distr.	0.05	-0.63	0.24	-0.25	1.04
Miltenberg, Distr.	0.15	-0.67	0.21	-0.35	1.34
Main-Spessart, Distr.	0.53	-0.49	0.03	-0.24	1.56
Schweinfurt, Distr.	0.67	-0.52	0.56	-0.29	1.28
Würzburg, Distr.	1.31	-0.58	0.45	-0.10	1.89
Swabia					
Augsburg, City	-0.78	0.42	-0.31	0.00	-0.53
Kaufbeuren, City	-1.25	-0.30	0.39	-0.17	-0.78
Kempten (Allgäu), City	0.01	0.34	0.18	-0.14	-0.05
Memmingen, City	0.79	0.08	-0.10	-0.25	1.33
Aichach-Friedberg, Distr.	0.03	-0.58	0.41	-0.29	0.93
Augsburg, Distr.	0.74	-0.57	0.37	-0.20	1.50
Dillingen a.d.Donau, Distr.	-0.27	-0.42	0.18	-0.45	0.76
Günzburg, Distr.	0.57	-0.29	0.10	-0.31	1.41
Neu-Ulm, Distr.	-0.11	-0.17	0.04	-0.22	0.60
Lindau (Bodensee), Distr.	-0.01	-0.34	0.18	-0.21	0.69
Ostallgäu, Distr.	0.27	-0.67	0.35	-0.30	1.24
Unterallgäu, Distr.	0.24	-0.81	0.28	-0.27	1.37
Donau-Ries, Distr.	0.75	-0.33	-0.03	-0.31	1.71
Oberallgäu, Distr.	-0.29	-0.64	0.44	-0.21	0.48

Source: Statistics of the Federal Employment Agency and IAB Employment History; own calculations.

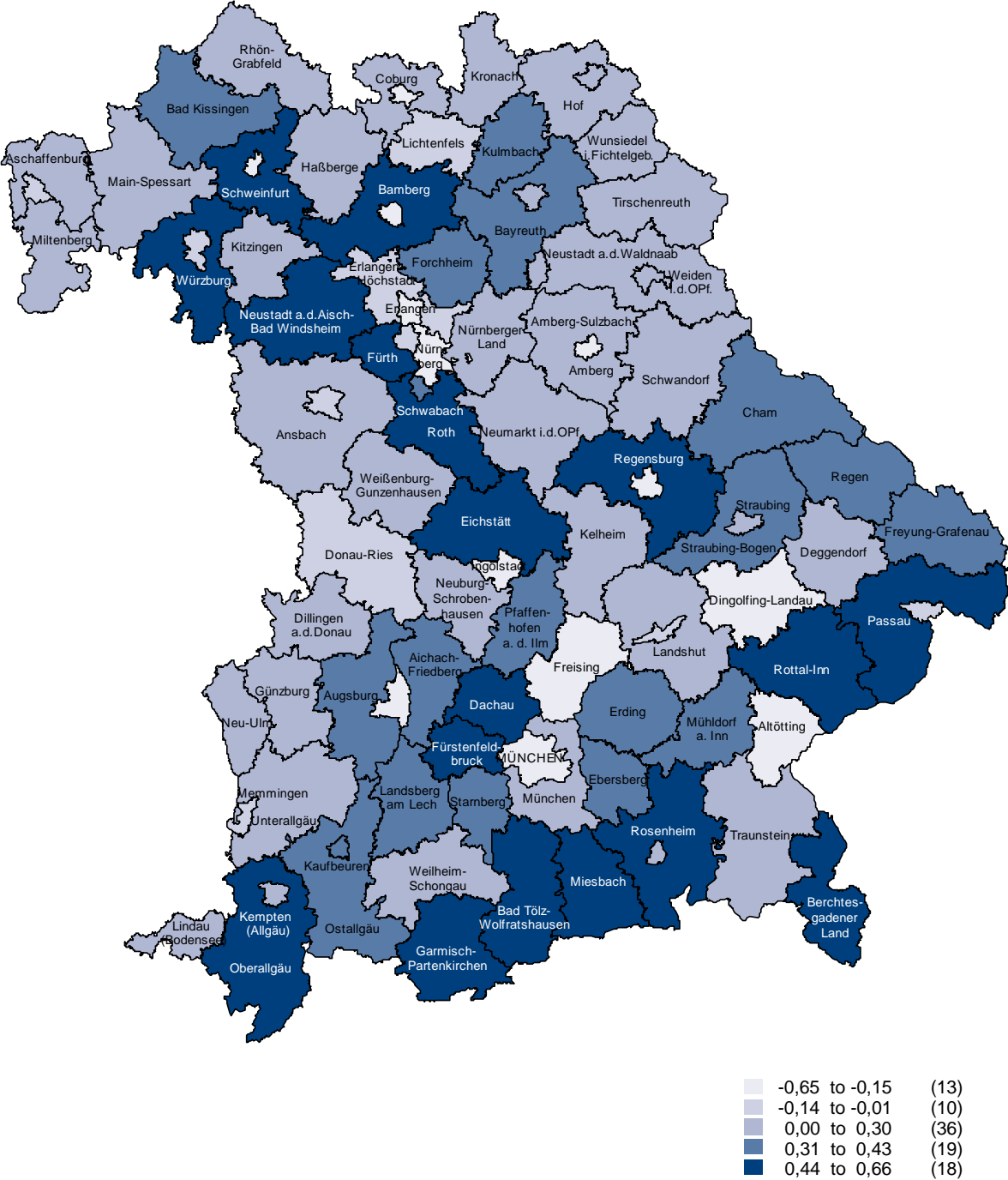
Map 1: Employment development 1993 to 2008 (annual average growth rate in %)



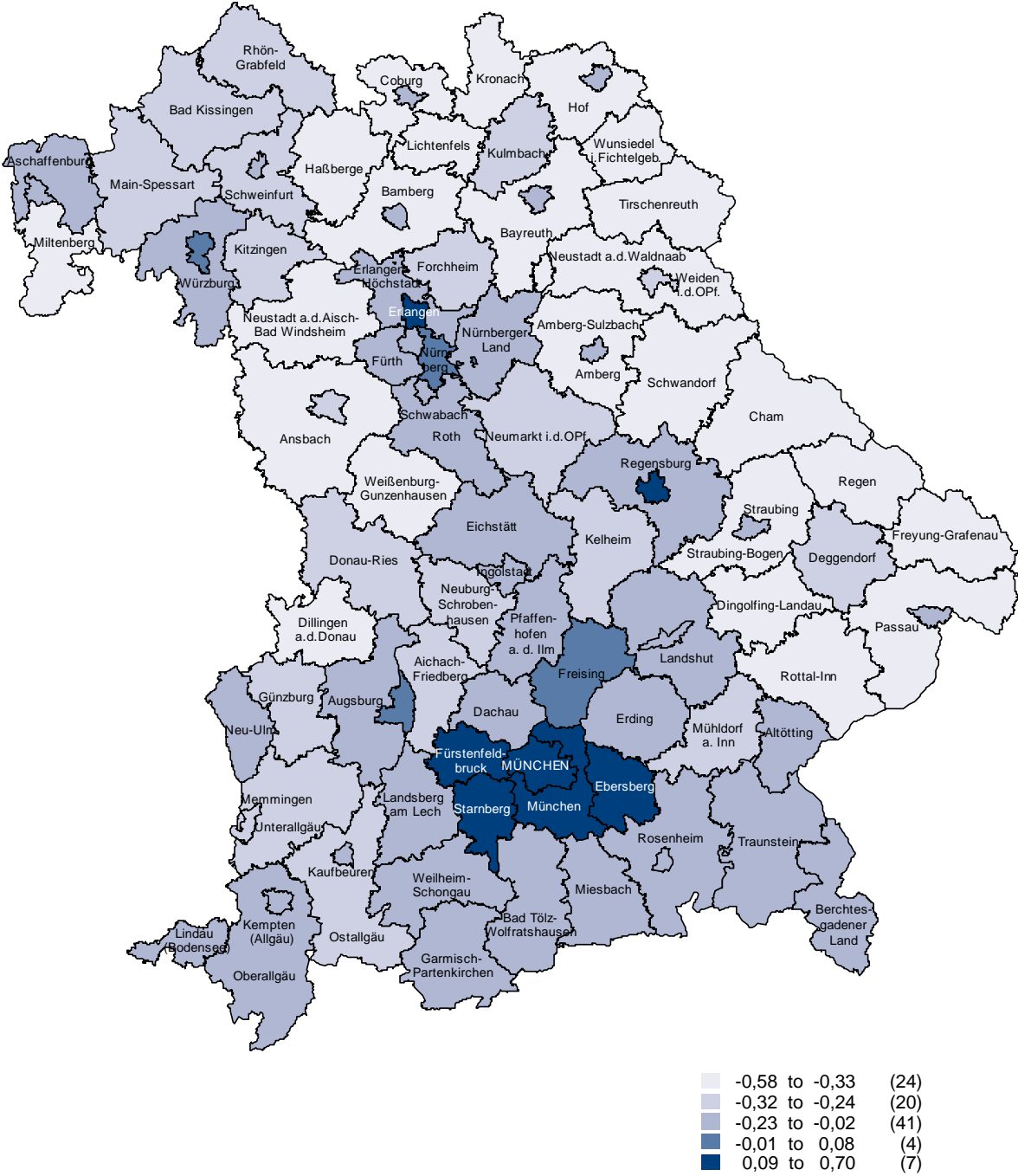
Map 2: Influence of the sectoral determinant in Bavarian districts



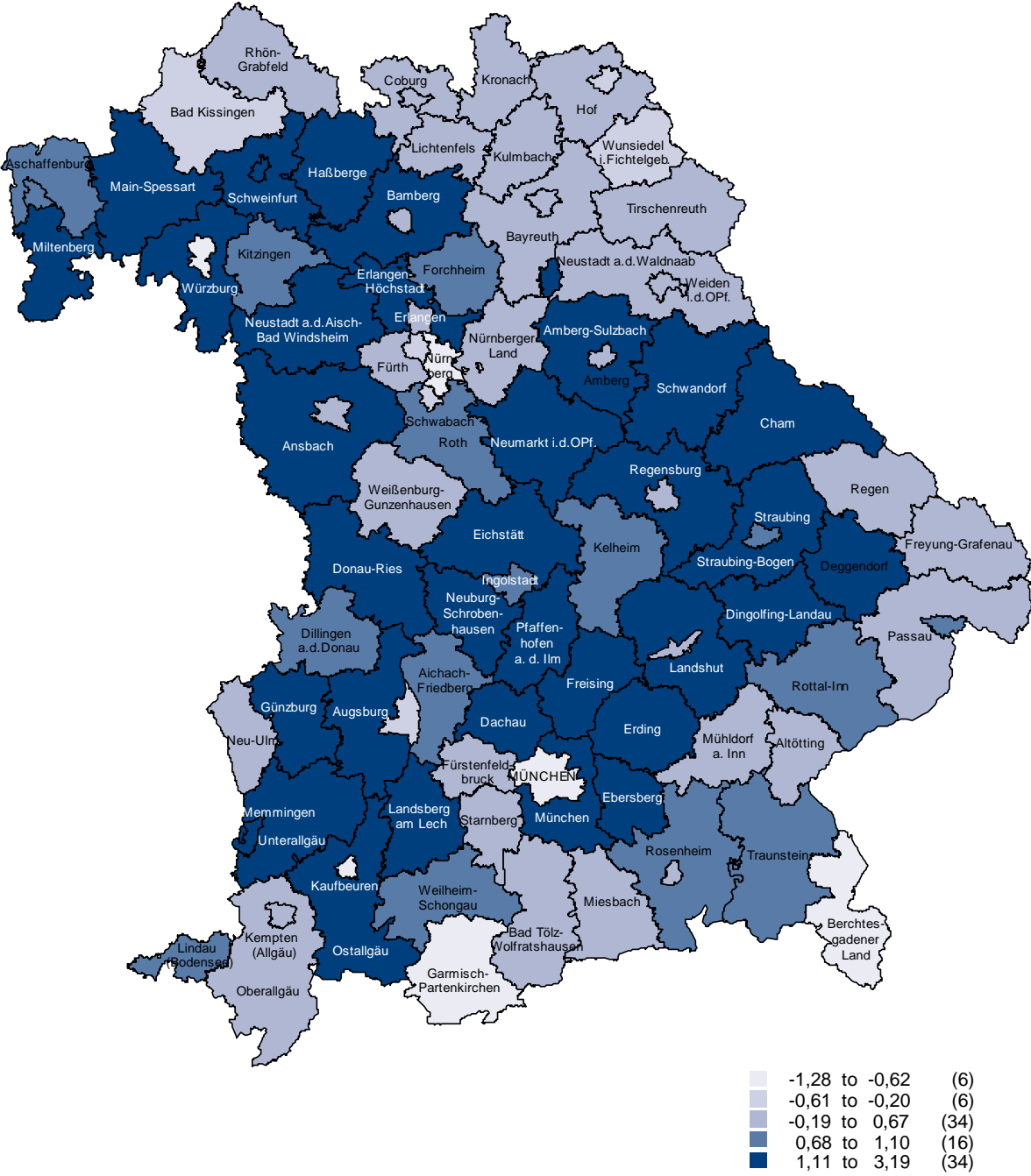
Map 3: Influence of the establishment size determinant in Bavarian districts



Map 4: Influence of the qualification determinant in Bavarian districts



Map 5: Influence of the location determinant in Bavarian districts



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