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ABSTRACT

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We address the effects of wages on employment growth on the basis of a theoretical model from which cost and demand effects can be derived. In the empirical analysis we take a highly disaggregated perspective and apply a newly developed shift-share regression technique on an exhaustive and very accurate data set for West Germany. The regression shows that the impact of regional wages on employment growth is significantly negative. There is some variation of this effect across sectors, but in no case we find support for the claim that an exogenous wage increase leads to higher employment growth.

JEL Classification: J23, E24, R11

Keywords: employment growth, shift-share-analysis, regional wages, purchasing power argument

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1) Introduction

The connection between wages and employment growth is among the most fundamental macroeconomic relations. Most economists agree that higher labour costs tend to reduce the employment growth rate of an economy. An increase in the relative factor price of labour will ceteris paribus cause a substitution of input factors and make production more capital intensive. Or, in the context of globalization, higher domestic labour costs will favour a shift of production towards low wage countries. It is therefore argued that an appropriate way to increase employment growth and – inter alia – to fight the seminal problem of unemployment is a policy of wage moderation. A rule of thumb says that wages can rise at most by the rate of productivity growth plus the inflation rate without having adverse employment effects, and positive employment growth must be "bought" by keeping the growth rate of wages below this benchmark level (Sachverstaendigenrat, 2004; Lehment, 2000).

Yet, even a brief look at commonly repeated public discussions or at the arguments of trade unions prior to wage negotiations makes clear that there is by far no general consensus in the society about the employment effects of wage increases (Jerger/Landmann, 2002). After all, wages are not only a cost factor for firms, but also account for roughly 2/3 of national income and are thus a major determinant of aggregate demand. In view of this, a "purchasing power argument" (henceforth: PPA) remains vital according to which higher wages can actually *increase* the employment growth rate due to demand side effects. Versions of the PPA have a long tradition in the history of economic thought and refer to ideas developed by Keynes (1936) (though there is no direct counterpart in his work). But in modern macroeconomic theory, the PPA practically plays no role any longer. This neglect stands in some contrast to the unchanged political relevance of the argument.

The model by Jerger/Michaelis (2003) is among the rare exceptions where the demand side repercussions of a wage hike are explicitly taken into account via a Kaldorian structure of savings of entrepreneur and worker households. They show that a wage hike increases aggregate demand if the two population groups have different marginal propensities to save. Whether this demand effect only moderates or over-compensates the negative supply side effect depends on the adjustment processes and the time horizon in the economy. In line with the conventional wisdom, Jerger/Michaelis (2003) point out that it is highly unlikely, with plausible values of deep exogenous parameters like the scale elasticity of production, the cyclicality of the price mark-up, or the degree of price stickiness, that the demand side dominates. This agrees with the conclusion of

Appelbaum/Schettkat (1999), where the prevalence of the PPA hinges on the price and income elasticity of demand on the respective product markets. However, from a theoretical point of view, it might be unlikely that the PPA holds, but it can not be ruled out with certainty.

Ultimately the employment growth effect of a wage increase is therefore an *empirical* question, and this paper intends to contribute to the empirical knowledge about this issue. What distinguishes our approach from existing work in this area (see e.g. Peturson/Sloek, 2001; Blanchard/Wolfers, 2000) is that we look at the connection between wages and employment growth from a highly disaggregated and intra-national perspective. Typically, employment growth performances are contrasted on the level of different countries (e.g. Garibaldi/Mauro, 2002). This is obviously an important thing to do, but macroeconomic studies at the national level also have some drawbacks. Firstly, they are naturally restricted to a quite low number of observations. Secondly, for an analysis involving wages, the national perspective might be too unspecific, as national average values hide great wage differences and thus a lot of statistical variation within a country. And lastly, economists have become increasingly aware in recent years that the intra-national variation in employment growth is often at least as pronounced as between countries (Martin/Tyler, 2000; Decressin/Fatas, 1995; Blanchard/Katz, 1992). This is also the case for Germany, which together with Italy is often referred to as the classical example of an economy with extreme internal disparities.[1]

In this study we focus our attention on employment growth within West Germany. We distinguish 28 different industries and 326 West German districts and look at the time period from 1993 to 2001. That is, our unit of observation is an industry within a region. In order to analyse the trade-off between the cost push and the demand side effects of high wages, we examine how an exogenous *regional* wage increase affects the employment growth of the sectors in that location. A regional wage increase implies an increase in labour costs for each sector in that district, which has negative effects on employment growth. But potentially there is a mitigating positive

[1]Of course this is mainly due to the large East-West gap that keeps on existing even after more than a decade since re-unification. In this paper, however, we do not look at the difference between East and West Germany, but focus on the internal disparities within the West. In doing so, we focus on a well integrated economic area without any significant formal obstacles to goods trade or factor mobility, and – very importantly – with a common economic history over the last decades. A comparison of East versus West Germany would probably not reveal general insights about the determinants of regional disparities in employment growth, but rather historically special circumstances, undigested parts of the transformation process and the "reunification shock".

effect due to an increased purchasing power of local consumers.[2] We explore this question with a new econometric estimation approach, a *shift-share-regression* that builds on the deterministic precursor developed by Dunn (1960) and the regression analytical analogue pioneered by Patterson (1991).[3] This technique allows us to disentangle the anatomy of employment growth in West Germany and control for general industry specific, location specific and time specific developments, as well as for a variety of additional variables that influence the growth performance of a sector/region-unit, in order to isolate the partial effect of wages on employment growth.

But wages are not included directly in the regression, because it would be quite misleading to use the raw and unsettled averages as explanatory variables. Labour productivity systematically differs across locations and industries, which gives rise to wage disparities across the single units. We are interested though in the employment growth effects of *"excessive"* wages that are *not* backed up by the underlying characteristics of the workforces. To construct such a measure, we take a preceding step and examine the wage structure across West Germany. We regress the average daily income in each sector and region on a variety of explanatory factors like the qualification, age and gender structure of the respective workforce that determine labour productivity and control for other factors that influence the level of wages. From this analysis we take the regional fixed effects and include them in the shift-share regression on employment growth. That is, a "high wage region" in our interpretation is not a region with high wages per se, but a region whose wages are higher than expected, given a variety of characteristics. If the PPA actually holds, we should see positive employment growth effects associated with this wage measure, since the demand side effects of overly high regional wages should over-compensate the cost push effects.

First we address this question without differentiating across sectors. But we are also interested to see if there is a sectoral variation, i.e. if the PPA is stronger visible in some industries than in others. A frequently raised argument against the PPA is that the cost push effect of a wage hike

[2] We look at a regional wage increase rather than at an increase accruing only to a single sector within a region, because the demand side repercussions of such a wage hike only for the own local sector are supposedly very small and negligible.

[3] The deterministic shift-share method by Dunn (1960) splits up the annual employment growth rate in the basic units of observation into a general national (or business cycle) component, an industry component and a genuinely regional effect. This method has often been criticised, since it prevents standard hypothesis testing and produces biased results that typically overstate the regional effects (Armstrong/Taylor, 2000; Knudsen/Barff, 1991). This critique does not apply, however, to the regression analytical analogue with complete sets of sector, region and time dummies that has recently facilitated some very useful contributions (see e.g. Moeller/Tassinopoulos, 2000; Blien/Wolf, 2002).

accrues locally, but the induced increase in purchasing power drains out (at least partly) to other countries or, respectively, regions. One might thus expect that a regional wage increase is less harmful for sectors that have a strong focus on local markets and that serve mainly local consumers, as these industries benefit directly from an increase in private spending.

The rest of the paper is organized as follows. In section 2 we give details about our data set and present a brief descriptive overview about internal economic disparities in West Germany. Section 3 provides some theoretical background. The estimation approach is introduced in section 4. In section 5 we present the results for the preceding wage structure analysis and in section 6 the results of the shift-share regression on employment growth. Section 7 summarizes the results and provides some concluding remarks.

2) Data and a descriptive overview

The data for this study is provided by the German Federal Employment Services (Bundesagentur fuer Arbeit) and contains the complete population of all full time employment relationships that are subject to social security, i.e. excluding civil servants and self-employed individuals. Since individual social security contributions are calculated on the basis of this official information, the data is highly reliable and by far more accurate than survey data. We focus here only on full time employment, because there are some data problems for part-time employment relationships due to the change in the data basis in 04/99, and because the wages for part-time employees are measured less accurately.[4] For each individual a new record is stored for each year up to 31 December and for every change of firm. We use here the so-called *quarterly statistics*, which include cross-sections for 30 June each year.

The data is partitioned according to the 326 West German districts (NUTS III regions, "Landkreise" and "kreisfreie Staedte", excluding West Berlin)[5] and according to 28 different industries. We have yearly observations for the period from 1993 to 2001. Theoretically, we could therefore observe

9 years * 326 districts * 28 industries = 82152 cells

[4] The data for part-time employees does not provide the exact figure of hours worked.

[5] For West Germany there is fortunately no problem with redefinitions of territorial units in the observation period, with the district of Hannover being the only exception. A comparable study for East German districts has to solve great difficulties to take into account various territorial reforms (see Blien et. al., 2003)

De facto our data set entails 70296 region/sector/time period-cells, because some of the possible combinations of dimensions do not occur at all (e.g. coalmining in northern Germany), because we have excluded all sector/region combinations which were not constantly active with at least one officially reported employee in all years of the observation period,[6] and since we take the employment *growth rate* as the dependent variable which gives us one year less of observations. In total our data vector has 8787 district/sector-combinations per year.

Table 1 gives an impression about the aggregate development in our data set from 1993 to 2001. Starting with roughly 17.5 million jobs, full time employment subject to social security has revealed a declining trend over the observation period, with an average annual growth rate of -0.67 per cent (arithmetic mean). But there was great variation in this development, both across sectors and regions. The average annual growth rate on the district level ranges from +2.37% in Outer-Munich to -3.47% in Gelsenkirchen (Ruhr area).

Table 1: Full time employment in West Germany, 1993-2001 – our data set.

1993	1994	1995	1996	1997	1998	1999	2000	2001
17535753	16964123	16781711	16425512	16154737	16169147	16352522	16103478	16600036

Table 2 shows the 28 different sectors and reports the size and the employment share in 1993 and in 2001, as well as the average yearly growth rate. Whereas some sectors like coalmining or textile/leather have dramatically shrunk, the business oriented service sector has expanded by more than 6 per cent per year. From the employment statistics we can obtain the wage income for each full time employee in our data set, including all bonus and extra payments subject to social security. With this information we can compute the average wage income per calendar day in each sector, region and year. These wage incomes will of course be heavily influenced by union wages for many employees, as collective bargaining has a high relevance in West Germany (Kohaut/Schnabel, 2003). It is known that union wages often show little variation, in particular across regions (Buettner, 1999). But our wage data refers to *effective earnings* which can substantially differ from union wages due to a positive wage drift and which reveal a much more substantial variation across districts and industries (Suedekum, 2004; Schnabel, 1995). It is an advantage that

[6] This procedure, which is necessary to prevent infinite growth rates, only led to an elimination of very few "mini sectors". Even if single industries saw a rapid decline in a district, the number of employees hardly ever had fallen down to zero. In total, less than 0.5 per cent of the full time employment relationships were eliminated.

the wages per employment relation are reported *at the workplace location*. Quite often one finds spatially disaggregated income data at the core of regional analyses that refer to the residence population. For example, the European Commission uses GDP per capita in NUTS2 regions for the conduct of European regional policies. This data is problematic, however, since it suffers from a bias due to daily commuting. The GDP per capita level in big cities is typically overstated as many persons work in the metropolitan business districts, but live in surrounding areas (Boldrin/Canova, 2001).

Table 2: Sectoral employment growth in West Germany

	Sector	Empl. level 1993	Empl. share 1993	Empl. level 2001	Empl. share 2001	Average growth rate p.a.
1	Agriculture & Forestry	125667	0.717	154937	0.933	3.27
2	Utilities & Electric Industry	218745	1.247	170523	1.027	-3.03
3	Mining	138661	0.791	67461	0.406	-8.45
4	Chemical Industry	530173	3.023	408811	2.463	-3.18
5	Synthetic Material	351748	2.006	340339	2.050	-0.37
6	Nonmetallic Mineral Mining	174260	0.994	138278	0.833	-2.83
7	Glass & Ceramics	113478	0.647	87817	0.529	-3.13
8	Primary Metal Manufacturing	676556	3.858	603115	3.633	-1.37
9	Machinery	858497	4.896	769894	4.638	-1.30
10	Motor Vehicles	1003808	5.724	953920	5.746	-0.59
11	Office Supplies, IT, Optics	1398643	7.976	1261019	7.596	-1.25
12	Musical Instrum., Jewelry, Toys	37164	0.212	26603	0.160	-4.08
13	Wood-working	359774	2.052	285236	1.718	-2.85
14	Paper & Printing	336135	1.917	281786	1.698	-2.17
15	Leather & Apparel	333055	1.899	186604	1.124	-6.95
16	Food & Tobacco	573604	3.271	465288	2.803	-2.57
17	Building & Construction	1467588	8.369	1133387	6.828	-3.16
18	Commerce	2324360	13.255	2186424	13.171	-0.75
19	Information & Transportation	905406	5.163	930978	5.608	0.38
20	Finance & Insurance	726519	4.143	696492	4.196	-0.45
21	Hotels & Gastronomy	407951	2.326	405040	2.440	-0.05
22	Health Care & Social Assistance	1241650	7.081	1319586	7.949	0.81
23	Economy-Related Services	1124991	6.415	1795282	10.815	6.07
24	Education	391265	2.231	405371	2.442	0.48
25	Leisure-Related Services	222945	1.271	237840	1.433	0.83
26	Household-Related Services	144752	0.825	123527	0.744	-1.94
27	Social Services	337271	1.923	342389	2.063	0.22
28	Public Sector	1011087	5.766	822089	4.952	-2.46

Our data are not faced with this commuting bias. This might explain why the highest (unsettled) average wages per job are not paid in metropolitan areas like Munich or Hamburg, but in the me-

dium-sized and heavily specialised districts Wolfsburg, Erlangen and Leverkusen. To get a feel for the magnitudes, table 3 reports the "top 10 districts", as well as the 5 districts at the bottom of this hit parade.

Table 3: Average daily income per full time employment relation, by district (in Euro)

	District	**Average wage level 1993-2001 (€)**
1	Wolfsburg, Stadt	92.20
2	Erlangen, Stadt	91.51
3	Leverkusen, Stadt	91.16
4	Frankfurt am Main, Stadt	90.51
5	München	90.27
6	Ludwigshafen am Rhein, Stadt	90.16
7	Böblingen	88.95
8	Stuttgart	88.90
9	Main-Taunus-Kreis	88.21
10	Groß-Gerau	87.60
322	Passau	62.03
323	Freyung-Grafenau	61.86
324	Regen	60.49
325	Südwestpfalz	60.08
326	Wittmund	59.64

Looking at raw differences in the sectoral wage structure, one finds the highest values in the energy sector (on average 98.20 €/day from 1993-2001), the chemical industry (94.84 €) and the banking sector (94.79 €), whereas the agricultural sector (54.73 €), gastronomy (43.11 €) and the household-related services (37.80 €) have the lowest values.

With respect to the income data, two further things should be noted. Firstly, income levels that exceed the threshold for social security contributions are reported with this value. Our data therefore are likely to understate the true degree of wage dispersion in West Germany. Secondly, although we deflate the wages and work with prices of 1993, we are restricted to use a common price deflator for all districts (the CPI for West Germany), because price level data and price indices are not available on a regional level. This is unfortunate, because high nominal wages reflect –at least partly– a high regional price level (see e.g. Tabuchi, 2001). It seems to be a very important area of further research to develop comparative price level data on a regional level in order to be able to derive true *regional real wages*.

We can also obtain a number of variables that describe important structural characteristics of the workforces in the repective sector/region-cells. In the shift-share analysis on employment growth we include the qualification structures and the structure of establishment sizes in each region, sector and time period. These exogenous variables are calculated as proportions of total employment in every cell with a lag of one year for the reference date of 30 June. We distinguish three skill categories (without formal vocational qualifications, completed apprenticeship, higher education). People for whom no qualification details were available were added to the group without formal qualifications, as it is known that they correspond closest in their structure to this group. For establishment sizes, three categories were calculated: the proportion of firms with fewer than 20 employees, those with 20-99 employees and those with at least 100 employees. The potential importance of firm sizes for the growth of the respective sector/region-cell, which might be used as a proxy for the degree of competition, has been emphasised e.g. by Porter (1990). In the preceding wage structure analysis we additionally control for the average age of the employees and for the fraction of men.

Furthermore we not only distinguish all West German districts, but to capture differences in the development of broader classes of regions, and to filter out potential unobserved cost-of-living differentials, we additionally control for nine different *area types* according to the common classification scheme by the research unit of the German Federal Office for Building and Regional Planning (BBR, formerly BfLR; see Goermar/Irmen, 1991), which are listed in table 4. In the parentheses we report the number of districts in each area type class.

Table 4: Type of district (within larger regions) according to BBR classification

Regions with large agglomerations	Regions with conurbational features	Regions of rural character
1 Core city (39)	5 Central city (21)	
2 Highly urbanised districts (41)		
3 Urbanised districts (29)	6 Urbanised districts (72)	8 Urbanised districts (44)
4 Rural districts (10)	7 Rural districts (48)	9 Rural districts (22)

3) Theoretical background

In this section we present a stripped-down version of the macroeconomic model by Jerger/Michaelis (2003). They use a modernized version of an approach inspired by Kaldor, where

different savings rates for workers and entrepreneurs in combination with price stickiness open the possibility of positive employment (growth) effects of wage increases.

Suppose the economy is populated by a continuum of worker and entrepreneur households, indexed by $h \in [0,1]$ and $j \in [0,1]$, who both live infinitely long. The utility function is homogenous for members of the same, but heterogeneous across the two groups, and is defined over goods consumption C and end-of-period real money balances M/P according to

$$U_h = \left(\frac{C_h}{\alpha}\right)^{\alpha} \left(\frac{M_{h,1}/P}{1-\alpha}\right)^{1-\alpha} \tag{1}$$

and

$$U_j = \left(\frac{C_j}{\beta}\right)^{\beta} \left(\frac{M_{j,1}/P}{1-\beta}\right)^{1-\beta} \tag{2}$$

This inclusion of money in the utility function in addition to the assumption of different time preference rates α and β for the two groups of households works as a convenient short-cut to allow for different exogenous savings rates across groups, and to abstract from investment as a source of aggregate demand.

The Kaldorian structure of savings enters through the assumption that α > β, i.e. the worker households have a higher marginal propensity to consume (today). Each worker household possesses initial money balances $M_{h,0}$ and earns an income $I_{h,e}=(1-\tau)W$ if employed and $I_{h,u}=B$ if unemployed, where W is a wage, B is a benefit and τ a proportional contribution rate to an unemployment insurance system. Via the budget constraint of the unemployment insurance the aggregate income of all worker households in period t=1 is simply $I_1^W \equiv \int_0^1 I_{h,1}\, dh = WN + M_{h,0}$, where N denotes the aggregate employment rate.

Entrepreneur households own proportional shares of the capital stock and earn a residual income $I_1^E \equiv \int_0^1 I_{j,1}\, dj = PY - WN + M_{j,0}$, where Y is aggregate real production. Assuming that the initial gross money stock $M \equiv M_{h,0} + M_{j,0}$ is distributed across the two groups according to $M_{h,0} = (1-\alpha) I_0^W$ and $M_{j,0} = (1-\beta) I_0^E$, and taking into account that both types of households spend a constant fraction of their income for current consumption, aggregate demand at any point in time in this economy can be computed as

$$Y^D = m_W \frac{WN}{P} + m_M \frac{M}{P} \qquad \text{with} \quad m_W = \frac{\alpha - \beta}{1 - \beta} < 1 \tag{3}$$

$$m_M = \frac{\alpha(1-\alpha) I_0^W + \beta(1-\beta) I_0^E}{(1-\beta)\left[(1-\alpha) I_0^W + (1-\beta) I_0^E\right]}$$

The parameter m_w can be interpreted as a payroll multiplier that depicts the positive effect on aggregate demand if there is a re-distribution from capital to labour income.[7]

The production side is characterised by a continuum of symmetrical, monopolistically competitive firms that produce one differentiated variety each. The production function exhibits constant returns to scale. Moreover, we focus on the short run and assume that the capital stock is given. Marginal costs for the only variable input, labour, are increasing according to

$$c_i = \left((1-\gamma)^\sigma \bar{R}^{1-\sigma} + \gamma^\sigma W^{1-\sigma}\right)^{1/(1-\sigma)} \tag{4}$$

where R is the rental rate of capital, σ is a technological and γ is a distribution parameter. Gross demand is split equally across all varieties and the price elasticity of demand is denoted –e (with e>1). The differentiation of single consumption varieties allows producers to charge prices with a mark-up (1/k) over marginal costs, with $0 < k \equiv (e-1)/e < 1$. But, in accordance with Jerger/Michaelis (2003), we assume that only a fraction (1-ς) of all firms can adjust prices whereas the prices for the other firms are sticky. The aggregate price index P is given by

$$P = \left(\bar{p}\right)^\varsigma (c/k)^{1-\varsigma} \tag{5}$$

Log-linearizing (3)-(5) and the production function, we obtain the following growth rates of the endogenous variables (denoted by a tilde)

$$\tilde{P} = (1-\varsigma)\gamma\tilde{W}$$

$$\tilde{Y} = \gamma \tilde{N} = m_w \gamma k \left(\tilde{W} + \tilde{N} \right) - \tilde{P} \ ,$$

which upon substitution yields

$$\tilde{N} = \frac{m_W k - (1 - \varsigma)}{1 - m_W k} \tilde{W} \qquad (6)$$

Equation (6) entails the essential point of the short-run analysis by Jerger/Michaelis (2003): The employment growth effect of a wage increase ($\tilde{W} > 0$), which might occur because of a collective bargaining agreement, can be positive under certain circumstances. Since $0 < m_W k < 1$ the denominator is always positive. With fully rigid prices (ς=1) a wage hike therefore unambiguously increases employment growth $\tilde{N}$. The size of this effect increases with the payroll multiplier m_W and decreases with the mark-up 1/k. If prices are fully flexible (ς=0), the employment effect is always negative. In between the two extremes the effect can either be positive or negative, depending on the sign of ($m_W k - (1 - \varsigma)$).

The analysis can be generalized also to the medium- and long-run where the capital stock can be adjusted. This puts additional strain on the potential validity of the PPA, which in the longer run can only hold under restrictive parameter constellations. In particular this concerns the range of additional parameters like the scale elasticity or the cyclicality of the price mark-up, from which we have abstracted in our abbreviated model structure. Moreover, it must be noted that a closed-economy setting was adopted. That is, an argument is neglected that is frequently raised against the PPA, namely that the induced demand side effects will partly drain out to other regions. This argument will be more relevant for export-oriented sectors with a low focus on the respective local market.

4) Empirical approach

We now turn to the specification of our shift-share regression approach. The unit of analysis is an industry within a region. The number of observations is thus i times larger than with a regional panel model with fixed industry effects and all estimations can be carried out with greater preci-

[7] Analogously, m_M depicts a money multiplier. But since the nominal money stock M is assumed to remain constant, this variable will play no further role.

sion.[8] The basic model of the regression analogue of a shift-share approach by Patterson (1991) regresses the annual employment growth rate in sector i and district r on a complete set of sector, region and time dummies α_i, κ_r and λ_t, and includes an error term ε_{irt}.

$$\hat{N}_{irt} = \alpha_i + \kappa_r + \lambda_t + \varepsilon_{irt} \tag{7}$$

where $\hat{N}_{irt} = \left(N_{ir(t+1)} - N_{irt} \right) \big/ N_{irt}$.

Since this method matches all requirements for standard statistical inference, we can include additional explanatory variables. The most comprehensive model that we will estimate is given by

$$\hat{N}_{irt} = \kappa_r + \alpha_i + \lambda_t + \delta_y + \sum_{j=1}^{3} \beta_j^Q Q_{jir(t-1)} + \sum_{z=1}^{3} \beta_z^B B_{zir(t-1)} + \sum_{i=1}^{28} \beta_i^W X_m W'_{r(t-1)} + \varepsilon_{irt} \tag{8}$$

with

δ_y	the effect of area type y (y = 1...9), see table 4
$Q_{jir(t-1)}$	proportion of the qualification group j among all workers in cell [ir(t-1)].
$B_{zir(t-1)}$	proportion of the establishment size of category z among all workers in cell [ir(t-1)].
$W'_{r(t-1)}$	region fixed effect from the preceding wage structure analysis
X_m	interaction variable for sector m. X_m=1 if m=i, X_m=0 otherwise.
β	regression coefficients

The variable $W'_{r(t-1)}$ is the (lagged) regional fixed effect for district r from the preceding wage structure analysis. To obtain this measure for "excessive" wages in region r, we estimate for each sector/region-combination and separately for each year

[8] Blien et. al. (2003) also point to different methodological problems of panel models, in which the observation unit is a region. The authors show that the results of regional panel regressions are unstable and implausible especially with respect to the coefficients of the industries. An industry which is drastically shrinking may have a positive coefficient. With regions as the observation units, two different effects can not be separated: one that is related to the development of the industry itself and one that is associated with the location of the industry. The shrinking industry may be associated with a positive development of the regions where it is located with high rates. A shift-share regression approach is suited to precisely separate these effects.

$$\ln W_{irt} = \beta_{0,t} + W'_{rt} + \alpha'_i + \delta'_y + \sum_{j=1}^{3} \beta'^{Q}_{j} Q_{jir(t-1)} + \sum_{z=1}^{3} \beta'^{B}_{z} B_{zir(t-1)} + \beta'^{G} G_{irt} + \beta'^{A} A_{irt} + \varepsilon'_{irt} \quad (9)$$

The variables λ'_t, α'_i and δ'_y denote the fixed time, sector and area type effects in this wage regression. The qualification structure of the workforce and the structure of establishment sizes in each cell are also included in (8). But qualification and firm sizes supposedly influence not only employment growth, but also wages. The fraction of men is denoted G_{irt}, A_{irt} is the average age of the employees in cell [irt]. The error term of this equation is ε'_{irt}. The variable $W'_{r(t-1)}$, the region fixed effect, can be understood as a measure that shows how wages in region r differ from what should be observed, given the variety of control variables. "High wage" and a "low wage" regions are characterised by values of $W'_{r(t-1)}$ that are significantly higher (lower) than zero. Note that the regressors $W'_{r(t-1)}$ are unlikely to be biased through unobserved interregional price differentials, since these are filtered out by the area type dummies δ'_y.

These region fixed effects, lagged by one period, are then used back in (8). As explained in the introduction, we use the *regional* fixed effects as our measure of "excessive" wages. Alternatively one could use a fixed effect for each sector/region-combination in (9) to analyse how the wages in each cell differ from the level that should be expected. However, this approach would probably not allow to test the potential prevalence of the PPA, as the induced demand side repercussions of a wage increase only in the own sector/region-combination supposedly will be very small. On the other hand, we abstract from interactions and demand spillovers across regions.[9]

Lastly, in the specification of the shift-share regression (8) we have included an interaction term X^m. With this variable it is possible to analyse whether the effects of „excessive" wages in region r differ systematically between the sectors in that district.

Turning to the methodology, equation (8) must be estimated by using weighted least squares (WLS). Since the cells are very heterogeneous in their size, the same absolute change in employment implies very different changes in employment growth rates. Exorbitant jumps are possible in particular for very small cells, which results in an inherent heteroskedasticity problem. Therefore we weight the whole equation (8) with the employment of each cell (N_{irt}) divided by the total national employment (N_t) in the respective year. Technically speaking, we weight the

variance-covariance matrix of the error terms with a matrix **G,** which as a diagonal matrix includes the employment proportions $g_{irt} = \sum_{r=1}^{326}\sum_{i=1}^{28}\sum_{t=1}^{8}\left(N_{irt}/N_t\right)$.

$$\text{cov}(\varepsilon) = \tilde{\mathbf{\Omega}} = \mathbf{G\Omega G} \tag{10}$$

For the wage equation (9), a comparable heteroskedasticiy problem does not arise, because we do not estimate a growth rate. Therefore we do not have to weight the observations.

The second methodological problem is that the models (8) and (9) are plagued with perfect multicollinearity, because we use complete sets of dummy variables. The usual strategy is to exclude one fixed effect in each set of dummies. The other fixed effects are then measured in relation to this excluded reference category. However, in order to identify a "high wage" and a "low wage" region, we are interested in the deviation of a district r from the national grand mean. If this is to be used as the reference, one would have to recalculate not only the coefficients (like Krueger/Summers, 1988), but also their level of significance (Moeller, 1995). A comparatively more elegant solution is the use of identifying restrictions for the estimated coefficients. No further recalculations for the parameters or for the standard errors are necessary with this procedure. The identifying restrictions are chosen such that the sum of the weighted coefficients must equal zero, so that we can interpret the estimated coefficients as percentage deviations from the national grand mean of zero. Since we need a time invariant weighting scheme for the definition of the constraints, we use the employment proportions for the year 1997 (the middle of the observation period). Note that the specification of the constraints is simply a normalization for one set of dummy variables that does not affect the other estimated coefficients.

For the sector fixed effects in the shift-share regression (8) we impose the following constraint:

$$\sum_{i=1}^{28} g_i \cdot \tilde{\alpha}_i = 0 \ , \tag{11}$$

[9] This corresponds with the closed economy setting from the theoretical model introduced in section 3. The issue of regional demand spillovers is potentially interesting and could, in later papers, be analysed with spatial econometrics techniques.

where g_i is the employment share of sector i in 1997 and $\tilde{a}_i$ is the dummy variable of sector i that is weighted according to (10). Analogously, we restrict the coefficients for the three skill categories and the three establishment size classes to sum up to zero.

$$\sum_{j=1}^{3} g_j \tilde{\beta}_j^{Q} = 0 \tag{12}$$

$$\sum_{j=1}^{3} g_z \cdot \tilde{\beta}_j^{B} = 0 \tag{13}$$

where g_j and g_z are the respective employment shares in 1997 and the tilde indicates the weighting of the coefficients according to (10). For the district fixed effects $\tilde{\kappa}_r$ and the area type fixed effects $\tilde{\delta}_y$ we use a slightly different identifying restriction. We impose

$$\sum_{r=1}^{326} \sum_{y=1}^{9} g_r \tau_y \tilde{\kappa}_r = 0 \tag{14}$$

where $\tau_y = 1$ if district r belong to area type y, and $\tau_y = 0$ otherwise. And additionally we centre the weighted area type fixed effects on zero.

$$\sum_{y=1}^{9} g_y \tilde{\delta}_y = 0 \tag{15}$$

The estimated district coefficients W_r', weighted by the employment proportion $g_r=N_{rt}/N_t$ (t=1997), therefore sum up to zero not only for all 326 districts, but also for all districts of area type y. We can thus interpret the coefficients $\tilde{\kappa}_r$ as percentage deviations from the mean growth rate in the respective area type y, and the coefficients $\tilde{\delta}_y$ as percentage deviations of area type y from the West German average. Analogous restrictions are imposed for the preceding wage regression (8), only without the weighting procedure (10).

The selected econometric procedure, the constrained estimation of (9) and (8), leads to a restricted weighted least squares estimate of a regression model without an intercept (see also

Greene/Seaks, 1991). For some of the determinants of employment growth it might be argued that there is an endogeneity problem. For example, a better qualification structure in some region r might be - at least partly - the result of a better employment growth and not its cause, since the more active regions might attract selective mobility. Similarly, one could also argue that there might be an endogeneity problem between employment growth and wages, as employment growth might drive wages rather than the opposite.[10] These problems are taken into account by using the exogenous variables with a time lag of one period. For the impact of wages, equations (8) and (9) implicitly define a recursive system $\hat{N}_{irt} = f(W'_{r(t-1)}, Z)$ and $W'_{rt} = f(\hat{N}_{irt}, Z)$, where Z represent the other exogenous variables. The causality in this system is $W'_{r(t-1)} \longrightarrow \hat{N}_{irt} \longrightarrow W'_{rt}$ and there is no endogeneity probloem. To be completely sure, tests with higher time lags were carried out, which showed no substantial change in the results.

5) The wage structure in West Germany

Although the purpose to estimate (9) is only to obtain the district fixed effects as regressors for the employment growth analysis, some results of the wage structure regression are of independent interest and we present them briefly at this point.[11] Equation (9) is estimated separately for each year and entails four broad classes of explanatory variables: (i) the variables Q_{jirt}, B_{jirt}, G_{irt} and A_{irt} that describe important structural characteristics of the workforces in the sector/region-cells; (ii) the nine area type dummies δ'_{yt}; (ii) the 28 sector dummies a'_{it}; and (iv) the 326 district dummies W'_{rt}. For expositional purposes, we only report some results of a pooled regression over the whole observation period with additional time dummies for each year. Since we estimate subject to identifying restrictions, the standard R^2 measure is not available. When running an OLS regression that is as close as possible to our actual estimation strategy (i.e. by dropping one dummy variable from each set of fixed effects) we obtain R^2 levels above 0.9.

Table 5 shows the results for the first group of variables. Average wages increase with the average age, with the proportion of qualified workers, the fraction of large firms and the fraction of men. All variables are significant at the 1%-level. An inspection of the time dimension shows that the effects are roughly stable over time, with a slightly increasing tendency of the skill premium.

[10] This mechanism is at the core of the „wage setting curves“ in the modern imperfect competition approach of macroeconomics (see Layard/Nickell/Jackman, 1991).

[11] If the disaggregated wage structure were the main research focus, one would typically want to work with individual instead of aggregated data, even though our disaggregation is considerably deep.

Table 5: Wage analysis - Regression results I: Structural variables

	Variable	Coefficient
$\beta_1'^Q$	Low qualification	-0.2125
$\beta_2'^Q$	Medium qualification	0.0131
$\beta_3'^Q$	High qualification	0.5477
$\beta_1'^B$	Firm size 1-19	-0.1570
$\beta_2'^B$	Firm size 20-99	0.0181
$\beta_3'^B$	Firm size > 100	0.0730
β'^G	Fraction of men	0.4307
β'^A	Average age	0.0086
β_0	constant term	4.4497

Table 6 reports the results for the area type fixed effects, which again are all significant at the 1%-level. We clearly find evidence for an agglomeration wage premium in West Germany (see also Moeller/Haas, 2003). Core cities and directly surrounding districts pay about 2.5-3 percent above average. A closer look at the time dimension shows that this wage premium tends to be rising over time. For 1993, the estimated coefficient for area type 1 is 0.0267, in 2001 it is 0.032. The most rural districts (area type 9) pay more than 7 per cent below average. One must note, however, that these wage differences between centre and periphery probably also reflect interregional price differentials that we can not control for.

Table 6: Wage analysis - Regression results II: Area types

	Variable	Coefficient
δ_1'	Agglomeration region - Core city	0.0295
δ_2'	Agglomeration region – Highly urbanised distr.	0.0241
δ_3'	Agglomeration region - Urbanised districts	-0.0068
δ_4'	Agglomeration region - Rural districts	-0.0276
δ_5'	Conurbational region - Central city	-0.0126
δ_6'	Conurbational region - Urbanised district	-0.0179
δ_7'	Conurbational region - Rural district	-0.0401
δ_8'	Rural region - Urbanised district	-0.0520
δ_9'	Rural region - Rural district	-0.0752

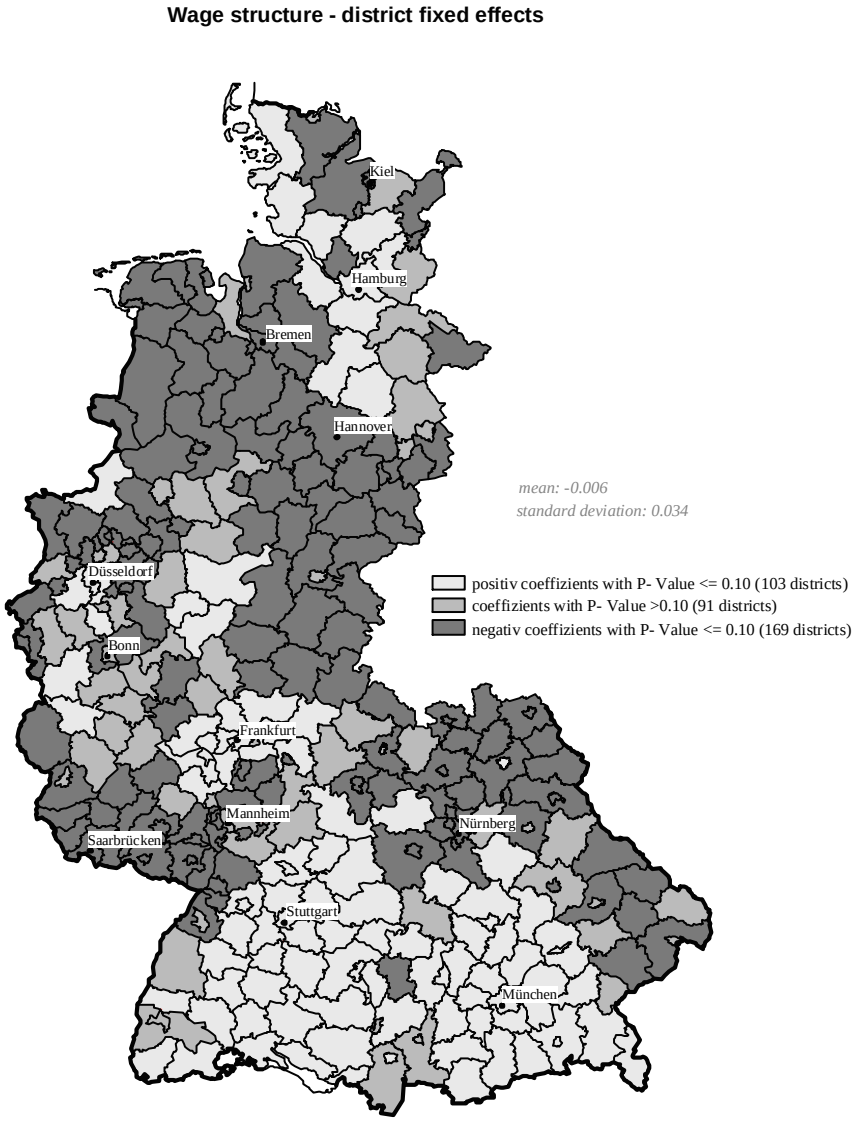
With respect to the sector dummies, that we do not report here, our results support commonly held beliefs about sectoral wage differences. For example, the financial sector pays more than 23 percent above average even after controlling for the characteristics reported in table 5. Other well paying sectors are electronics and health care. The agricultural sector, household related services and in particular the gastronomy sector pay very badly.

Lastly, there are the 326 district fixed effects that are presented in form of a map.[12] The district dummy of areas shaded in light grey is significantly positive, i.e. earnings in these districts are overly high according to our definition. The dark shaded districts are "low wage regions". Probably the most striking feature of map 1 is that low-, medium- and high-wage areas are not distributed randomly across space, but there seems to be a coherent spatial structure, namely a clustering of high-wage and low-wage areas. This is even more striking as the district fixed effects are calculated with the average wage of the respective area type as the reference category. Since we have controlled for the area types, the district effects isolate genuine location factors and do not represent the well-known fact that agglomeration areas pay a wage premium (a fact that can be read in table 6). The map suggests that districts surrounding Munich, Stuttgart, Frankfurt and Hamburg pay significantly above the average of their respective area type. The origin of this wage premium can not be resolved with our data, since it prevails even after controlling for a variety of factors. We interpret this unexplained rest as a measure of "excessively" high wages in these districts.

By and large, the wage level in most Southern districts is significantly above average even after controlling for many structural characteristics. But the division scheme is more complex. Firstly, there are at least some "high wage islands" in the North, e.g. the area surrounding Hamburg and the districts around the Volkswagen headquarters in Wolfsburg. Secondly, not all Southern districts pay overly well. The most striking cases are the districts in northern and eastern Bavaria, which actually tend to be low-wage regions. Apart from the north-south-divides, it is striking that border regions mostly tend to be low-wage regions, including the former border with East Germany, but excluding the borders with Austria and Switzerland. Most of these borders no longer have any formal significance as obstacles for trade or factor mobility. This is obviously so in the case of the former intra-German border, which simply does not exist any longer. But, to a lesser extent, the borders with other EU countries also have lost legal importance. Some authors have

[12] A full list of the estimated coefficients (and their significance) for all 326 districts and separately for each year is available upon request from the corresponding author.

argued that formally insignificant borders can remain important as actual separation lines for trade and mobility (Head/Ries, 2001; Head/Mayer, 2000). Brakman/Garretsen/Schramm (2002) point out that one can analyse border effects also by looking at regional wage data. Our results suggest that the border effect issue for West Germany is actually quite complex. Some borders do not seem to have any negative impact on the adjacent regions, although (as in the case of the Swiss border) they keep on being formally significant. Other, formally insignificant or non-existing borders, however, apparently do play a role.



6) Employment growth in West Germany

We now go over to the results of the shift-share regression on employment growth, which is estimated pooled over the whole observation period. Table 7 reports the regression results for the first group of explanatory variables. We do not yet differentiate the impact of regional wages on the employment growth of different sectors (i.e. we do not estimate with the interaction term X^m). This will be done below in table 8. The numbers in parentheses report the P-value of the estimate.

Table 7: Employment growth regression – Results I: Structural variables

	Variable	Model 1	Model 2
$\tilde{\beta}_1^Q$	Low qualification	0.0039 (0.290)	0.0038 (0.300)
$\tilde{\beta}_2^Q$	Medium qualification	**-0.0082** (0.000)	**-0.0081** (0.000)
$\tilde{\beta}_3^Q$	High qualification	**0.0634** (0.000)	**0.0632** (0.000)
$\tilde{\beta}_1^B$	Firm size 1-19	0.0027 (0.468)	0.0025 (0.497)
$\tilde{\beta}_2^B$	Firm size 20-99	**0.0379** (0.000)	**0.0379** (0.000)
$\tilde{\beta}_3^B$	Firm size > 100	**-0.0204** (0.000)	**-0.0203** (0.000)
$\tilde{W}_r'$	Wages	---	**-0.0859** (0.000)

A high fraction of well qualified workers significantly increases the employment growth of a sector/region-cell. Holding constant all other factors, including wages, more qualified workers raise the productivity in the respective cell, which invokes a positive employment effect. A significantly positive effect on employment growth also is also found for a high proportion of medium sized firms, whereas a high fraction of large firms tends to reduce employment growth. As long as firm sizes can be used as a proxy for the degree of competition that prevails in the respective sector and region (see Combes, 2000 for some critical remarks on this), our findings suggest that neither perfect competition (very small firms), nor local monopoly (very large firms) is the most growth friendly environment. Rather, a large fraction of firms with an intermediate firm scale seems to be best for growth. This finding contradicts the view that favours local monopoly as a growth engine, on the grounds that a monopolist can better internalise the profits from innovations and subsequently reinvest in further R&D (see Glaeser et.al., 1992 for an introduction). It also stands in some contrast to the reasoning of Porter (1990), according to which perfect compe-

tition is best for growth, since firms without market power face the stiffest pressure to be innovative in order to survive in the market. Our results suggest that the advantages and disadvantages of perfect competition and monopoly for innovation and growth at the regional level seem to be balanced in an optimal way by medium-sized firms.

Wages

We now look at the employment growth effects of high wages. Recall that we have conceptualised the notion of high, or "excessive", wages by the respective regional fixed effect from the wage structure analysis. An increase in this measure can be interpreted as an exogenous positive wage shock that accrues uniformly across all sectors in that district. What are the employment growth effects for the single involved sectors? According to the theoretical considerations from section 3 we must separate two effects: A cost push for the input factor labour, and a demand side effect due to an increase of the regional purchasing power.

The result from table 7 suggests that with all sectors lumped together the consolidated impact of a wage hike on employment growth is significantly negative. An increase of the district fixed effect $W'_{r(t-1)}$ (a regional wage hike) of ten percentage points that is not backed by the underlying characteristics of the economy, drives down annual employment growth by more than 0.85 per cent. Qualitatively we can interpret this finding such that the cost push effect dominates on balance over possible demand side repercussions in West Germany. This result is consistent with the theoretical implications of the standard macroeconomics literature, according to which high wage will reduce employment (growth). It stands in contrast with the view that higher wages are an appropriate way to increase economic activity (or: to fight unemployment) via a purchasing power effect of wages. One main contribution of our study is to show that this intuitive result, which is in accordance with the standard predictions of mainstream economics, can also be identified when a highly disaggregated view is adopted.

It is worth to point to a pitfall when the wage enters the shift-share regression in an incorrectly specified way. We re-estimated model 2, but replaced the (correct) wage measure $W'_{r(t-1)}$ with the unsettled average regional wage, and in another version with the unsettled average wage of the respective sector/region-cell. In both cases we obtain a highly significant (1%-level), small, but *positive* coefficient (0.002694 and 0.000078 respectively). But this finding does not imply that high wages really contribute to faster employment growth, as one could naively (or purposely)

conclude. The positive estimated coefficients only indicate that high productivity (i.e. high wages) and fast employment growth tend to be positively correlated in West Germany. Let us illustrate this with an example: Both the unsettled average wage and the average annual employment growth rate in the Bavarian district Dingolfing-Landau, where the local employment structure is dominated by a large automobile plant, are significantly above the West German average. However, the high wage level in this district can be well explained by the qualification of the local workforce, the firm size and the industrial structure, etc., and the respective district fixed effect in the wage structure analysis is insignificant. This indicates that wages in Dingolfing-Landau are not overly high, which is taken into account by our estimation approach. On the contrary, including unsettled wages, *without* controlling for these normal wage discrepancies across sectors and regions, leads to flawed conclusions with respect to the implications for employment growth.

Going back to the correctly specified wage measure, the disaggregated structure of the empirical model allows us to examine if the relative strength of the cost push and the purchasing power effect of wages differs across sectors. Is the PPA maybe valid at least for some sectors? In table 8 we present the results for an estimation variant with the sectoral interaction term X^m. That is, we differentiate the implications of a proportional *regional* wage increase on the employment growth performance across the single industries. The cost push effect hurts all involved industries to the extent that they use labour in production. But the purchasing power effect might be stronger for sectors that mainly serve local consumers than for export oriented sectors.

The overall picture remains that “excessive” wages tend to reduce employment growth. But there is considerable variation across the single industries. The wage impact is significantly negative in the mining sector (which is not too important due to its small size), in the chemical and synthetic material industry, in the processing industries (leather, food), in transportation, but also in the “key sectors” automobile production, construction, commerce and information technology, which are among the largest sectors in West Germany. Also for health care and social services we find a significantly negative impact on employment growth.

For some sectors, however, the impact of higher wages is insignificant. This is the case for most service industries, including the advanced services like education, financial business and the economy-related services, but also for the more basic household-related services and gastronomy. But also in some manufacturing sectors, namely in the electronics sector, machinery, metal manufacturing and the glass/ceramics sector, and in some processing industries (wood, paper,

jewellery) the estimated coefficients are insignificant. A plausible hypothesis, presumably relevant for the gastronomy, leisure-related services etc., seems to be that these sectors have a stronger focus on local markets. Hence, these sectors are stronger affected from potential demand side repercussions of local wage hikes. A different argument is that the wage elasticity of labour demand is generally lower in some sectors, e.g. because payroll accounts for a smaller fraction in total costs. This might explain some of the insignificant coefficients particularly in industrial sectors.

Table 8: Regression results II – Wage growth and employment growth across sectors

	Sector	Coefficient	P-Value
1	Agriculture & Forestry	-0.4245	0.143
2	Utilities & Electric Industry	-0.1390	0.254
3	**Mining**	**-0.3355**	**0.039**
4	**Chemical Industry**	**-0.3788**	**0.000**
5	**Synthetic Material**	**-0.2182**	**0.050**
6	Nonmetallic Mineral Mining	-0.3319	0.188
7	Glass & Ceramics	0.3757	0.137
8	Primary Metal Manuf.	0.0210	0.711
9	Machinery	0.0353	0.536
10	**Motor Vehicles**	**-0.1432**	**0.001**
11	**Office Supplies, IT & Optics**	**-0.1102**	**0.007**
12	Musical Instrum., Jewellery, Toys	-0.3366	0.391
13	Wood-working	0.0060	0.957
14	Paper & Printing	-0.0612	0.562
15	**Leather & Apparel**	**-0.2129**	**0.061**
16	**Food & Tobacco**	**-0.2675**	**0.001**
17	**Building & Construction**	**-0.2274**	**0.000**
18	**Commerce**	**-0.0925**	**0.011**
19	**Information & Transportation**	**-0.2529**	**0.000**
20	Finance & Insurance	0.0272	0.538
21	Hotels & Gastronomy	-0.0038	0.961
22	**Health Care & Social Assistance**	**-0.0723**	**0.083**
23	Economy-Related Services	-0.0220	0.550
24	Education	-0.0903	0.209
25	Leisure-Related Services	0.0042	0.966
26	Household-Related Services	0.0254	0.919
27	**Social Services**	**-0.1625**	**0.030**
28	**Public Sector**	**0.0916**	**0.055**

The sectoral variation notwithstanding, we do not find support for the view that it is actually possible to increase the growth of private employment by accelerating wage growth. By and large the wage effects tend to be more adverse in manufacturing than in services. But even for those

sectors that are closest to local consumers, a significantly positive employment growth effect can not be identified in the data. This result is again reassuring a predominant neoclassical view. But we are unaware of other studies where this result has been established clearly.

Fixed effects

Apart from the results on the effects of high wages, we obtain some further, more general insights about the disaggregated anatomy of employment growth in West Germany. We look first at the estimation results for the industry fixed effects that are reported in table 9. These coefficients describe the general sector-specific growth pattern over the observation period and reveal a quite clear trend of structural change, away from manufacturing activities and towards services. This process went on both for services jobs with a rather bad reputation (gastronomy, household-related), but also for higher quality jobs like in financial services or education. The only manufacturing sector with a significantly higher growth rate than the average is automobile production. The long-term process of structural change is documented at various points in the literature (e.g. Madison, 1987), and it shows up also in our estimation results even though the observation period is relatively short to address the issue of structural change.

Table 9: Regression results IV – Industry fixed effects

	Variable	Model 1	Model 2
$\tilde{\alpha}_1$	Agriculture & Forestry	0.0091 (0.307)	0.0109 (0.222)
$\tilde{\alpha}_2$	Utilities & Electric Industry	**-0.0136** (0.001)	**-0.0147** (0.000)
$\tilde{\alpha}_3$	Mining	**-0.0629** (0.000)	**-0.0707** (0.000)
$\tilde{\alpha}_5$	Chemical Industry	**-0.0284** (0.000)	**-0.0251** (0.000)
$\tilde{\alpha}_5$	Synthetic Material	-0.0001 (0.979)	-0.0007 (0.830)
$\tilde{\alpha}_6$	Nonmetallic Mineral Mining	**-0.0374** (0.000)	**-0.0379** (0.000)
$\tilde{\alpha}_7$	Glass & Ceramics	**-0.0186** (0.010)	-0.0118 (0.134)
$\tilde{\alpha}_8$	Primary Metal Manuf.	**-0.0136** (0.000)	**-0.0121** (0.000)
$\tilde{\alpha}_9$	Machinery	-0.0025 (0.121)	**-0.0048** (0.005)
$\tilde{\alpha}_{10}$	Motor Vehicles	**0.0127** (0.000)	**0.0131** (0.000)
$\tilde{\alpha}_{11}$	Office Supplies, IT, Optics	**-0.0018** (0.066)	-0.0016 (0.112)

	Variable	Model 1	Model 2
$\tilde{\alpha}_{12}$	Musical Instrum., Jewellery, Toys	**-0.0372** (0.008)	**-0.0369** (0.008)
$\tilde{\alpha}_{13}$	Wood-working	**-0.0232** (0.000)	**-0.0222** (0.000)
$\tilde{\alpha}_{14}$	Paper & Printing	**-0.0131** (0.000)	**-0.0133** (0.000)
$\tilde{\alpha}_{15}$	Leather & Apparel	**-0.0654** (0.000)	**-0.0644** (0.000)
$\tilde{\alpha}_{16}$	Food & Tobacco	**-0.0201** (0.000)	**-0.0197** (0.000)
$\tilde{\alpha}_{17}$	Building & Construction	**-0.0325** (0.000)	**-0.0311** (0.000)
$\tilde{\alpha}_{18}$	Commerce	**-0.0062** (0.000)	**-0.0060** (0.000)
$\tilde{\alpha}_{19}$	Information & Transportation	**0.0059** (0.000)	**0.0092** (0.000)
$\tilde{\alpha}_{20}$	Finance & Insurance	**0.0170** (0.000)	**0.0122** (0.000)
$\tilde{\alpha}_{21}$	Hotels & Gastronomy	**0.0067** (0.022)	**0.0072** (0.036)
$\tilde{\alpha}_{22}$	Health Care & Social Assistance	**0.0210** (0.000)	**0.0207** (0.000)
$\tilde{\alpha}_{23}$	Economy-Related Services	**0.0639** (0.000)	**0.0631** (0.000)
$\tilde{\alpha}_{24}$	Education	**-0.0063** (0.005)	**-0.0064** (0.009)
$\tilde{\alpha}_{25}$	Leisure-Related Services	**0.0191** (0.000)	**0.0168** (0.000)
$\tilde{\alpha}_{26}$	Household-Related Services	-0.0121 (0.142)	-0.0111 (0.190)
$\tilde{\alpha}_{27}$	Social Services	0.0007 (0.745)	0.0023 0.349)
$\tilde{\alpha}_{28}$	Public Sector	**-0.0055** (0.000)	**-0.0079** (0.000)

In table 10 we report the results for the area type dummies. The most interesting finding here is that large city districts (area types 1 and 5) tend to lose employment slowly but significantly. This "sub-urbanization" process – just like the structural change process – is also a long-term development that implies a structural de-glomeration process of employment away from the core city centres. Similar findings have been pointed out in earlier studies for West Germany e.g. by Seitz (1996) or Geppert (1996). In accordance with Moeller/Tassinopoulos (2000) we find that the employment gainers are not only the areas that are directly adjacent to the biggest cities (area types 2+3), but also other regional types.

The time period dummies $\tilde{\lambda}_{1994} - \tilde{\lambda}_{2001}$ that describe general business cycle movements are omitted, since they are of minor interest for us. We also omit the remaining district fixed effects, as

they turn out to be very small and in the vast majority insignificant.[13] This suggests that most locations do not grow at systematically different rates after controlling for the variety of structural characteristics that we have accounted for.

Table 10: Regression results III – Area type fixed effects

	Variable	Model 1	Model 2
$\tilde{\delta}_1$	Agglomeration region - Core city	**-0.0085** (0.000)	**-0.0085** (0.000)
$\tilde{\delta}_2$	Agglomeration region - Highly urbanised districts	**0.0041** (0.000)	**0.0043** (0.000)
$\tilde{\delta}_3$	Agglomeration region - Urbanised districts	**0.0051** (0.001)	**0.0056** (0.000)
$\tilde{\delta}_4$	Agglomeration region - Rural districts	**0.0063** (0.080)	**0.0063** (0.077)
$\tilde{\delta}_5$	Conurbational region - Central city	**-0.0082** (0.000)	**-0.0082** (0.000)
$\tilde{\delta}_6$	Conurbational region - Urbanised district	**0.0056** (0.000)	**0.0056** (0.000)
$\tilde{\delta}_7$	Conurbational region - Rural districts	**0.0100** (0.000)	**0.0100** (0.000)
$\tilde{\delta}_8$	Rural region - Urbanised districts	**0.0049** (0.000)	**0.0049** (0.000)
$\tilde{\delta}_9$	Rural region - rural districts	0.0044 (0.128)	-0.0044 (0.127)

7) Summary and concluding remarks

In this paper we have analysed the intra-national variation of employment growth in West Germany from 1993 to 2001 with a newly developed shift-share regression technique. We have specifically addressed the question whether high wages tend to increase or reduce employment growth on a local level. Our analysis profited from an exhaustive and very accurate data set with the complete sample of full time employment subject to social security in West Germany, disaggregated into 28 industries and 326 districts.

To obtain an accurate measure for "excessive" regional wages we ran a preceding wage structure analysis and isolated the unexplained regional fixed effects as regressors for the employment growth analysis. Some of the results of this preceding analysis are of independent interest. We have shown that there is a coherent spatial wage structure in West Germany. One can observe a regional clustering of high- and low-wage regions. This distinct geographical distribution features

[13] A list with the coefficients is also available upon request from the corresponding author.

a south-north incline of wages, but with high wage islands in the North, and low-wage islands in the South. Moreover we find that wages of border districts seem to be systematically lower than the average, including districts along the former intra-German border, but excluding border regions with Austria and Switzerland. Agglomeration areas pay a notable wage premium that is even rising over time.

The subsequent shift-share regression on employment growth shows that the impact of "excessive" regional wages on employment growth is significantly negative. We find no evidence for the claim (that is often raised in policy discussions prior to wage negotiations) that it is possible to increase employment growth by accelerating wage growth via a demand side purchasing power effect of wages. By differentiating the effect of wages on employment growth across sectors we find some variation across industries. The effect of a wage hike turns out to be highly significant in some industries, insignificant in others. The general pattern seems to be that the employment effects are more adverse in manufacturing than in service industries that presumably have a stronger focus to serve local consumers. But we find no evidence for a positive effect of a high wages on employment growth. Further case studies would be useful that examine the reasons for this variation across sectors in greater detail.

Apart from the special focus on wages our shift-share regression also yields some more general insights about the disaggregated anatomy of employment growth in West Germany. We identified two long-term processes in the development, namely a secular trend of structural change towards service industries and a sub-urbanization process.

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