Local Employment Growth in West Germany: A Dynamic Panel Approach

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Abstract: In times of high and persistent unemployment, it has become one of the most important policy tasks in many developed countries to trigger a process of sustained employment growth. An illustrative example is the policy of regional "growth-poles", which assumes that a local concentration of a specific industry in a limited geographical area will lead to a growth take-off. The theoretical rationale for this type of regional policy can be knowledge spillovers, whose importance for the economic (employment) growth has been emphasised in the endogenous growth literature.

Yet, there is a considerable debate about the precise nature of knowledge spillovers. Do the externalities accrue between sectors (Jacobs-externalities), or are they rather intra-sectoral (MAR-externalities)? Apart from the question what local economic structure is conducive for employment growth, an equally important issue concerns the timing of the impact of externalities. Is it the current economic structure that matters for employment growth, or rather the historical economic structure? If the former turns out to be the case, regional policies might become effective immediately. In the latter case the impact of policy might be slower but also longer lasting.

In this paper we study the dynamics of local employment growth in West Germany from 1980 to 2001. Using dynamic panel techniques, we analyse the nature and the timing of Jacobs- and Marshall-Arrow-Romer externalities, as well as the impact of general human capital spillovers. Jacobs-externalities are stronger in manufacturing than in services, the opposite is true for MAR-externalities. General human capital spillovers are only found in manufacturing. The influence of all forms of externalities rapidly decays in time, suggesting that they are rather static than dynamic. Additionally, we look at the impact of competition, general agglomeration effects and overly high regional wages on local employment growth.

Keywords: Regional labour markets, externalities, local employment growth, dynamic panel estimation, urbanization and localisation effects

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1) Introduction

In times of high and persistent unemployment, it has become one of the most important policy tasks in many developed countries to trigger a process of sustained employment growth. There is a variety of policy instruments at the national level that can be used trying to achieve this goal. Yet, at the same time most OECD countries are characterised by massive intra-national disparities in their labour market performance. For example, in the European Union unemployment rates and employment growth rates differ much stronger within than across countries (Suedekum, 2003). Therefore, a policy strategy that takes into account the determinants of employment growth at the regional level and then tries to tailor policy instruments to foster job creation at a lower geographical scale seems equally important. If the specific conditions were known under which certain industries thrive at the local level, this would be an important piece of information for policymakers that aim at giving specific assistance.

An illustrative example is the policy of regional "growth-poles", which assumes that a local concentration of a specific industry in a limited geographical area will lead to a growth take-off (an image often portrayed by the famous Silicon Valley example). The theoretical rationale for this type of regional policy can be knowledge spillovers, whose importance for economic (employment) growth has been emphasised in the endogenous growth literature (Romer, 1986). It is known that knowledge spillovers rapidly decay with distance (Jaffe el al., 1993; Ciccone and Hall, 1996; Audretsch and Feldman, 1996), and thus they will be directly relevant for employment growth at the regional level. If spillovers accrue within a sector, the policy of "growth poles" is likely to be successful, since productivity will rise when an industry is locally concentrated.

Yet, there is a considerable debate about the precise nature of knowledge spillovers. The seminal paper of Glaeser et al. (1992) has argued that externalities accrue *between* sectors, e.g. through a cross-fertilisation of people from different professional backgrounds. In their terminology, they find evidence for "Jacobs-externalities" which are identified by a positive effect of a diversified local industrial structure on the growth rate of an industry. On the other hand, they find no or even counter-evidence for intra-sectoral "Marshall-Arrow-Romer" (MAR) externalities, which form the underpinning of the "growth pole" strategy. This finding has been challenged by Henderson et al. (1995), who find a positive growth impact of local overrepresentation.

Apart from the question what local economic structure is conducive to employment growth, an equally important question concerns the *timing* of the impact of externalities. Is it the current economic structure that matters for employment growth, or rather some historical pattern that determines such things as the “image” or the “business climate” of a specific location? If the former turns out to be the case, regional policies might become effective immediately. In the latter case the impact of policy might be slower but also longer lasting.

Although the empirical local employment growth literature has considerably grown in recent years (see Overman/Combes, 2004 for a recent survey), very little has been done on the timing issue. The conventional approach in this literature is to compute a cross-section of growth rates for several local industries and regress these on base year variables that reflect the historical local economic conditions. If evidence for externalities is found, they are thought of as being “*dynamic*”, since the local structure from 10-30 years ago matters. However, these approaches do not provide a real test whether externalities are dynamic, but assume this from the very beginning. To sort out whether externalities are static or dynamic, one needs data on local industries for many consecutive years in order to make full use of the three dimensions of the panel (location, industry, time period) and test for the relevant lag structure. An additional advantage of panel techniques is the possibility to control for time invariant industry and location fixed effects that can not be easily distinguished from externalities in a cross-section analysis.

The high data requirements have prevented most researchers from conducting such an analysis. In our view there are two notable exceptions. The first is Henderson (1997), who can draw on a 14-year panel (1977-1990), covering employment in 5 manufacturing industries across US urban counties. Using a dynamic panel model he finds evidence both for MAR- and Jacobs-externalities. The relevant lag structure is 6-7 years in the former and an even longer time horizon in the latter case. The second important contribution comes from Combes, Magnac and Robin (2004), who study the employment growth of 36 different (manufacturing and service) industries in 341 French local areas between 1984 and 1993. This paper extends the approach of Henderson (1997) in various directions. Firstly, the analysis is not restricted to manufacturing sectors and city employment, and thus issues of sample selection do not arise. Secondly, they show that the specification of MAR-externalities in Henderson (1997) is problematic and leads to an overstatement of their impact. And lastly, they decompose total employment within a local industry into average plant size and the number of plants, thereby distinguishing between the growth of existing plants and the creation of new plants. Turning to the results, they find that it is actually the current economic structure that matters for growth. Hence, externalities appear to be static in the French case. Moreover, they are predominantly of the Jacobs-type.

In this paper we analyse the nature and the timing of externalities in West German (manufacturing and service) industries. Apart from providing novel evidence for another country, Europe's largest economy after all, we add to the empirical local employment growth literature in various respects. Firstly, we can draw on a comprehensive and very accurate data set that forms a balanced panel, covering the complete population of full-time employees in West Germany from 1980 to 2001. The data is disaggregated into 326 local districts and 28 different industries. To our knowledge this is the most comprehensive, most recent and longest panel data set that has been used so far. Next, unlike previous studies we have information about the qualification structure of the workforces in the different local industries. According to theory, human capital is a major determinant of economic growth, and thus controlling for this factor is worthwhile for its own sake. But more than that, we can thereby develop an understanding of the relative importance of Jacobs- and MAR-externalities versus general human capital spillovers that do not depend on the local economic structure. Lastly, we also have information on wages that we will use in the empirical analysis, but in a more elaborate way compared to other studies that have included wages (or wage growth rates). If at all, unsettled wages were directly plugged into the employment growth regression (e.g. Glaeser et al., 1992; Henderson et al., 1995). We argue that using unsettled wages can be quite misleading, since there can be important static differences in labour productivity across locations and industries that give rise to normal wage disparities across the single units. Therefore we propose a methodology (similar to Blien and Suedekum, 2004b) to correct wages for these effects and include only a measure of "excessive regional wages" in the employment growth analysis. This measure captures the trade-off between cost push and potentially offsetting demand side effects.

Briefly previewing our results, we find that the timing of externalities is in fact a crucial issue in West Germany. Externalities seem to have primarily a short-run effect, i.e. they appear to be static rather than dynamic. Concerning their nature we find clear evidence for Jacobs-externalities. MAR-externalities also play a role as local employment growth in West Germany exhibits mean reversion. But there is considerable inertia that can be thought of as being due to the positive effects of specialization. The results hold irrespective of the fact that we control for human capital intensity, which itself also has a positive impact on employment growth. The effect of "excessive wages" is, as expected, negative yet not strongly significant.

The rest of the paper is organized as follows. In Section 2 we describe our empirical model and the data set in greater detail, and we discuss our specification of variables. The results are presented in section 3. Section 4 provides a conclusion.

2) The model

2.1. The basic model

In this paper, we rely on the following estimation equation that represents a dynamic panel setup.

$$emp_{z,s,t} = \alpha + \sum_{\ell=1}^{m} \rho_\ell \, emp_{z,s,t-\ell} + \sum_{\ell=0}^{m} \delta_\ell \, X_{z,s,t-\ell} + U_{z,s} + D_t + \varepsilon_{z,s,t} \tag{1}$$

$emp_{z,s,t}$ is the log scale of industry s in area z at time t. $emp_{z,s,t-\ell}$ is the lagged dependent variable, $X_{z,s,t-\ell}$ are the (current or lagged) time variant characteristics (in logs) that are discussed at length below.[1] $U_{z,s}$ is a fixed time invariant location and industry specific effect, and D_t is a general time effect. The standard error term is denoted $\varepsilon_{z,s,t}$. This setup is close to the methodology proposed in Henderson (1997). Yet, it takes serious the critique of Combes, Magnach and Robin (2004) concerning the specification of MAR externalities (see below).

As Nickell (1981) shows, in the dynamic panel model the standard within-group estimate is biased and inconsistent because of a correlation between the transformed error term $\varepsilon_{z,s,t} - \bar{\varepsilon}_{z,s}$ and the transformed endogenous variable $emp_{z,s,t-1} - \overline{emp}_{z,s}$ with $\bar{\varepsilon}_{z,s} = (1/T)\sum_{t=1}^{T} \varepsilon_{z,s,t}$ and $\overline{emp}_{z,s} = (1/T)\sum_{t=1}^{T} emp_{z,s,t-1}$. Following Arellano and Bond (1991) we use the GMM method to get consistent estimates for the unknown coefficients. Therefore, we take first differences to get rid of the time invariant effect $U_{z,s}$, so we obtain

$$\Delta emp_{z,s,t} = \sum_{\ell=1}^{m} \alpha_\ell \Delta \, emp_{z,s,t-\ell} + \sum_{\ell=0}^{m} \delta_\ell \, \Delta X_{z,s,t-\ell} + \Delta d_t + \Delta \varepsilon_{z,s,t} \tag{2}$$

where $\Delta \, emp_{z,s,t-\ell} = emp_{z,s,t-\ell} - emp_{z,s,t-\ell-1}$.[2] This transformation makes it possible to use values of $emp_{z,s,t}$ (lagged twice or more) as instruments (Anderson and Hsiao, 1982; Arellano and Bond, 1991). Crucial for the validity of these potential instruments is the assumption about the order of autocorrelation of the error term. Under the assumption of serially

[1] Note that our data set does not allow to observe employment at the plant level, which prevents us from decomposing total employment in cell (z,s,t) into average plant size and number of plants, as in Combes, Magnac and Robin (2004).

[2] Since $emp_{z,s,t}$ is measured in logs, the left-hand side of (2) is (approximately) the employment growth rate.

uncorrelated $\varepsilon_{z,s,t}$ the first differenced error terms $\varepsilon_{z,s,t} - \varepsilon_{z,s,t-1}$ follow a MA(1) process, so $emp_{z,s,t-p}$ ($p = 2,3,\ldots$) are valid instruments for $\Delta emp_{z,s,t-1}$. Furthermore, we assume that the remaining right-hand side variables $X_{z,s,t}$ are strictly exogenous with respect to $\varepsilon_{z,s,t}$, i.e.

$$E(\Delta\varepsilon_{z,s,t} \mid \Delta X_{z,s,t'}) = 0 \quad \forall t,t' \in [1,\ldots,T].$$

Test statistics for these assumptions are presented in the result tables.

2.2. Data

The data for this study is provided by the German Federal Employment Agency (Bundesagentur fuer Arbeit). This information is highly reliable official information that is used as the basis to determine individual social security contributions. It covers the entire territory of West Germany and the complete population of full-time employment relationships subject to social security (i.e. excluding civil servants and self-employed individuals) between 1980 and 2001. Employment is observed in Z=326 NUTS3-districts ("Landkreise" and "kreisfreie Städte")[3] and in 28 different industries. The data refer to the workplace location, hence there are no problems with upward biases in the income levels of metropolitan areas due to inward commuting. Furthermore, the data is not subject to any censoring.[4] For every district-industry and for every year we know

- the total employment level
- the employment shares in small (<20 workers), medium-sized (20-99) and large (>100) establishments
- the employment shares of three skill categories (without formal vocational qualifications, completed apprenticeship, higher education)[5]
- the average age of the employees
- the fraction of men

[3] For obvious historical reasons, East Germany is not part of the analysis. Moreover, we also excluded West Berlin from the data.
[4] Censoring is an issue in the data set used by Combes (2000) and Combes, Magnac and Robin (2004), who have information at the plant level for France, yet with the limitation that the exact employment figures of plants with fewer than 20 employees are not reported.
[5] 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.

- the average wage income per employee per calendar day, including all bonuses and extra payments subject to social security.

Two things should be noted with respect to the income data. Firstly, income levels that exceed the threshold for social security contributions are reported with this value. Our data therefore understates the true wage dispersion in West Germany. Secondly, although we deflate the wages and work with prices of 1977, 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.

Although we have data on 28 different industries, we perform our analysis only for 21 of them. Specifically, we exclude agriculture, mining and the public sector as well as the basic service industries like transportation, household-related services, gastronomy and health care, since we reasonably do not expect externalities to matter for these sectors (see Blien and Suedekum, 2004a for supportive evidence). We end up with 15 manufacturing industries and 6 advanced service industries.[6] In the empirical analysis we could estimate industry by industry in order to figure out idiosyncratic industrial patterns. However, in order to restrict the number of results, we lump all manufacturing and all service industries together and only perform global regressions for the two broad classes of activities.

2.3. Specification of explanatory variables

In this subsection we discuss our collection of explanatory variables and in particular our specification for the different forms of externalities. Recall that in the estimation equation all independent variables $X_{z,s,t}$ are differenced and in logs, i.e. we approximately measure their growth rates.

a) Sectoral specific effects

The sectors we look at have faced a very different development in the observation period. To control for pure sector effects such as structural change at the national level, we include the total size of sector s across all Z=326 districts without the own regional employment:

[6] The 15 manufacturing industries are Electronics, Chemical Industry, Synthetic Material, Nonmetallic Mineral Mining, Glass&Ceramics, Primary Metal Manufacturing, Machinery, Automobile, Office Supplies & IT, Musical Instruments&Jewellery, Wood-working, Paper & Printing, Leather&Apparel, Food&Tobacco and Building&Construction. The advanced services include the sectors Commerce, Finance&Insurance, Business-Related Services, Education, Leisure-Related Services and Social Services.

$$sect_{s,t} = \sum_{z'=1}^{Z} emp_{z',s,t} - emp_{z,s,t} \tag{3}$$

b) Total regional size

To capture total market size and agglomeration effects unrelated to the industrial structure, we include the total size of region z without the own sectoral employment to avoid endogeneity.

$$size_{z,t} = emp_{z,t} - emp_{z,s,t} = \sum_{s'=1}^{S} emp_{z,s',t} - emp_{z,s,t} \tag{4}$$

where S denotes the total number of manufacturing/service industries This variable is commonly used in the literature. One must be very careful, however, how to measure MAR-externalities when both the total area employment, equation (4), and the (lagged) employment level of the district-industry is included.

c) MAR externalities

The usual measure for MAR externalities is a local employment share of industry *s*. But the employment share of industry *s* in area *z* is perfectly collinear with the employment level $emp_{z,s,t}$ and total area employment $size_{z,t}$. Thus, one can not include all three elements as explanatory variables, as Combes (2000) has shown. An alternative indicator for the presence of MAR externalities is the (size of the) coefficient for the lagged dependent variable.

As argued by Combes, Magnac and Robin (2004) the auto-regressive parameter in (2) can be used to test for MAR-externalities, as it indicates whether a local industry grows faster in environments with strong past growth performance. Strictly speaking, there is only evidence for MAR externalities if the estimated coefficient is larger than one, as this would imply an explosive growth path of the respective industry. A parameter between zero and one indicates that there is mean reversion in the long run, albeit there can be some inertia in the transition dynamics towards the long-run target. This inertia, which can be due to specialization and thus MAR externalities, is stronger the larger (closer to one) the coefficient.

d) Jacobs externalities

Most of the former studies have used a variant of the commonly used Herfindahl-Hirshman index to test Jacobs-externalities. For example, Combes (2000) has suggested the following specification that was later also used in Combes, Magnac and Robin (2004) and in Blien and Suedekum (2004a).

$$HHI_{z,s,t} = \left[\sum_{s'=1, s'\neq s}^{S} \left(emp_{z,s',t} / (emp_{z,t} - emp_{z,s,t}) \right)^2 \right]^{-1} \quad (5)$$

This measure increases with local diversity faced by sector *s*. It reaches a maximum when all surrounding industries account for an identical employment share. A positive coefficient associated with $HHI_{z,s,t}$ would thus signal Jacobs-externalities, as sector *s* faces a more balanced local industrial environment. But there is an identification problem when using $HHI_{z,s,t}$ in logs together with the total regional employment (4) as an additional explanatory variable.

$$\log(HHI_{z,s,t}) = -\log\left(\sum_{s'=1, s'\neq s}^{S} \frac{emp^2_{z,s',t}}{(emp_{z,t} - emp_{z,s,t})^2} \right) = -\log\left(\frac{\sum_{s'=1, s'\neq s}^{S} emp^2_{z,s',t}}{(emp_{z,t} - emp_{z,s,t})^2} \right)$$

$$= -\log \sum_{s'=1, s'\neq s}^{S} emp^2_{z,s',t} + 2\log\left(emp_{z,t} - emp_{z,s,t} \right) \quad (6)$$

The diversification effect could not be identified from the total regional employment, as can be seen by comparing (6) with (4) in logs.

Because of this i we prefer to use an alternative measure for diversification, namely a standard Krugman-diversification index which is defined in the following way

$$diversity_{z,s,t} = -\sum_{s'=1, s'\neq s}^{S} \left| \frac{emp_{z,s',t}}{emp_{z,t}} - \frac{emp_{s',t}}{emp_t} \right| \quad (7)$$

This index sums the absolute differences of the regional and the national employment shares of all sectors (except for the one under consideration). It takes on the value of zero if the surrounding local economic structure exactly mirrors the average national structure, and it is stronger negative the more idiosyncratic (and less diversified) the district z. It uses a different reference structure than the HHI (the national average structure instead of a setting with identical employment shares), and it is not flawed with comparable identification problems.

e) Competition

A related debate that is often taken up in the empirical local growth literature is how the degree of local competition influences the process of knowledge creation and thus, ultimately, growth. If single industries are strongly monopolised within a region, then rents might be easier defendable and can subsequently be reinvested in further R&D. On the other hand, as argued e.g. by Porter (1990), competition might be more growth friendly than monopoly, since firms might face a stiffer pressure to innovate. To test this "Porter effect" one would typically like to use some Herfindahl-Hirshman-index about the market power prevalent in any local industry. However, this requires data at the plant level that is not available in our case. To come up with an alternative measure for the degree of local product market competition, we use the employment share in small firms with fewer than 20 employees.

$$competition_{z,s,t} = emp\left[in\ firms < 20\ employees\right]_{z,s,t} \Big/ emp_{z,s,t}\ , \qquad (8)$$

Although firm sizes are an imperfect measure for competition (since they might also measure internal scale economies), we hope that this variable reflects local product market competition in the sense that competition should be stiffer the higher is the employment share in small firms.

f) Education

Due to data limitations, previous studies did not include information about human capital intensity into the empirical analysis. From a theoretical point of view, the inclusion of education is straightforward for its own sake. Human capital spillovers that directly affect the level of TFP are common practise in growth theory by now (see e.g. Lucas, 1988; Burda and Wyplosz, 1992). But they become especially interesting if one thinks about these general human capital spillovers, which were traditionally not seen in relation to the local economic structure, in combination with MAR- and Jacobs-externalities. The rationale for these interaction-based knowledge spillovers is communication of workers either within the own industry (MAR) or across industries (Jacobs). One would typically think that knowledge spillovers will be more relevant when educated workers communicate with each other. On the other hand, human capital externalities might also be general and independent of the prevailing local economic structure. To sort this out, we include the employment share of college educated workers.

$$education_{z,s,t} = high\ skilled_{z,s,t} \big/ emp_{z,s,t} \quad , \tag{9}$$

This variable simply measures the human capital intensity of a local industry. It allows us to see the relative importance of externalities that depend on the local economic structure, versus such human capital externalities that are generally present independent of other industries in the respective region.

g) Wages

Lastly, we include a wage measure into our list of explanatory variables. As argued in the introduction we will not simply use raw wages, but rather use a methodology (described at length in Blien and Suedekum, 2004b) that allows us to isolate a measure of "excessive regional wages". To do so, we take a preceding step and regress the average (log) wage in every sector, region and year ($wage_{z,s,t}$) on a variety of explanatory variables like the qualification, age and gender structure of the respective workforce that determine labour productivity. From this analysis we take the regional fixed effects and include them in main regressions (1) and (2). 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. That is, we estimate period-by-period the following wage regression

$$\ln(wage_{z,s,t}) = a' + W'_z + S'_s + \beta X'_{z,s,t-1} + \varepsilon'_{irt} \tag{10}$$

where $X'_{z,s,t-1}$ is the matrix of observable characteristics of the respective local industry (firm size structure, qualification etc.), S'_s is an industry fixed effect and W'_z a location fixed effect. We estimate (10) subject to the restriction that all regional fixed effects, weighted by the aggregate employment share of regional over total national employment, must sum up to zero. This method, which is simply a normalization that does not affect the relative size of any two regional fixed effects, is useful since it allows us to interpret the values of W'_z as percentage deviations from a national grand mean of zero, not in relation to some arbitrarily omitted reference category from the complete (and thus, perfectly multicollinear) set of regional dummies. Economically, the variable W'_z can be understood as a measure that shows how wages in region z differ from what should be observed, given a variety of characteristics. "High wage" and a "low wage" regions are characterised by values of W'_z that are significantly higher (lower) than zero. In our view, this is a more meaningful measure than the raw average regional wage, as used e.g. in Henderson (1997), since it controls for static productivity differences that influence wages.

3) Results

We estimate our empirical model separately for the manufacturing sector (15 industries) and the advanced services sector (6 industries). We report the results of a parsimonious model specification in table 1a, where we include two lags of the dependent variable and the independent variables with up to two lags. That is, we specify an autoregressive distributed lag model, ADL(2,2), as laid out e.g. in Davidson and MacKinnon (2004:577). The results are robust with respect to different specification tests.

For instrumenting the first difference of the lagged dependent variable we use higher order time lags of the dependent variable in levels (Arellano and Bond, 1991). In table 1b we provide the results of diagnosis tests for the validity of instruments. The Sargan-test can not be rejected at the 5% level for manufacturing (p=0.080) and for services (p=0.098).[7] The other null hypothesis that is necessary for the validity of instruments, serial uncorrelated error terms $\varepsilon_{z,s,t}$, can not be rejected at conventional significance levels. We conclude that we can use $\log(emp_{z,s,t-l})$ with $l \geq 2$ as valid instruments.

3.1. Manufacturing

In manufacturing industries, both Jacobs- and MAR-externalities matter in the short run. The contemporaneous coefficient for diversity is positive (0.180) and significantly different from zero. The same is true for the endogenous variable lagged by one period. The coefficient is smaller than one, so we can not expect an explosive growth path. Yet, the size of the coefficient (0.840) suggests that the mean reversion process exhibits considerable inertia, which can be thought of as being due to the positive effects of regional specialization.

One has to note that the effect of the independent variables quickly fades away with time. The impact of all variables (except for wages) is insignificant with a time lag of two or more periods. This agrees with the conclusion of Combes, Magnac and Robin (2004) for the case of France, who also find that externalities are mainly static. It stands in contrast to the conclusion

[7] It is commonly known from Monte Carlo studies (e.g. Hansen et al., 1996) that the Sargan-test rejects the null hypothesis of valid instruments too easily. Hence, given the strong support we get from the autocorrelation test, we do not worry too much about the low p-value of the Sargan-test.

of Henderson (1997) that externalities seem to have a more long-run effect in the United States, with a lag of six years or more.

Table 1a: Results Dynamic Panel Estimation

Dep.Variable: **y(t)** TIME Dummies: **YES**

		Manufacturing	Services
number of groups		4717	1955
y	t-1	0,840*** (0,000)	0,869*** (0,000)
	t-2	-0,079 (0,392)	-0,006 (0,958)
size	t	0,155*** (0,002)	0,079* (0,066)
	t-1	-0,096* (0,087)	-0,030 (0,502)
	t-2	0,033 (0,459)	0,043 (0,201)
sect	t	0,539*** (0,000)	0,836*** (0,000)
	t-1	-0,321*** (0,000)	-0,742*** (0,000)
	t-2	0,058 (0,450)	0,038 (0,761)
competition	t	-0,049*** (0,000)	-0,322*** (0,000)
	t-1	0,042*** (0,000)	0,312*** (0,000)
	t-2	0,008 (0,373)	0,026 (0,539)
diversity	t	0,180*** (0,000)	0,095*** (0,002)
	t-1	-0,145*** (0,000)	-0,049* (0,077)
	t-2	0,043 (0,159)	-0,0141 (0,540)
wages	t	-0,067 (0,531)	-0,050 (0,557)
	t-1	0,109 (0,227)	0,148* (0,055)
	t-2	-0,224** (0,011)	0,004 (0,959)
education	t	0,020*** (0,000)	0,004 (0,173)
	t-1	-0,014*** (0,000)	-0,012*** (0,000)
	t-2	0,001 (0,777)	-0,007** (0,016)

Table 1b: Tests for validity of instruments	Manufacturing	Services
Sargan test of over-identifying restrictions	chi2(17) = 25,74 Prob > chi2 = 0,0794	chi2(17) = 24,85 Prob > chi2 = 0.0981
AB-test that average autocovariance in residuals of order 1 is 0. H0: no autocorrelation	z = -18,09 Pr > z = 0,0000	z = -6,63 Pr > z = 0,0000
AB-test that average autocovariance in residuals of order 2 is 0 H0: no autocorrelation	z = 1,13 Pr > z = 0,2577	z = 0,81 Pr > z = 0,4200

In particular, the positive sign of the contemporaneous coefficient for total regional size shows global agglomeration advantages or positive market size effects. On the other hand, we find no evidence for Porter externalities, as the sign of the contemporaneous coefficient for competition is even significantly negative. This result should be treated cautiously, because firm size structures are not a perfect measure for product market competition.

Concerning the education variable, we find a significantly positive impact on employment growth. This finding is consistent with general human capital spillovers, as emphasised in the endogenous growth literature. Interestingly, these general effects of education seem not to interfere with the Jacobs- and MAR-externalities that depend on the local economic structure, as an elimination of the education variable leaves the qualitative conclusions with respect to the other control variables unchanged.

Finally, the short run impact of overly high regional wages is negative, but not significant. Recall that we have constructed a measure for “overly high” regional wages, which should have a negative impact on employment growth according to neoclassical arguments. On the other hand, high regional wages also point to a higher purchasing power of local consumers, which might have positive demand-side effects on employment growth (see e.g. Jerger and Michaelis, 2003). We interpret the negative but non-significant coefficient in table 1a such that cost push effects dominate over potential demand side effects, but that the latter offset the former to an extent that renders the relationship between wages and employment growth insignificant.[8]

As argued above, the impact of externalities in West Germany appears to be mainly static. However, we also check if there is a long-run impact. Given the ADL-specification, the long-

[8] This conclusion is in accordance with the findings of Suedekum and Blien (2004), who look at the relation between wages and employment growth in West Germany (1993-2001) by means of a shift-share regression technique. There, the wage effect is broken down according to single industries. For a subset of industries it is insignificant, but for some it is significantly negative.

run effects on employment growth can be determined by computing (for each independent variable) the following coefficient δ* (Davidson and MacKinnon, 2004:577)

$$\delta^* = \frac{\sum_{l=0}^{2} \delta_l}{1 - \sum_{p=1}^{2} \rho_p} \tag{10}$$

where δ_l are the coefficients for the lagged independent variables $X_{z,s,t}$, and ρ_p for the lagged dependent variable. The long-run results are reported in table 2, with p-values for the significance of the coefficients in parentheses.

As can be seen, in particular the long-run impact of total regional size has an impact of employment growth in manufacturing. The coefficient is positive (0.384) and significantly different from zero. This finding is in favour of general agglomeration economies and is well consistent with the positive (and still significant) long-run impact of diversity (0.324). Both findings can be thought of as supporting dynamic Jacobs-externalities, which corroborates the results of Blien and Suedekum (2004a), who conduct the more traditional cross-section analysis on dynamic externalities for the case of Germany (1993-2001).

Table 2: Long-run effects

	Manufacturing	Services
size	0.384*** (0.005)	0.838* (0.080)
sect	0.670*** (0.000)	1,197*** (0,000)
competition	-0.001 (0.990)	0.145 (0.757)
diversity	0.324*** (0.007)	0.293 (0.211)
wages	-0.762 (0.300)	0.934 (0.457)
education	0.028*** (0.005)	-0.136 (0.315)

Concerning the long-run impact of the dependent variable, we can provide the result that the null hypothesis of a coefficient equal to one can not be rejected at any reasonable level of significance. This suggests that MAR externalities do in fact matter in West German manufacturing industries, both in the short and in the longer run.

3.2. Services

Going over to the service sector, we find that in the short run both Jacobs- and MAR-externalities matter (see right column of table 1a). However, the size of the impact of diversity (0.095) is considerably smaller as compared to the manufacturing sector (0.180). The same is true for the contemporaneous effect of total regional size, which is positive and significant for services (0.079), but also smaller than the analogous coefficient for manufacturing (0.155). Moreover, there are no significant long-run impacts from diversity (see table 2).

On the other hand, the coefficient for the lagged dependent variable is somehow larger in the service sector (0.896) than in manufacturing (0.840) and it is also strongly significant. There is thus also considerable inertia in the mean reversion process. In the long-run, the null hypothesis of an impact equal to one can also not be rejected.

We therefore conclude that both static and dynamic MAR-externalities are present in West German service industries, and they are somewhat stronger than in the manufacturing sector. Jacobs-externalities also play some role in the short-run, although the size of the effect is smaller than in manufacturing. We find no evidence for ´dynamic´ Jacobs-externalities in the service industries. All these findings agree with the cross-section results by Blien and Suedekum (2004a).

With respect to our competition variable we also find a significantly negative short-run effect in the service sector, and we suggest an analogous interpretation as for manufacturing. Somewhat surprisingly, human capital externalities appear to play a minor role in service industries. As for manufacturing, the impact of overly high wages is negative but non-significant in the short run. The size of the impact is even smaller (-0.050 versus -0.067), which suggests that the employment growth effects of overly high wages are less adverse in services than in manufacturing.

4.) Conclusion

The local economic structure is an important determinant of the employment growth performance of different industries, but timing is a crucial issue. In West Germany, it is predominantly the current (rather than some historical) structure that matters. In the terminology of growth theory, we can thus conclude that externalities appear to be more static than dynamic. For economic policy this can be good news, because structural interventions that influence the industry structure at the local level will have an immediate impact on employment growth. According to our estimations, policymakers do not have to wait for several years before results become visible. On the other hand, the effects of policy might also not be long-lasting. Our results show that industries benefit both from local specialization and from a diversified and urbanized surrounding environment. The impact of the latter factor is more important for manufacturing than for service industries.

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