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Economic Growth of Agglomerations and Geographic

Concentration of Industries – Evidence for West Germany

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Abstract:

During the two decades from 1980 to 2000, there was no clear overall trend of economic convergence or divergence among West German regions. However, a number of regions that were already rich - generally large agglomerations - have succeeded in further distancing themselves from the rest. At the same time, we identify knowledge-intensive services as industries whose geographical concentration was initially high and continued to increase. Logistic and nonparametric regression estimates show that the higher a region's share of employment in these service sectors, the greater the probability that a region is classified as being rich and becoming even richer.

Keywords: regional convergence, knowledge-intensive services, industry-specific local linkages, logistical regressions, nonparametric regressions

JEL-classification: C14, C16, R12, R30

1 Introduction

Various strands of economic theory suggest that the removal of barriers to trade and to factor mobility will result in a higher spatial concentration of sectoral (and possibly overall) economic activity and, as a consequence, a higher sectoral specialisation of regions. This, in turn, would be likely to result in growing regional income disparities, at least temporarily. Such a development should be observable in Europe (KRUGMAN 1993) where economic integration has been broadening and intensifying during the past few decades, particularly since the beginning of the 1990s. Empirical evidence, however, appears to indicate otherwise. Findings on the spatial concentration of industries within the EU are mixed.[i] If anything, concentration has decreased, not increased (HALLET 2002, MIDELFART-KNARVIK and OVERMAN 2002, BRÜLHART and TRAEGER 2005). The same applies to income disparities between regions. While the longstanding process of regional convergence in Europe slowed down in the 1980s, it regained momentum in the 1990s (MAUERSETH 2001). At the same time, metropolitan areas have maintained and even extended their leading position in the income hierarchy (GEPPERT and STEPHAN 2005).[ii]

For the EU's largest national economy, (West) Germany, the evidence for spatial concentration is quite similar. The German economy is equally split into concentrating and deconcentrating sectors (SÜDEKUM 2005). Moreover, like the EU as a whole, a relatively small number of high-income areas are growing further away from the rest (COLAVECCHIO et al. 2005). This is visible in the kernel density estimates of gross domestic product (GDP) per capita for West German planning regions (Figure 1), which stretch out further at the right tail of the distribution in 2000.

While theoretical predictions of spatial concentration in Europe have obviously not fully materialised to date, there appears to be a tendency towards further agglomeration of economic activities. Using West Germany as an example, the present paper explores the

hypothesis that there might be a connection between high-income regions that are extending their lead and highly concentrated sectors that are further increasing their degree of spatial concentration. Our analysis is based on regional units that approximate local labour markets and on highly disaggregated employment data that allows relatively homogeneous economic activities to be observed. We employ nonparametric kernel regression since its flexibility is particularly well suited to the exploratory character of our analysis.

Figure 1

With our approach, however, there are definite limits to what can be established about a *causal* relationship between sectoral concentration and regional growth. The spatial concentration of industries may – as we conjecture - be driving urban growth but it may be a two-way process: fast growing cities – with their growing externalities – may be attracting specific industries, thereby promoting the spatial concentration of those industries. A similar endogeneity might, in principle, result from a demand linkage: regions where specific industries are strongly represented may happen to be growing relatively fast, thus further boosting the concentration of those sectors through local demand effects. Our empirical results described below, however, suggest otherwise. Virtually all of the sectors that are continuing to increase their degree of spatial concentration provide *traded* goods and services.[iii] Local demand, while certainly not negligible, is just one component of total sales. Therefore, endogeneity via local demand is unlikely to pose a severe problem in the present context.

In the following section, we explain our empirical approach, the database and the regional delimitations. Section 3 presents descriptive results for the regions we classified as high-income and fast growing, as well as for the sectors we classified as highly concentrated and continuing to concentrate. Section 4 provides and compares Logit and nonparametric estimates of the relationship between the incidence of such regions and the regional significance of such sectors. Section 5 concludes.

2 Empirical Approach

Does the probability that a region that is already rich is becoming even richer depend on the importance in that region of geographically concentrated sectors becoming even more spatially concentrated? In order to answer this question, our empirical analysis proceeds in two steps:

1. We first classify regions and sectors according to the development of their GDP and geographical concentration, respectively.

2. We then estimate the relationship between the probability of an initially prosperous region exhibiting above-average growth of GDP per capita and its share of employment in initially geographically concentrated sectors exhibiting increasing geographical concentration.

While steps 1 and 2 are described in further detail in Sections 3 and 4 below, the purpose of this section is to give an overview of our empirical strategy.

One of the most intriguing aspects of regional development in both Europe as a whole and West Germany in particular has been the ability of some high-income agglomerations to continue to achieve above-average growth in per capita income. Borrowing from the language of competitive cycling, they may thus be referred to as "breakaway regions" as they managed to "pull away from the pack", having already been at the "front of the field" of all regions. We convert this phenomenon into the following discrete dependent variable:

$$
Y = \begin{cases} 1 & \begin{array}{l} \text{if a region shows above - average per - capita income in the base year} \\ \text{and above - average per - capita income growth during the observation period} \end{array} \\ \\ 0 & \text{otherwise} \end{cases}
$$

Classifying sectors according to the development of their geographical concentration is not as clear cut. There is a broad discussion in the literature regarding ways to measure the

geographical distribution of economic activities (e.g. COMBES and OVERMAN 2004). We primarily employ the Herfindahl index to measure the spatial concentration of a sector but check the robustness of results using the Gini coefficient as an alternative. Sectors with an above-average initial level of geographical concentration that continue to concentrate geographically are easily identified by examining the initial level and the change in the Herfindahl index based on the distribution of a sector's activity across all regions. After having identified such sectors, we calculate, for each region, its share of employment in these sectors in the base period. This regional employment share of geographically concentrating sectors serves as the explanatory variable *X*.

In order to actually compute the values of *Y* and *X* for each region, we need data on regional GDP per capita and on the distribution of sectoral activity across regions. However, an uninterrupted series of regional GDP for the entire period (1980 to 2000) is not available. The data from the old European System of National Accounts (ESNA79) covers the period 1980 to 1996, while data according to the new system ESNA95 is available for the years from 1991 onwards. We interlink these two time periods by using conversion factors for 1991 and 1992.

Differentiated information on the regional distribution of the output of individual economic sectors is not routinely published in Germany. However, such information is available for the input factor labour, which we use here as an approximation of the regional distribution of sectoral production. More specifically, detailed information on employment by region and sector can be derived from statistics on employees paying statutory social insurance contributions. So as to obtain a long series that matches the GDP data, we use the pre-1993 sectoral classification of the Federal Employment Agency.[iv] [v]

In the presentation of our empirical work, we focus on the years 1980 and 2000, the initial and the final year of the entire observation period, respectively. However, data for the interim years 1985, 1990 and 1995 are used to check the robustness of our findings. That is, we

examine whether the findings based on data from 1980 and 2000 carry over to shorter periods, i.e. the individual 5-year intervals that can be defined using the interim years. To this end, we pool the data from the four 5-year intervals 1980-1985, 1985-1990, 1990-1995, 1995-2000, obtaining a relatively large sample on which to base our nonparametric estimates.

Our geographical units of observation are the planning regions defined by the Federal Building Office.[vi] German planning regions, in our view, are reasonable approximations of socio-economic, self-contained spatial units. The vast majority of these regions have diameters of up to around 60 miles. One of the most important criteria in the delimitation of planning regions is commuting linkages. Thus, they represent something fairly close to regional labour markets. Furthermore, planning regions appear to be suitable units to capture localised externalities. Human capital spillovers are essentially transmitted within regional labour markets, and the reach of R&D spillovers is estimated at 50 to 75 miles. (See the survey of studies by DÖRING and SCHNELLENBACH 2006, p. 384.)

To model the relationship between the probability of an initially rich region becoming even richer (Y=1) and the sole explanatory variable X - the share of regional employment in sectors continuing to geographically concentrate- we first use the Logit model defined as:

$$P(Y = 1 | X) = \frac{1}{1 + \exp[-(\beta_0 + \beta_1 X)]}$$

The Logit model is easily estimated and interpreted and provides an initial assessment of the relationship we study. However, this advantage comes at the expense of the relatively restrictive functional form it imposes on the relationship between the probability of observing a rich region with a trend of further improving its relative position and its share of employment in geographically concentrated sectors that are further increasing their concentration. This restrictiveness is undesirable since the aim of this paper is to *explore* the

relationship between X and the probability that *Y=1*. We thus go beyond the Logit model to also estimate a nonparametric model of $P(Y = 1| X)$.

The nonparametric model $P(Y = 1| X) = m(X)$ does not fix the form of the regression function *m(X)* a priori. It merely assumes that $P(Y = 1| X)$ does not abruptly change as a result of small changes in *X*, that is, that the function *m(X)* does not have any jumps. The kernel method uses this property to form an estimate of *m(X)* at a particular value *X=x* by taking averages using the values of *Y* from observations with values of *X* that are within a narrow interval around *X=x* (HÄRDLE et al., 2004). The width of this interval has to be chosen to determine how "local" the average is to be. In this paper, an optimal data-driven window width is used, based on a cross-validation criterion.

It is well known that estimates of a nonparametric regression are inflicted by the "curse of dimensionality", that is, they can be very imprecise if the number of explanatory variables is large because the observations tend to spread "far and wide" in multidimensional space with few observations left for forming local averages. Moreover, estimates of multivariate non-parametric regressions can be difficult to interpret and communicate as they may neither yield a parametric formula (by definition) nor a graph (if there are more than two explanatory variables). Neither is the case, however, in this paper since only one explanatory variable is being considered.

3 Regions and Sectors

Regions experiencing above-average income growth starting from an already high initial level of economic performance are listed in Table 1 based on data from 1980 and 2000. For this long-term period, only 8 of the 71 adjusted planning regions fulfilled both criteria necessary to qualify as a "breakaway region". Half of these regions are large agglomerations (Munich,

Rhine-Main, Stuttgart and Hamburg), two are urban manufacturing centres (Nuremberg, Middle-Upper Rhine), and two are less urbanised regions in the states of Baden-Württemberg (Danube-Iller) and Bavaria (Franconia).

Table 1

Breaking down the entire period from 1980 to 2000 into the four 5-year intervals 1980-1985, 1985-1990, 1990-1995 and 1995-2000 reveals that the large agglomerations followed a relatively steady "breakaway path" throughout the observation window. That is, they managed to repeatedly achieve above-average growth in per capita income during the five year subintervals. This is not the case for the aforementioned less urbanised regions of Baden-Württemberg and Bavaria where a period of particularly strong growth ended in 1990. The subinterval breakdown also shows that other urban areas such as Bremen, Hanover and Düsseldorf join the group of breakaway regions in the 1990s.

The sectors exhibiting unusually high geographical concentration both in terms of initial level and subsequent growth during the period from 1980 to 2000 are listed in Table 2.

Table 2

Of the 82 sectors[vii] observed, 12 met both criteria during the period from 1980 to 2000.[viii] On the one hand, traded services (film industry, business consultancy, engineering, legal consultancy, arts/theatre and banking) are particularly prominent among the already geographically concentrated industries that continue to further concentrate. The same pattern in the level and development of geographical concentration is to be found among the service sectors with a more local orientation (security and courier). This is not surprising, given that these local services are closely linked to traded services and follow suit as the latter continue their process of geographical concentration.

Apart from these service sectors, the list in Table 2 also includes five manufacturing industries. which are either small in terms of employment (energy/water supply, chemical fibres, and tobacco processing) or experienced high losses of employment (clothing and non-ferric metals) during the period from 1980 to 2000. Germany's major manufacturing industries (chemicals, machinery, electronics and automobiles), however, are not to be found among the sectors with an above-average increase in geographical concentration.

Looking again at the 5-year subintervals 1980-1985, 1985-1990, 1990-1995 and 1995-2000 reveals that the number of industries continuing on a path of geographical concentration is declining over time. The manufacturing industries are more prevalent during the first two subintervals and rarely reappear. Many of the tradable services feature on the list only in two out of the four subintervals. However, when they do, they show large increases in geographical concentration.

4 Estimates

We will now empirically explore whether the probability of observing a rich region that continues to pull away from the bulk of the other regions depends on the significance of sectors in that region that continue to concentrate geographically starting with an above-average initial level of spatial concentration. Logit estimates of this relationship are given in Table 3. It contains estimates for the entire observation period based on information for 70 regions[ix] from 1980 and 2000. It also provides estimates obtained from the pooled sample comprised of four observations for each region, corresponding to the four subperiods 1980-1985, 1985-1990, 1990-1995 and 1995-2000.[x] Moreover, Table 3 reports additional estimates, where the explanatory variable is constructed solely on the basis of the regional employment share of geographically concentrating *service* sectors. The primary reason for separating the geographically concentrating service sectors from their manufacturing counterparts is

suspected differences between the former and the latter in terms of the conditions for and developments in the location of sectoral economic activity.

Table 3

Looking at the column headed "all industries" in Table 3 - which is based on the definition of *X* using geographically concentrating sectors from both service *and* manufacturing industries - suggests that there is a positive relationship between *X* and the probability that *Y*=1. The relationship appears to be rather weak in terms of Pseudo-R^2. Still, the estimated coefficient of *X* is statistically significant at the 10% level for the period from 1980 to 2000 and at the 5% level for the pooled sample.

The extent to which the share in regional employment of geographically concentrating sectors is able to explain the breakaway of a rich region is noticeably greater for the service sectors. This applies to both the sample using data from 1980 and 2000 only and to the the pooled sample of observations from the 5-year intervals.[xi] While the coefficient of *X* is significant at the 1% level in both cases, the fit is particularly good for the long-term horizon (1980 to 2000) with a Pseudo R^2 of 0.29. The pooled sample has more observations and more variation in *X*, which both helps to improve the precision of the estimate of the effect of *X* and also contains more "noise" associated with using data from shorter time intervals.

Do the findings implied by the Logit estimates carry over to the more flexible nonparametric estimates of the conditional probability of a region breaking away? Estimates based on the broader definition of the explanatory variable that incorporate geographically concentrating industries in both the service *and* manufacturing sectors are shown in Figures 2 and 3. Figure 2 is based on 70 observations: one per region for the period from 1980 to 2000. The estimates in Figure 3 make use of the pooled data comprising 240 observations.

The nonparametric kernel estimates[xii] and the corresponding confidence intervals at the 95%

level are indicated by dotted lines while the corresponding Logit estimates are indicated by

solid lines. The horizontal line denoting the unconditional frequency of observing a

breakaway region corresponds to the hypothesis of no relationship between X and the

probability that Y=1 and helps to assess the significance of the nonparametric estimates.[xiii]

Figure 2

Figure 3

Both the estimated Logit and nonparametric probabilities of observing a "breakaway region"

normally increase with a region's share of employment in sectors continuing to

geographically concentrate. The nonparametric estimates, however, show a much flatter

slope. Moreover, they fail to be significant anywhere since the horizontal line indicating the

unconditional probability for all values of X is within the confidence intervals.

Figures 4 and 5 are based on the definition of X that restricts attention to regional employment

in *service sectors* with a level of geographical concentration that is above the 1980 average

and is increasing over time. Figure 4 refers to the period from 1980 to 2000 while Figure 5 is

based on the pooled data.

Figure 4

Figure 5

Both diagrams show much greater consistency between the Logit and the nonparametric

estimates[xiv] than Figures 2 and 3. Not only do both types of estimates imply a (generally)

significant positive relationship between the probability of a rich region becoming richer and

the share of regional employment belonging to sectors continuing to concentrate

geographically but also the Logit estimates are almost entirely within the finely dotted confidence intervals around the nonparametric estimates.

They do, however, differ in one important way: the comparison reveals that the Logit estimate implies a much steadier increase in the probability of observing a breakaway region as X increases. The nonparametric estimate, being a series of local averages, shows a more differentiated picture. The probability of a region breaking away is not very high if it has only a low initial employment share among the service sectors that are continuing to concentrate geographically. Indeed, most of the regions with low employment shares among these unusual service sectors show a "normal" development of prosperity. With very high employment shares, however, the nonparametric estimates show a steep increase in the probability of being classified as a breakaway region. Even for the pooled data, this eventual rapid increase is based on relatively few data points where values of X are high. This is evident in the confidence intervals that widen considerably around the nonparametric estimate in this area. Yet, despite their width, the horizontal line marking the unconditional probability of observing a breakaway region clearly lies outside of the curves depicting the confidence intervals at the extreme right-hand edge of the graphs. This implies that only if geographically concentrating service sectors are of very great importance in a region can their positive influence on the region's ability to break away be regarded as statistically significant. This is particularly evident in Figure 4 for the data based on the initial and final year of the interval from 1980 to 2000: if the regional share of employment in concentrated and further concentrating service sectors exceeds 22%, the probability of observing a breakaway region shows a steep increase and significantly deviates from its unconditional value.

5 Conclusions

The results of our empirical analysis for West Germany suggest that sectoral concentration processes can make a considerable contribution to regional income differentiation, and particularly to spatial agglomeration. While most of the 82 sectors we examined did show geographical deconcentration during the 1980s and 1990s, some industries continued to concentrate spatially. The latter are divided into two rather distinct subgroups: small – and generally declining – manufacturing industries on the one hand and knowledge-intensive services on the other.[xv] At the same time, a number of rich West German areas managed to rise ever further above the average level of per capita income, and such a development is all the more likely the higher the share of concentrating sectors in the regional economy.

Strictly speaking, we have identified an *association* between the sectoral concentration process and the continuing rise of already rich agglomerations. Our analysis, however, does not establish the precise nature of the *causal* mechanisms that may be underlying this association. The spatial concentration of knowledge-intensive services may be rooted in local interactions leading these services to be the driving forces of urban growth. Alternatively, both externalities generated in high-performing cities and skilled workers sorting into these places (Combes et al. 2004/2006) may be attracting knowledge-intensive services. In this case the concentration of services would be following urban growth, not driving it.

In any case, the increasing clustering of knowledge-intensive services suggests that localisation economies (MAR externalities) play an important role in these sectors. This conjecture is supported by a recent study on regional employment growth in West Germany based on a dynamic panel approach (BLIEN et al. 2004). However, the fact that large agglomerations such as Munich, Frankfurt and Hamburg are predominant among the rich regions that are becoming richer indicates that urbanisation economies (Jacobs externalities) might also be at work. In their analysis of the spatial distribution of employment in the USA for the period from 1972 to 2000, Desmet and Fafchamps (2005) found that total employment

has become increasingly concentrated and that this trend is driven by services. In addition, services have been gathering in counties where employment is high, pointing to the existence of urbanisation economies. Combes et al. (2004/2006) also attribute an important role to such economies in their analysis of spatial wage disparities. This is further substantiated by evidence on the functional division of labour revealing that knowledge-intensive service functions are shifting towards large metropolitan areas (DURANTON and PUGA 2004 for the USA, BADE et al. 2004 for Germany). Obviously, the enormous progress in information and communications technology has not reduced the affinity of knowledge-intensive activities with dense urban environments.

However, our empirical results also leave open certain questions for further research. Why do some traded services, such as advertising, not show continuing geographical concentration? Why are some large metropolitan areas, such as Cologne, unable to benefit from the geographical concentration and dynamics of knowledge-intensive services? Is the success of the Stuttgart and Nuremberg regions due less to services and much more to clusters of high-performing manufacturing branches?

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Table 1

Regions with above-average initial level and above-average growth of income

	GDP per capita	
	West Germany = 100 1980	Change in index value 1980 - 2000
Munich	129,2	28,1
Stuttgart	123,1	0,1
Hamburg[1]	118,9	0,8
Frankfurt[2]	117,3	20,8
Nuremberg[3]	113,1	4,8
Middle-Upper Rhine	110,0	5,7
Danube-Iller[4]	103,4	3,7
Franconia[5]	100,2	3,7
All regions[6]	**100,0**	**0,0**

[1] City of Hamburg and two contiguous planning regions.

[2] Rhine-Main planning region.

[3] Central Franconia region.

[4] Baden-Wuerttemberg part of the Danube-Iller region.

[5] Franconia region in the Federal State of Baden-Wuerttemberg.

[6] Total number of regions: 71.

Sources: Regional accounts for the Federal States and own calculations.

Table 2

Sectors with above-average geographical concentration in 1980 and increasing concentration

from 1980 to 2000

	Herfindahl index of geographical concentration	
	1980	Change in % 1980 - 2000
Film industry	0,119	7,3
Tobacco processing	0,105	21,3
Chemical fibres	0,098	12,7
Non-ferric metals	0,060	1,0
Engineering	0,039	0,9
Business consultancy	0,035	18,9
Arts/theatre	0,034	4,7
Banking	0,033	18,1
Security, courier services	0,033	32,0
Legal consultancy	0,029	7,6
Energy, water supply	0,028	0,6
Clothing	0,026	9,6
All sectors	**0,025**	**-2,4**
Sources: Employment statistics of the Federal Employment Agency and own calculations		

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Table 3

Results of the Logit estimate

	All industries			Services		
	Coefficient	t-value	p-value	Coefficient	t-value	p-value
	Period observed: 1980 - 2000					
Share in employment	55,7	1,80	0,072	133,8	3,03	0,002
Constant	-6,5	-2,49	0,013	-8,6	-3,68	<0,001
Pseudo-R^2		0,07			0,29	
n (regions)		70			70	
	Periods observed (pooled): 1980-1985, 1985-1990, 1990-1995, 1995-2000					
Share in employment	5,9	2,04	0,042	14,5	3,97	<0,001
Constant	-3,0	-5,42	<0,001	-3,6	-7,38	<0,001
Pseudo-R^2		0,02			0,08	
n (observations)		280			280	

Figure 1

Density of GDP per capita for West German regions 1980 and 2000

Gaussian kernel with bandwidth according to Fox (1990). West German planning regions.

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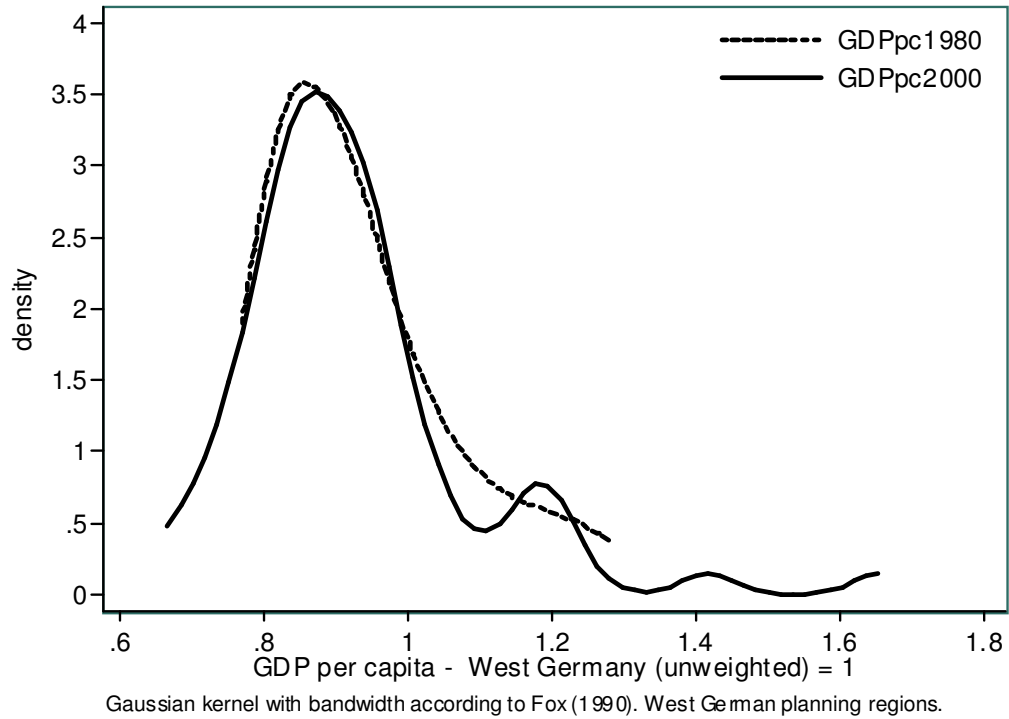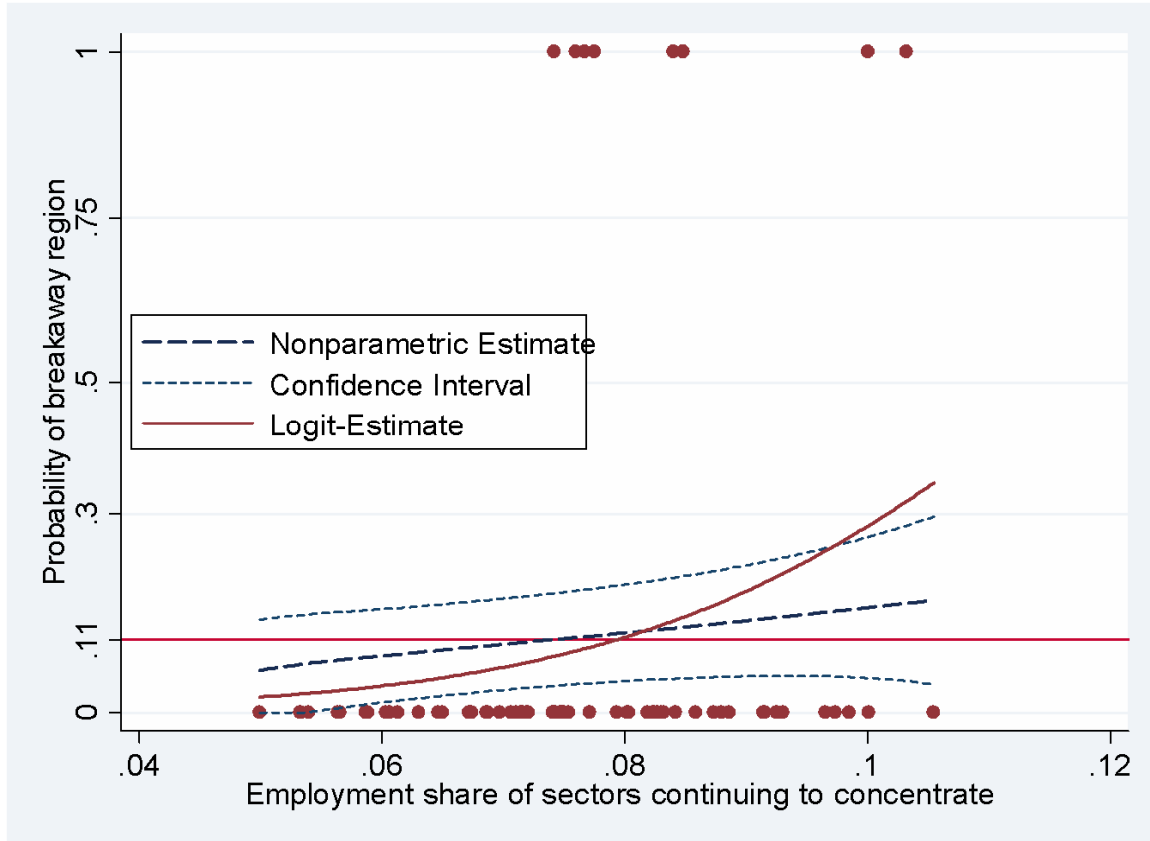39
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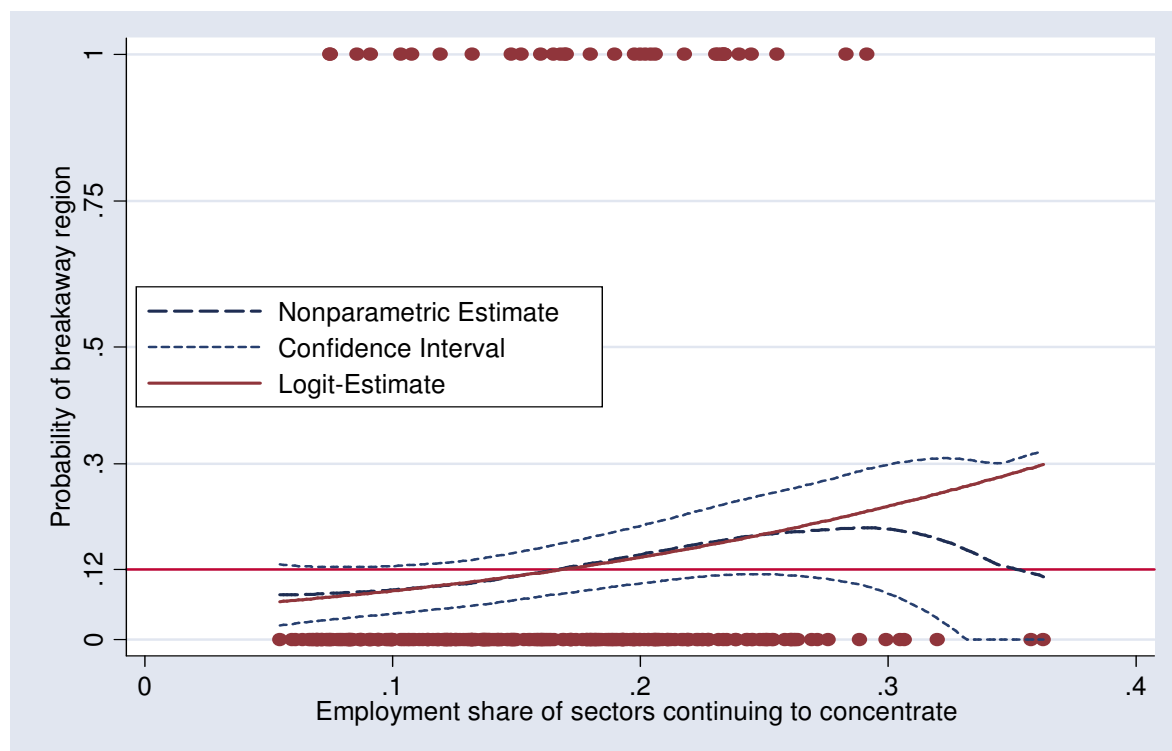42
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Figure 2

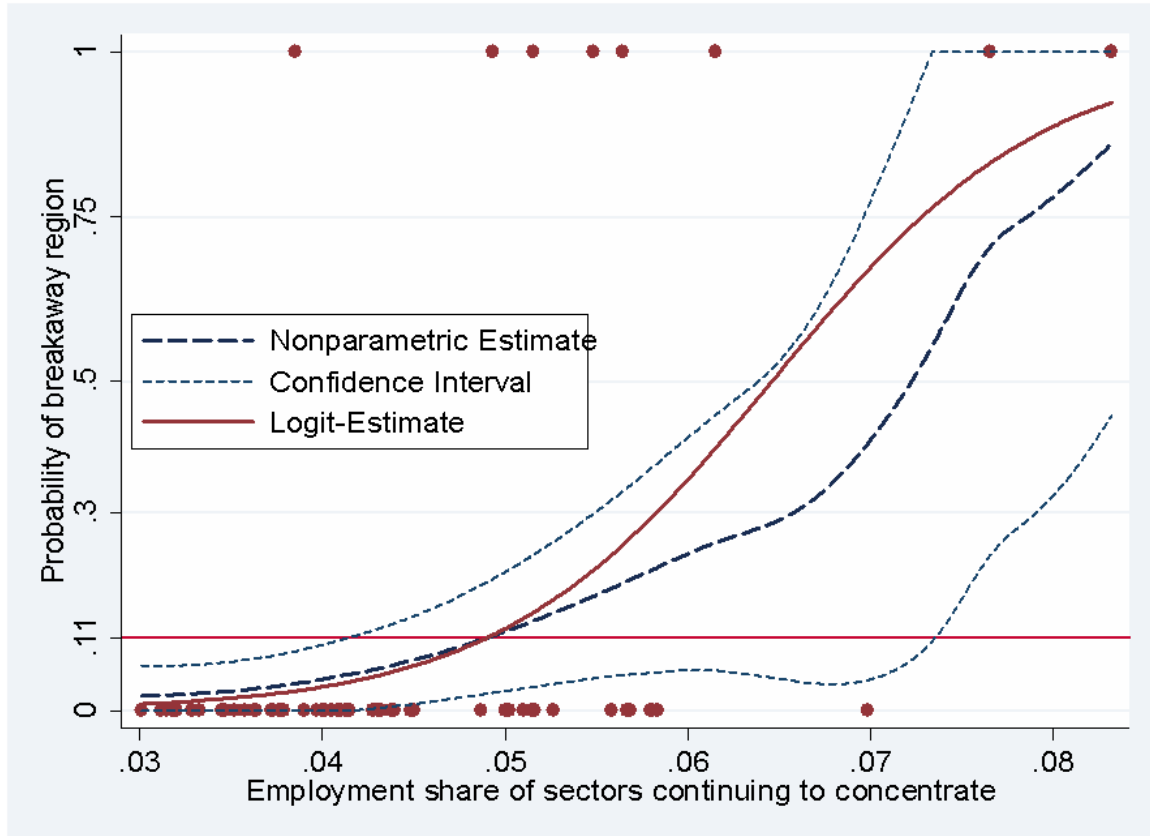Results of the non parametric estimates for all industries and the total period observed (1980–2000)

Figure 3

Results of the non parametric estimates for all industries and pooled data for 5-year
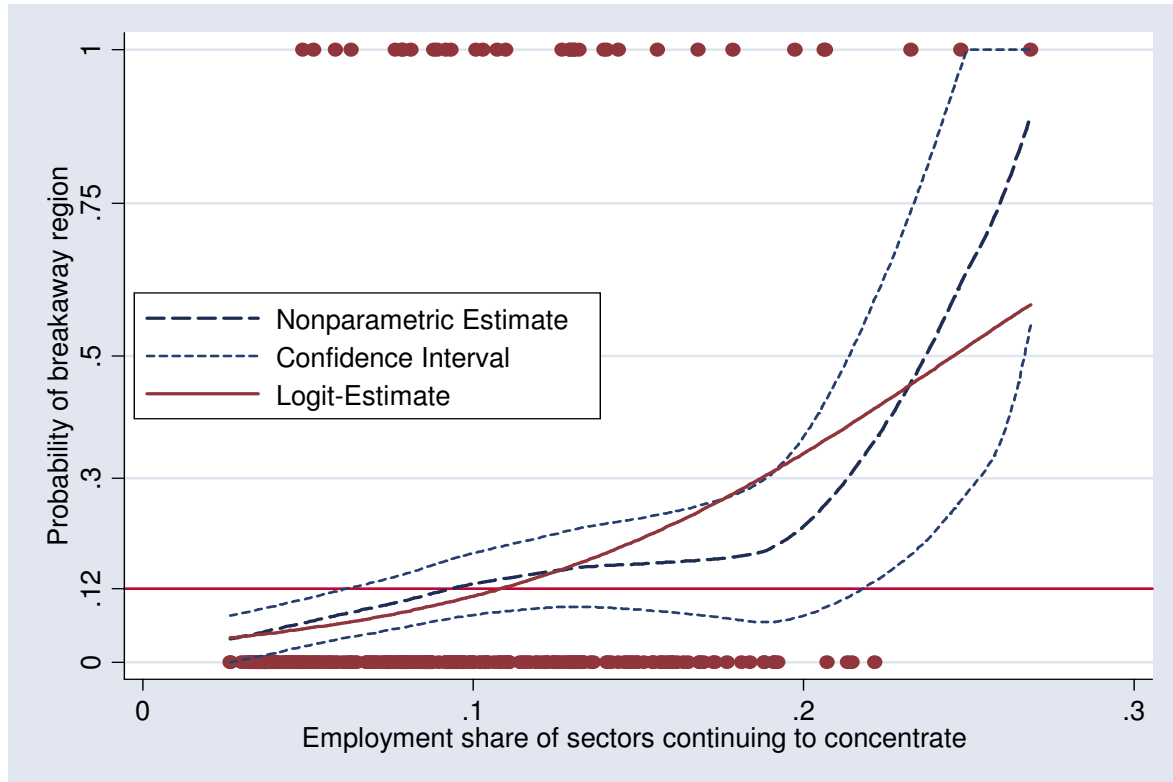
subperiods

Figure 4

Results of the non parametric estimates for service industries and the total period observed

(1980 –2000)

Figure 5

Results of the non parametric estimates for service industries and pooled data for 5-year

subperiods

Notes

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[i] COMBES and OVERMAN (2004) provide a comprehensive and critical survey of studies.

[ii] CHESHIRE and MAGRINI (2000) drew a similar conclusion in their analysis of functional urban regions (FUR) within the EU.

[iii] For the geographical scope of services markets see Esparza and Krmenec (1994), Lejour and de Paiva Verheijden (2004), Deutsch et al. (2006).

[iv] This system of classifying sectors has been replaced by the 1993/2003 systems. The use of the old classification does not result in any real disadvantages for our study, but it should be noted that the information technology sector is not treated as a separate entity in the old classification but is included under engineering. The classification used here comprises 83 economic sectors.

[v] There is no GDP data for East Germany prior to 1991 and no reliable disaggregated employment data prior to 1993. However, there is another reason for excluding East Germany from this analysis: in the socialist economy of the GDR, most sectors were highly concentrated spatially. This pattern changed dramatically in the process of transformation and restructuring that took place during the 1990s. Since our primary interest is on spatial processes in a market economy, not on the specifics of transformation, we focus on West Germany.

[vi] The delimitation of these "Raumordnungsregionen" mainly follows commuting patterns and socio-economic linkages although the federal state boundaries are observed. However, in the case of the city states, this yields units that are not very meaningful economically. Therefore, the planning regions that directly adjoin Hamburg and Bremen are grouped into one unit with the core city. Altogether, we have 71 West German regions that remained unchanged from 1980 to 2000.

[vii] For the entire period from 1980 to 2000, the railways sector also showed an increase in spatial concentration. Nonetheless, it is not included in the category of concentrating sectors because the spatial distribution of employment in this field is determined to a considerable extent by the administrative allocation of the on-train personnel of the Deutsche Bahn.

[viii] Calculations on the basis of the Gini coefficient produce similar results. There is an overlap of 9 sectors with the classification according to the Herfindahl index. Only the one sector of petroleum processing was added to the category of concentrating sectors and three sectors (non-ferric metals, engineering and arts/theatre) were dropped.

[ix] One extreme observation, planning region 80, was dropped. There the share of concentrating sectors in 1980 was more than five times as high as in the region with the second highest share of such sectors.

[x] The pooled sample thus contains 4 times 71 (= 284) observations. Dropping planning region 80 (see previous note) gives 4 times 70 (=280) observations.

[xi] The estimated coefficient of the share in regional employment is in both cases statistically significant at the 1% level.

[xii] The bandwidths of 0.044 (for the period 1980-2000) and 0.115 (for the pooled sample) were chosen on the basis of a cross-validation criterion, cf. HÄRDLE *et al.*, 2004.

[xiii] The unconditional expected values for the shares of the breakaway regions in all areas are 0.11 .

[xiv] The bandwidths of 0.02 (for the period 1980-2000) and 0.062 (for the pooled sample) were selected using cross-validation.

[xv] A similar result with respect to spatial concentration is reached by SÜDEKUM (2005), even though the disaggregation of the economy is much lower in that study (28 sectors). There, inter alia, the vast group of all business services is identified as showing a tendency of spatial concentration.