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HWWA Discussion Paper

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Concentration and Specialisation Trends in Germany since Reunification

ABSTRACT

In this paper we describe the development of regional specialisation and geographical concentration in Germany between 1993 and 2001. Somewhat contrary to theoretical expectations derived from the recent literature in location theory, we neither find compelling evidence for a specialisation process of German regions, nor for a concentration process of industries. By and large and with some exceptions, this conclusion holds both for West Germany and Germany as a whole, as well as for all levels of territorial aggregation (NUTS1-NUTS3). Urban areas are stronger specialised than rural districts, but also subject to faster de-specialisation. Those regions, which have increased regional specialisation against the trend, have performed significantly better in terms of employment growth.

Keywords: Regional Specialisation, Geographical Concentration, Economic Integration, Location Theory, Employment Growth, Germany

JEL-Classification: F14, F15, R12

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1. Introduction

How does economic integration affect the spatial structure of economic activity, both in terms of the specialisation of regions and the geographical concentration of industries? This important and politically highly relevant question has attracted a considerable interest by economists in recent years, with the primary focus laying on the introduction of new models in international trade, economic geography and growth theory. The ongoing integration of the European Union has always served as a natural case study to think about these issues, and something like a new “folk theorem”, due to Krugman (1991, 1993), has become popularised. According to this, EU regions will become stronger specialised and economic activity in Europe will become more geographically concentrated in the future. This famous prophecy was the starting point of an empirical literature dealing with the spatial economic structure of the European Union.

Compared to the theoretical advances that have been made, the empirical knowledge is still rather limited, however. This is particularly so at the sub-national level to which much of the new theoretical literature is devoted. Some papers describe the development of specialisation and concentration patterns across the EU. But a major problem of this literature is data availability and quality. Until today there is no consistent, comprehensive and balanced European regional data set.¹ Researchers were therefore often forced to use country level data (e.g. Aiginger/Pfaffermayr, 2004; Brülhart, 2001; Midelfahrt-Knarvik et al., 2003, 2000; Amiti, 1999; Haaland et al., 1999). EU-wide studies at the regional level are much scarcer, both concerning the specialisation of regions and the concentration of industries. The exceptions in this respect are Molle (1997), Midelfahrt-Knarvik/Overman (2002), Hallet (2002) and Brülhart/Traeger (2003), who – however – have to deal with issues like incomplete coverage, selectivity of the sample, inconsistent sectoral classification and territorial aggregation schemes across countries, and so on.² In addition, the observation period of these studies is at some point in the middle of the 1990s, usually 1995. Thereby the developments in the aftermath of more recent important events of the European integration process, e.g. the Maastricht-treaty, the Amsterdam-treaty, the treaty of Nice etc., are hardly covered or not covered at all.

1 In their recent Handbook-article, Combes/Overman (2004) put it this way: “After reviewing the literature, and given our first hand knowledge, the only conclusion that we are able to reach is that the European data are a mess.”

2 A complementary contribution comes from Stirboek (2004, 2002), who looks at investment and gross capital formation data instead of employment data across EU-regions.

The existing empirical literature almost unanimously concludes that EU countries have become more specialised since the 1970s. The picture for regional specialisation is mixed, as some regions became more, others less idiosyncratic. The same mixed picture emerges for the geographical concentration of industries: some concentrated while others became more dispersed. Aiginger/Leitner (2002) even point out that regional economic activity in the European Union is subject to a general de-concentration process. Combes/Overman (2004) and Krieger-Boden (2000) provide recent surveys, while insisting that the results for the regional level must be viewed with caution, given that all EU-wide studies are hampered with data problems.

One possible way out of this blues is to analyse specialisation and concentration patterns for individual EU countries, where the data situation is often much better. This has been done e.g. by Paluzie/Pons/Tirado (2001) for the case of Spain, or by Maurel/Sédillot (1999) for France. In this paper we will look at the developments in Germany, after all Europe`s biggest national economy. An important distinguishing feature of our study, also compared to other papers on individual countries, is that we can observe a very recent time period: from 1993 to 2001. Moreover, we can draw on an extremely accurate and entirely balanced panel that consistently covers the whole German territory and the complete population of all full-time employment relationships (subject to social security).

After a brief exposition of some theoretical arguments in section 2, we describe the data and the indices of choice in section 3. Then we present the descriptive evidence on specialisation and concentration trends in section 4. Our first main finding is that we can neither observe a general trend of regional specialisation, nor one of geographical concentration at the NUTS3-level in Germany. The average German region has become less specialised over the last decade. Most industries have become more dispersed. The ones that have become more concentrated are often very old fashioned and “declining” industries, where geographical concentration is simply due to the fact that the sector disappears more rapidly from some regions than from others. Only very few “modern” sectors, notably service industries have become more concentrated over the recent years. Since East Germany might be subject to some special influences, particularly in the first years of the observation period right after the German reunification in 1990, we also look separately at the developments in West Germany. Moreover, we perform the

analysis not only at the NUTS3-, but also at the NUTS2- and the NUTS1-level. It turns out that the main conclusions will not be altered substantially.³

In section 5 we turn to the *characteristics* of specialised regions and concentrated industries. We report some simple, but revealing correlations between the degree of specialisation and some regional characteristics on the one hand, and between the degree of concentration and some sectoral characteristics on the other hand. Lastly, in section 6, we look at the *implications* of specialisation for regional employment growth. Regional employment growth rates from 1993 to 2001 are estimated as a function of the level and the increase of specialisation (and some additional control variables). The main finding here is that the *increase* of regional specialisation, but not the level, significantly increases regional employment growth. In other words, even though regional specialisation has declined in Germany over the last decade, those regions which – against the trend – have become more specialised also have performed significantly better in terms of employment growth. Section 7 provides a summary and some concluding remarks.

2. Theoretical background

The theoretical literature on location theory and the spatial consequences of economic integration has by now become very voluminous, encompassing elements of trade theory, growth theory, urban economics and economic geography. There is also no shortage of survey and review articles, as well as elementary introductions. Hence, we shall be very brief at this point.⁴

It is useful to distinguish three broad families of models in the existing theoretical literature: (i) the traditional neoclassical approaches, (ii) models with external scale-effects and spillovers and (iii) models with internal scale economies and market-mediated linkages.

3 Interestingly, similar conclusions for Germany are also drawn by other authors who look at the disaggregated German employment and output structure from different perspectives and for earlier time periods (Moeller/Tassinopoulos, 2000; Bode, 1999; Broecker, 1989).

4 Readers might refer to Ottaviano/Puga (1998) or Neary (2001) for reviews of the ‘new economic geography’. Glaeser (1998) and Duranton/Puga (2000) provide very good overviews from the point of view of urban economics. A comprehensive treatise on the economics of agglomeration comes from Fujita/Thisse (2002).

The central elements of the first type of models are constant returns to scale, homogeneous products, perfect competition on all markets and full appropriation of the social contribution of input factors by the respective factor owner. Economic growth in these models is driven by capital accumulation (in a broad sense) in spirit of the Solow-model. The geographical structure of a multi-region economy, which may be a nation or an integrated economic area like the EU, is driven by exogenous endowments (different technologies, access to natural resources etc.), which also shape the inter-regional trade patterns. The elimination of trade barriers, i.e. falling spatial transaction costs, result in stronger regional specialisation and thereby – inter alia – in stronger geographical concentration of single industries, since regions increasingly focus production according to comparative advantages. Furthermore, increasing inter-regional trade and faster regional convergence of per-capita income levels are implied. Especially the latter result is corroborated by factor mobility. The traditional trade theory á la Heckscher/Ohlin and Ricardo belongs to this group of models.

In the second group of theories, homogeneity of the final products, constant returns at the firm level and marginal cost pricing prevail, but there are aggregate scale effects due to spillovers, which are assumed to be localised. Factor owners do not fully internalize their social contributions, but rather impose (usually positive) externalities on others. In the theory of economic growth, these externalities can act as a long-run growth engine, because they can prevent or at least delay the tragedy of decreasing returns to capital accumulation. Factor mobility must not necessarily lead to faster convergence any longer. Spillovers can be the cause of persistent regional disparities and, on an even finer geographical scale, are at the very heart of city formation (see Glaeser, 1998). Due to their localised nature, spillovers are an important motive for individuals to concentrate geographically. With respect to specialisation, the implications of these models are less obvious. There is a crucial question whether the localised knowledge spillovers accrue mainly within or across industries (see Glaeser et al., 1992 and Henderson et al., 1995). Concentration and specialisation are implied if spillovers are mainly intra-sectoral (localisation economies, ‘MAR externalities’). With mainly inter-sectoral spillovers (urbanisation economies, ‘Jacobs externalities’), agents would strive for geographical concentration of production, but not for specialisation. Moreover, concentration forces are also counteracted by congestion forces, such as commuting costs, higher housing prices etc. If dispersion forces are relatively strong, we should see rather low levels of geographical agglomeration, low city sizes etc. The stronger are spillovers, the more concentration (and possibly also specialisation) we should observe. The level of

transportation costs for final products and the stage of the economic integration process can be critical in the conflict between agglomeration and dispersion forces.

In this respect, the second group of models is very similar to the third group, where we now have internal scale economies, product differentiation and imperfect competition. Usually we have no external spillovers or comparative advantages in these models any longer⁵, but rely on pecuniary externalities and market-mediated linkages. Due to the existence of spatial transaction costs, there exist endogenous market size effects. Scale economies are more fully exploited in a thick local market, which can both be a growth engine (Romer, 1990) and an independent source of trade (Krugman, 1980). If enriched with the element of factor mobility, this model structure gives rise to the endogenous formation of geographical economic patterns that crucially depend on the level of transportation costs: With very high transportation costs (i.e. on an early stage of economic integration) firms must be close to consumers to satisfy final demand. If consumers are spread out over space, so will economic activity in general. With very low transportation costs or full economic integration, industry location ceases to matter and we should again observe a relatively dispersed spatial structure in order to avoid agglomeration-related congestion costs. But with intermediate trade costs, the so-called “centripetal” forces can take over. A core-periphery structure of economic activity can result, which implies both geographical concentration of mobile economic activity (in the core) and regional specialisation.

As noted already by Brülhart (2001), these different models can lead to somewhat observationally equivalent implications concerning the effects of deeper economic integration for the geographical equilibrium configuration. At least for some parameter constellations and thus for certain phases of the integration process, all above mentioned models suggest that we should observe more regional specialisation and more geographical concentration. Hence, more than one model can serve as the theoretical basis of the famous Krugman-hypothesis for the European Union. Interestingly, the traditional trade theory leads to the least ambiguous implications. The model class (ii) and in particular the model class (iii) offer a richer menu of possible spatial outcomes. The existing EU-wide empirical evidence at the national level tends to suggest that we are currently in a phase that implies more concentration/specialisation, thereby confirming the

5 Yet, it is possible to incorporate these mechanisms for industry location as additional elements. See Midelfart-Knarvik (2004) for an NEG-model with external, localised knowledge spillovers and Forslid/Wooton (2003) for an NEG-model with comparative advantage.

Krugman-hypothesis (see, however, Aiginger/Leitner, 2002). In the remainder of this paper we will look at whether this also holds for the internal developments within Germany.

3. Data and indices

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 subject to social security, i.e. excluding civil servants and self-employed individuals. Since 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. 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 finest level of territorial aggregation for which data is available is NUTS3. In Germany there are 439 NUTS3-regions (Landkreise and “kreisfreie Städte”). Since the descriptive evidence on specialisation and concentration might be sensitive to the aggregation level, we have added up the NUTS3 information also to the NUTS2-level (40 regions, corresponding to the German “Regierungsbezirke”) and to the NUTS1-level (16 regions, “Bundesländer”). The industry decomposition is, admittedly, not very deep. We can distinguish 28 different sectors, encompassing 15 manufacturing industries, 9 service industries, commerce, agriculture, mining and the public sector. The sector/region-panel is entirely balanced over the whole observation period and we are not faced with censoring problems. Data refer to the workplace location, not to the residence location of workers. Table 1 gives a first overview about the data. It reports the employment level and the employment share of each sector in 1993 and 2001, as well as the average annual growth rate (arithmetic mean). Full-time employment has been shrinking by an annual rate of 1.12 per cent over the observation period. In the West, the shrinking rate has “only” been 0.66 per cent, while in the East (incl. Berlin) it was 2.77 per cent per year. Furthermore, what is striking is the great variation of the sectoral growth rates. Most manufacturing industries (sectors 2, 4-16) and particularly mining shrink faster

Table 1: Sectoral employment growth in Germany

Nr	Sector	Employment level 1993	National employment share 1993	Employment level 2001	National employment share 2001	Average employment level 1993-2001	Average annual growth rate
1	Agriculture& Forestry	181991	0.8%	280076	1.4%	218618	7.3 %
2	Utilities& Electric Industry	316519	1.4%	225974	1.1%	275368	-4.1 %
3	Mining	210058	0.9%	80729	0.4%	130023	-11.1 %
4	Chemical Industry	588713	2.6%	449952	2.2%	501986	-3.3 %
5	Synthetic Material	381832	1.7%	382443	1.8%	369276	0.1 %
6	Nonmetallic Mineral Mining	221209	1.0%	177297	0.9%	206016	-2.7 %
7	Glass & Ceramics	147835	0.7%	105883	0.5%	117352	-4.0 %
8	Primary Metal Manufacturing	803140	3.5%	717306	3.5%	731691	-1.3 %
9	Machinery	993331	4.4%	857281	4.1%	878242	-1.8 %
10	Motor Vehicles	1177402	5.2%	1073734	5.2%	1056794	-1.1 %
11	Office Supplies, IT, Optics	1559756	6.9%	1441662	7.0%	1452574	-1.0 %
12	Musical Instrum., Jewelry, Toys	48296	0.2%	31824	0.2%	37068	-5.0 %
13	Wood-working	432600	1.9%	340415	1.6%	388480	-2.9 %
14	Paper & Printing	368046	1.6%	315215	1.5%	333538	-1.9 %
15	Leather & Apparel	407165	1.8%	220845	1.1%	285081	-7.3 %
16	Food & Tobacco	770558	3.4%	571851	2.8%	634718	-3.6 %
17	Building & Construction	2222561	9.8%	1595510	7.7%	1997583	-4.0 %
18	Commerce	2810985	12.3%	2607453	12.6%	2667950	-0.9 %
19	Information & Transportation	1297997	5.7%	1226531	5.9%	1214019	-0.7 %
20	Finance & Insurance	832691	3.7%	800677	3.9%	809917	-0.4 %
21	Hotels & Gastronomy	573385	2.5%	523680	2.5%	514679	-1.0 %
22	Health Care & Social Assistance	1628053	7.2%	1687389	8.1%	1633322	0.5 %
23	Business-related Services	1453003	6.4%	2260842	10.9%	1779546	5.7 %
24	Education	613252	2.7%	644954	3.1%	626792	0.7 %
25	Leisure-related Services	273173	1.2%	297514	1.4%	281546	1.1 %
26	Household-related Services	201870	0.9%	162034	0.8%	169312	-2.6 %
27	Social Services	533995	2.4%	473683	2.3%	487469	-1.4 %
28	Public Sector	1671185	7.4%	1179825	5.7%	1390826	-4.2 %

than the national average. The opposite is true for most service industries, which often have experienced positive employment growth rates.

There is additional information about important structural characteristics of the workforces in the respective sector/region-cells. We can distinguish three skill categories (without formal vocational qualifications, completed apprenticeship, higher education) calculated as portions of total employment. 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. We also have information about the employment portions in three categories of establishment sizes: with fewer than 20 employees, with 20-99 employees and with at least 100 employees. For each of these firm size classes we also know the number of active firms, and hence we can compute the average establishment size for small, medium and big plants in every region and industry. Unfortunately, we have no information about the employment level of every single firm. We also have no consistent information about output, so that we can not compute labor productivity.

There is a considerable debate about how to measure regional specialisation and, in particular, geographical concentration of industries (see Combes/Overman, 2004:12ff. and Overman/Redding/Venables, 2003 for an intensive discussion). A variety of indices has been proposed, each with its specific advantages and disadvantages. In this paper, we will confine to standard measures that are commonly used in the literature. Regional specialisation is measured by the Krugman-specialisation-index (KSI) that can be computed for every district and for every year. This is done in the following way: We compute the nationwide sectoral employment shares in the year t (\bar{x}_{it}) and the respective employment shares for each district r (x_{irt}). The KSI of district r at time t is the sum of the absolute values of the differences between the regional and the national employment shares.

$$KSI_{rt} = \sum_{i=1}^{28} |x_{irt} - \bar{x}_{it}| \quad (1)$$

It has a lower bound of zero (if region r has exactly the same industry mix as the entire country) and an upper bound of two if the regional industry structure has nothing in common with the national structure. The main critique against the KSI concerns the fact that it is not invariant with respect to the scale of territorial aggregation (as we shall see below). But for a given aggregation scheme it facilitates comparisons across regions. It

requires a consistent industrial classification scheme in all regions, which has posed problems for many EU-wide studies, but not for ours.

The standard measure for the geographical concentration of industries is the “locational Gini-coefficient” (GINI), based on the relative regional employment shares of industries. It is computed by ranking, for every industry i , the relative regional employment shares $s_{irt} = x_{irt}/\bar{x}_{it}$ in ascending order. Graphically, the GINI is the area between the Lorenz-curve and the 45°-line divided by the total area under the 45°-line. Analytically, it can be computed by the following formula

$$GINI_{it} = \frac{N}{N-1} \cdot \left[\frac{2}{N} \cdot \frac{\sum_{r=1}^N (r \cdot s_{irt})}{\sum_{r=1}^N s_{irt}} - \frac{N+1}{N} \right] \quad (2)$$

where N is the number of territorial units. The GINI is equal to zero if all regions have the same employment share of sector i , and equal to one if the sector is entirely concentrated in one region.

This concentration measure has been criticised, among other aspects, for not taking into account the “lumpiness” of firms. The GINI signals concentration if a sector is relatively overrepresented in an administrative unit. But this overrepresentation must not represent localisation effects, but might simply be the result of high concentration of employment in single plants. To cope with this problem, Ellison/Glaeser (1997) and Maurel/Sédillot (1999) have developed alternative indices of localisation that take firm size structures into account. However, the computation of these indices is quite demanding in terms of data availability, and due to a lack of employment data at the firm level we can also not calculate them exactly. Moreover, since we can observe only a relatively broad industrial classification scheme, indivisibilities at the firm level are not likely to be a major problem to measure concentration properly. To check this, we have approximated the Herfindahl-Hirshman-index (HHI) of the plant size distribution for every industry, which is an integral part of the concentration index of Ellison/Glaeser (1997) and Maurel/Sédillot (1999). We have used the average size of small, medium and big plants in every unit of observation, which we can compute with our data at hand, as a proxy for the actual firm size structure in every industry. It turns out that this HHI measure is in fact very small (< 0.005) for all industries except for mining, and thus a standard concentration measure at this industrial classification level is not biased

substantially by differences in firm size structures.⁶ In general, one should note that the disadvantages of GINI are really more evident if one mainly wants to compare the *level* of concentration across different industries. The focus in this paper, however, lies on the development of concentration over time, which is quite well reflected by a standard measure like the GINI, which – after all – has the strong appeal of being very easily interpretable.

4. Concentration and specialisation in Germany: The evidence

Concentration

We start with the descriptive evidence on geographical concentration. Table 2a in the appendix reports the GINI-coefficients for the 28 industries from 1993-2001 calculated on the basis of all 439 German NUTS3 regions. Furthermore we report the average level and the average annual growth rate (arithmetic mean) of the GINI. A positive (negative) value of the latter indicates that the respective industry has become more (less) concentrated over the observation period.

Looking first at the differences in the levels, one finds great variation across industries. The most concentrated industry is mining, which is predominantly represented in the Ruhr area in Western Germany. Manufacturing industries in general are stronger concentrated than services. Some activities such as commerce, construction and health care are ubiquitous, meaning that they almost account for an identical employment share in all regions. Out of these 28 industries, 17 have become less concentrated over the years. Among the 11 industries that have become more concentrated are mining, non-metallic mineral mining, agriculture, jewellery, woodworking, leather and food/tobacco. These are fairly old and traditional industries with a low and declining weight for overall employment (see table 1). The observation that these sectors have become more concentrated is thus due to the fact that they disappear faster from some regions than from others. The remaining four industries that have become more concentrated are machinery, construction, finance/insurance and the business-related services. In particular the latter two are two booming sectors with rapid growth rates that range considerably above average. In these cases it seems plausible that localisation economies have driven the con-

6 A different objection against the GINI is the difficulty to decompose the index into different subgroups. This is an important issue for EU-wide studies that try to disentangle within- and between-country differences in geographical concentration (see Brühlhart/Traeger, 2003), but it applies to our individual country study only to a lesser extent.

centration process. Interestingly, this concentration process of modern sectors appears to be mainly relevant for advanced services, which stands in some contrast to the focus on manufacturing that is often adopted in the theoretical economic geography literature.

In table 2b (see appendix) we look at the development of geographical concentration separately for the 326 West German NUTS3-regions (excluding West Berlin). The reason is the following: The spatial economic structure of East Germany was characterised by artificially high concentration levels. This economic structure was not driven by market forces, but by central economic planning of the socialist government with a heavy bias towards industrial monostructures. This geographical configuration was subject to rapid erosion after German re-unification (Blien et al., 2003), in particular in the first years of the observation period. We want to eliminate this historically “special” industrial reorganisation process and focus on the more market driven changes within West Germany.

The results indicate a bit, but not dramatically more concentration. 14 industries have become less, 14 more concentrated. Among the latter group we again have various declining industries as well as some advanced services. But now there is also a slight increase in the concentration of some modern manufacturing sectors (electronics, office supplies/IT). However, geographical concentration does by far not occur in all, or in all modern sectors in West Germany. For example, production in the automobile sector, the chemical industry, or in the education sector has become more spread out. These findings can be interpreted as mixed evidence on the Krugman-hypothesis for the case of West Germany.

How does the level of territorial aggregation affect the results? In tables 2c and 2d in the appendix we report the GINI computed on the NUTS2-level for Whole Germany and West Germany respectively. The level of the GINI does not deviate strongly from the NUTS3-level. For Whole (West) Germany, 20 (17) industries have become less concentrated. These are even more than on the NUTS3-level. The picture about those sectors that have become more concentrated is quite similar to the NUTS3-level: old industries and advanced services, and, if one only looks at West Germany, also some modern industrial sectors.

Finally we track concentration across German NUTS1 regions in table 2e (see appendix). 17 sectors have de-concentrated, 11 have concentrated. Compared with the

NUTS3-level for Whole Germany (table 2a), we have 8 industries where the sign of the average annual growth rate of the GINI differs: Motorvehicle production, health care, education and leisure-related services have become more concentrated on the NUTS1-, but less concentrated on the NUTS3-level.⁷ The opposite is true for jewellery, food/tobacco, construction and financial services. Apparently, conclusions about the concentration of single industries are somewhat sensitive to the territorial aggregation level. The industries that were subject to concentration both on the NUTS1- and the NUTS3-level were agriculture, mining, non-metallic mineral mining, machinery, woodworking, leather (i.e. the usual declining industries) and the business-related services.

We summarize the findings about the recent concentration trends in Germany in table 3 and figure 1. In table 3 we report, for all territorial scales and for Whole and West Germany, whether each sector has weakly or strongly (de-)concentrated. Strong (de-) concentration is arbitrarily defined by an average annual growth rate of the GINI that exceeds one per cent in absolute terms. In figure 1 we report the degree of concentration of the “average” German sector, which is simply the weighted average of the single GINI coefficients.

Table 3 indicates that only very few sectors have concentrated unambiguously, i.e. invariant to which territorial scale we measure concentration. Out of these sectors, the business-related services seem most interesting to us, as this sector is rapidly growing and the concentration process is presumably driven by localisation effects. For agriculture and building & construction this is almost surely not the case.

Looking only at West Germany, we can detect more concentration that is invariant to the spatial scale (e.g. IT, Synthetic Material). But also with West Germany as the reference, there are various modern sectors that unambiguously have deconcentrated (e.g. information, health care).

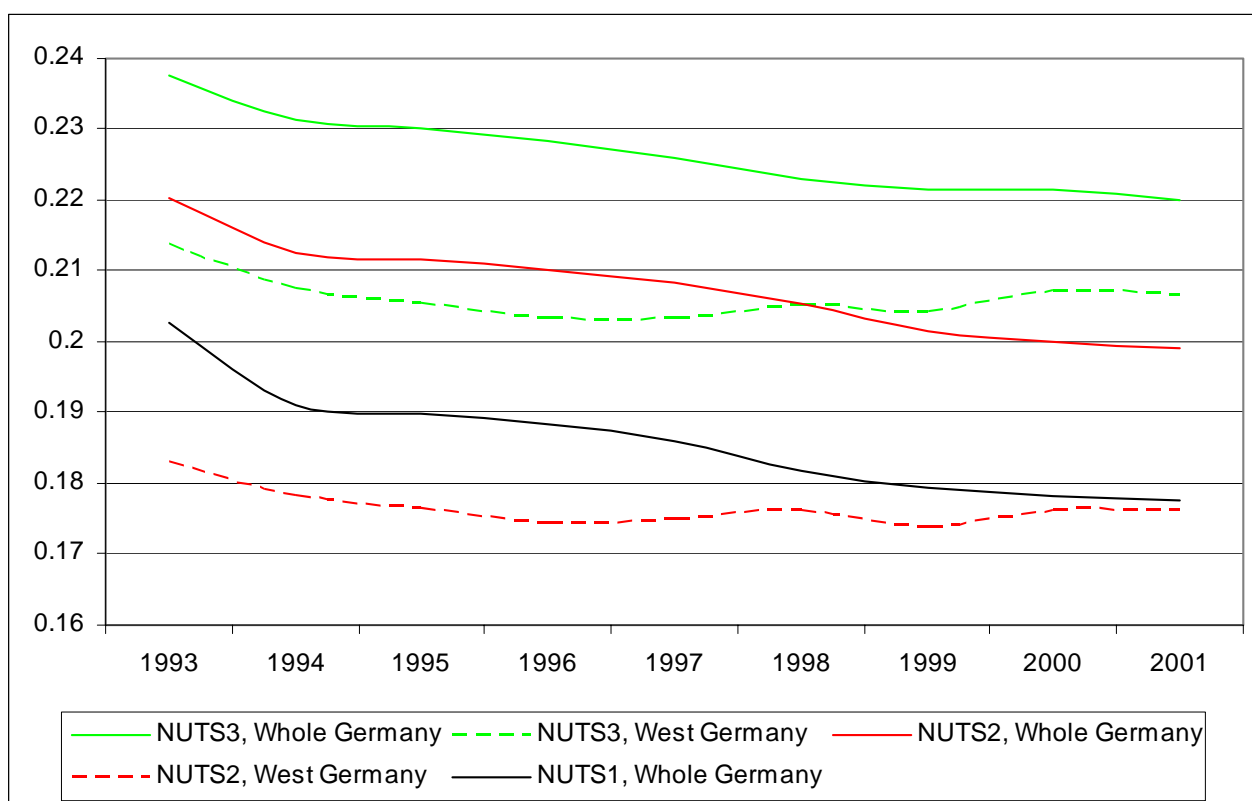
7 One possible way how this can happen is the following: Consider two NUTS1-regions (X,Y) consisting of two NUTS3 regions each (a_x, b_x, a_y, b_y). Think of some sector that is overrepresented in X compared to Y. Within region Y, the sector is heavily overrepresented in a_y compared to b_y , whereas the employment shares in a_x and b_x are identical. Now consider a shift of employment from a_y that accrues proportionally to a_x and b_x . This shift implies an increase of concentration at the NUTS1-level, as employment shift from region Y to region X. But at the same time it implies less concentration at the NUTS3-level, since the employment share decreases in a_y .

Table 3: Geographical concentration on different territorial levels

Nr	Sector	NUTS1, Whole Ger- many	NUTS2, Whole Germany	NUTS2, West Germany	NUTS3, Whole Germany	NUTS3, West Germany
1	Agriculture & Forestry	++	++	++	++	++
23	Business-related Serv- ices	++	+	+	++	++
9	Machinery	++	++	++	+	+
17	Building & Construc- tion	-	-	++	++	++
16	Food & Tobacco	--	-	++	++	++
20	Finance & Insurance	-	-	+	++	++
3	Mining	++	+	-	+	+
6	Nonmetallic Mineral Mining	+	+	+	+	+
24	Education	++	++	--	-	--
15	Leather & Apparel	+	+	-	+	+
25	Leisure-Related Serv- ices	++	+	+	-	-
13	Wood-working	++	-	-	+	+
5	Synthetic Material	--	--	++	-	+
26	Household-Related Services	--	--	-	-	++
10	Motor Vehicles	+	-	+	-	-
11	Office Supplies, IT, Optics	--	-	+	-	+
22	Health Care & Social Assistance	+	--	-	--	--
12	Musical Instrum., Jewelry, Toys	--	-	-	+	-
2	Utilities & Electric Industry	-	--	-	--	+
4	Chemical Industry	--	--	--	-	-
18	Commerce	--	--	--	-	--
7	Glass & Ceramics	-	-	-	-	-
21	Hotels & Gastronomy	--	--	--	-	--
19	Information & Trans- portation	--	--	--	--	--
14	Paper & Printing	--	--	-	--	-
8	Primary Metal Manu- facturing	--	-	-	--	-
28	Public Sector	--	--	-	--	--
27	Social Services	--	--	-	--	--

- ++) Average annual growth rate GINI > 1 %
+) 0 % < Average annual growth rate GINI < 1 %
-) - 1 % < Average annual growth rate GINI < 0 %
--) Average annual growth rate GINI < -1 %

Figure 1: GINI (weighted average) across spatial scales



Looking at the “average” German sector, figure 1 verifies the impression that Whole Germany has experienced a slight de-concentration process. Concentration in West Germany en gros does not seem to have any clear trend.

Specialisation

We now turn to the specialisation of regions and we again start with the NUTS3-level. Since it would be unhandy to report the KSI for all 439 districts⁸, we suffice to report the range as well as the weighted and unweighted average and the standard deviation of the KSI for all years. This is done in table 4a in the appendix. Germany’s most specialised region is the district of Wolfsburg, where the VW headquarters are located. Other heavily specialised regions are Leverkusen (Bayer), Erlangen (Siemens) or Dingolfing-Landau (BMW). The (weighted) average level of the KSI over the years has been 0.4781. However, this average KSI more or less constantly declines over the observation period. Therefore, the average German NUTS3-region has become less idiosyn-

⁸ A list with all KSIs is available upon request from the author.

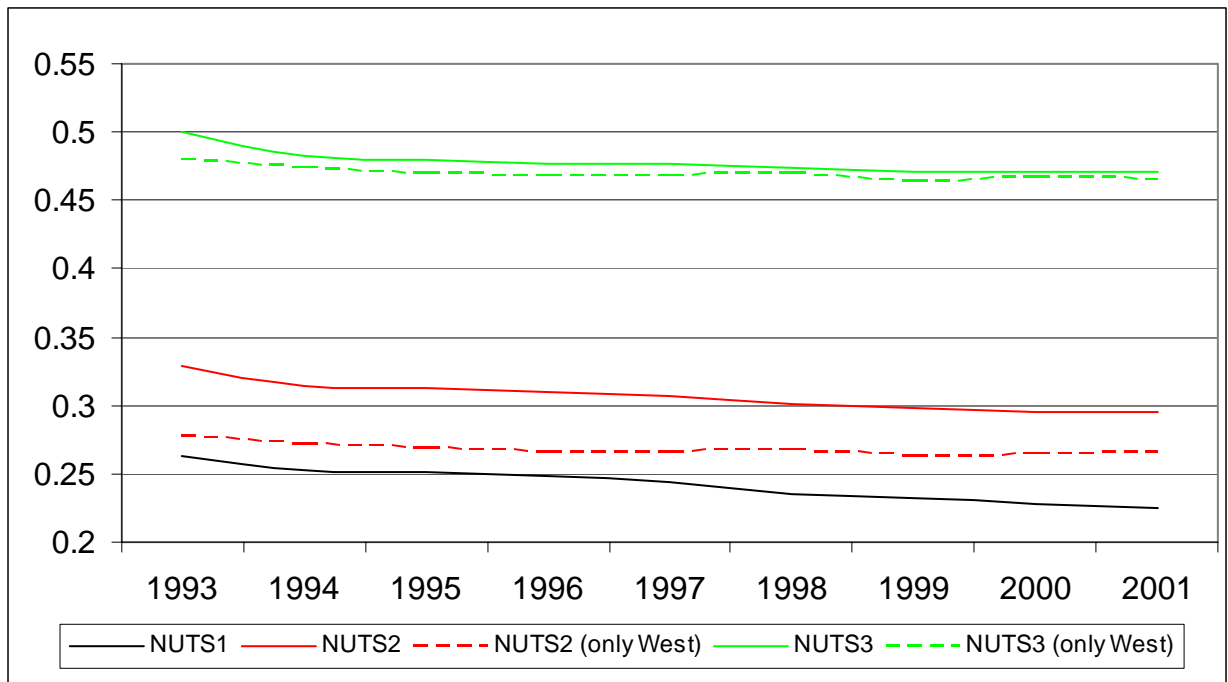
cratic over time. There are 158 NUTS3 regions that have become more specialised, but the majority of 281 districts converged to the average German industrial structure. Also the minimum and the maximum KSI as well as the standard deviation of the KSI have declined.

These numbers again encompass the artificially high degrees of specialisation in East Germany (and the rapid erosion thereof in the years after 1990). Table 4b in the appendix therefore reports the KSI only for the West German NUTS3-regions, with the average West German industrial structure as the reference. The conclusions do not change dramatically, but the de-concentration process in the West is not so rapid. Regional specialisation of the average region first declines, and then remains roughly stable since 1997. The numbers also reveal that the average region in the West is less specialised than the average region in the East, particularly in the early years of the observation period.

When switching to a more aggregate spatial scale (NUTS2 and NUTS1), the average level of the KSI declines. This highlights the fact that the KSI is not comparable across different scales, which has posed problems for EU-wide studies where (due to data availability) different NUTS-levels for different countries have been used (e.g. Hallet, 2002). The conclusions about the de-specialisation of the average German region do not change, however, neither for the NUTS2- nor the NUTS1-level.

Tables 4c and 4d in the appendix show that most regions have exhibited convergence to the average (West) German industrial structure. Some regions have become more specialised (12 out of 40 NUTS2-, and 3 out of 16 NUTS1-regions), but this was the exception and not the rule. Average specialisation is higher in the East than in the West, but also more rapidly declining. Figure 2 illustrates the findings graphically by summarizing the development of the (weighted) average KSI over time across the different spatial scales.

Figure 2: KSI (weighted average) across spatial scales



All in all, the evidence presented in this section suggests that we have neither seen much concentration, nor much specialisation in Germany's regions since 1993. If anything, then the opposite (de-concentration and de-specialisation) has occurred. This conclusion holds by and large for all levels of territorial aggregation. In West Germany we see more concentration and specialisation over time than in Germany as a whole, but also not to an extent that would greatly verify the Krugman-hypothesis outlined in the introduction.

Note, however, that we adopt a national perspective and essentially compare local with national economic structures. Our results do therefore not report the specialisation and concentration of German regions and sectors from an EU-wide perspective. If Germany as a whole becomes more idiosyncratic compared to the rest of the European community (which according to Midelfart-Knarvik/Overman [2002] is in fact the case since the early 1980s), also the conclusions about concentration and specialisation of German industries and regions might be different from an EU-wide perspective. Apparently, we observe stronger specialisation across countries. But this process, at least for the case of Germany, does not seem to be accompanied by an internal specialisation process at any

regional level.⁹ Taken at face value, this implies that European countries successively develop more distinguished industrial patterns, but that the single regions in these countries converge (at least in the majority) to the national average structures. This conclusion is drawn, however, by combining the empirical findings of several papers that use different data sets with different industrial classification schemes, inconsistent territorial classification schemes and different coverage periods. Once better EU-wide data is available, clearly more work is needed to verify or to reject this tentative impression.

5. The characteristics of specialised regions and concentrated industries

In this section we turn to the characteristics of specialised regions and concentrated industries. Some parts of the literature (including EU-wide and other individual country studies, e.g. Haaland et al., 1999; Amiti, 1999; Midelfart-Knarvik et al., 2000; Paluzie/Pons/Tirado, 2001) have tried to uncover causal explanations for the observed specialisation and concentration patterns by using statistical analysis, while other authors (e.g. Hallet, 2002; Brühlhart, 2001) have sufficed to present descriptive evidence. In this paper we go along with the second group. This choice has been made for the following reasons: Firstly, we have based our descriptive presentation in the last section on simple indices that pin down specialisation and concentration in one single number. In statistical analyses, however, these indices are not very good as left-hand-side variables, because they waste information about the precise location of single industries and different specialisation patterns of the single regions.¹⁰ Secondly, given that we have only a broad industrial classification scheme, we have only 28 GINI coefficients per year, which are surely too few observations to conduct a meaningful statistical analysis. Lastly, Combes/Overman (2004:27) classify various conceptual problems of these estimations, e.g. omitted variable bias and endogeneity, which cast doubts on whether the results one obtains can really be interpreted as causal *explanations* of the observed spatial economic patterns.

In order to avoid these problems, we report some simple correlations between the KSI and various regional characteristics, as well as between the GINI and various industry

9 According to Paluzie/Pons/Tirado (2001) a internal specialisation or concentration trend has also not occurred in Spain.

10 E.g., a high value of the KSI indicates that a regional economic structure is very different from the average national structure, but it does not tell in *what* activities the region is specialised. This point is made by Midelfart-Knarvik et al.(2000).

characteristics that have been described in section 3. All correlations refer to the NUTS3-level for Whole Germany. Table 5 shows the cross-correlation table for regional characteristics. The first two variables are the KSI in 1993 and the average annual growth rate of the KSI over the observation period. The negative correlation (-0.2178) suggests that regions with a high degree of regional specialisation in the base year experienced lower increases of specialisation (i.e. stronger structural convergence) than regions with a low initial level of the KSI. This correlation entails the de-specialisation process in East Germany as well as the general de-specialisation process that was discussed in section 4.

Table 5: Regional specialization and regional characteristics, NUTS3 (n=439)

	KSI 1993	aver.annual growth KSI	density 1993-2001	big firms 1993-2001	high skilled 1993-2001
KSI 1993	1				
aver. annual growth KSI	-0.2178	1			
density 1993-2001	0.0522	-0.0269	1		
big firms 1993-2001	0.2992	-0.0728	0.6541	1	
high skilled 1993-2001	0.0856	-0.1553	0.5481	0.3813	1

A high level of specialisation (a high KSI in 1993) also tends to go along with a higher average employment density (defined as total employment over area size in square kilometres), a large regional share of high skilled employees and, in particular, with a large employment share in big plants. The correlation coefficients are 0.0522, 0.0856 and 0.2992, respectively. These three indicators are all computed as time averages over the whole observation period, but conclusions do not change if we use the respective figures for the base year instead. Essentially they reflect urban characteristics, although not necessarily features of large metropolitan areas. They are all positively correlated among themselves. On average (large and medium-sized) cities are characterised by a high employment density and an overrepresentation of skilled workers and big firms. Table 5 suggests that areas with these urban characteristics tend to be stronger specialised than rural areas. This is a quite well known stylised from the American urban economics literature (see e.g. Duranton/Puga, 2000), which carries over to the German case. Yet, the growth rate of the KSI is mildly negatively correlated with these city features (-0.0269, -0.1553 and -0.0728 for density, skilled workers and big firms, respec-

tively). This adds up to the impression that urban areas experienced a stronger structural convergence process than the average German region.

In table 6 we report the cross-correlations between geographical concentration and some industry characteristics.

Table 6: Geographical concentration and industry characteristics, NUTS3 (n=28)

	GINI 1993	aver.annual growth GINI	nat.share 1993-2001	big firms 1993-2001	High skilled 1993-2001
GINI 1993	1				
aver. annual growth GINI	-0.0239	1			
nat. share 1993-2001	-0.5834	-0.1192	1		
big firms 1993-2001	0.5999	-0.3809	-0.1741	1	
high skilled 1993-2001	-0.0052	-0.2020	0.1022	0.3282	1

The numbers suggest that the relationship between the level and the average growth rate of geographical concentration is virtually zero (-0.0239). More interestingly, the correlation between the level of concentration ($GINI_{93}$) and the national employment share (i.e. the size) of the respective industry is strongly negative (-0.5834). This suggests that mainly such industries are concentrated that have a low weight for total national employment (e.g. mining, food/tobacco etc.). Moreover, geographical concentration tends to come with a high employment fraction in big firms. This observation notwithstanding, firm size structures are not so different across industries to overwhelm the accuracy of the GINI concentration index (see the discussion in section 3). There seems to be no relationship between concentration and the fraction of high skilled in the respective sectoral workforce. Again, very similar results are obtained if we use figures for the base year instead of time averages.

6. The implications of specialisation for regional employment growth

Finally we look at the implications of specialisation for regional employment growth.¹¹ We compute a cross-section of growth rates y_r for all NUTS3-regions from 1993 to 2001, i.e.

$$y_r = \frac{emp_{r,2001} - emp_{r,1993}}{emp_{r,1993}} \quad (3)$$

As explanatory variables we firstly use the average annual growth rate of the KSI as a measure for the specialisation trend of region r . We include time averages of the employment density of region r (in logs) and the level of the KSI. Additionally we control for the employment share in big firms and the share of high skilled workers in region r , and we add a dummy variable for regions from East Germany. We use OLS with robust standard errors, since the White-test indicated potential problems with heteroskedasticity. Results are reported in table 7.¹²

The main finding is that the average annual growth rate of the KSI significantly increases employment growth. Thus, the regional growth rate was higher if the region increased specialisation during the observation period. But there is no significant relationship between the average *level* of specialisation and the employment growth rate. Given the descriptive findings from section 4, this statistical result can be interpreted such that those regions which became stronger specialised in the last decade, i.e. that developed against the general trend, performed significantly better in terms of the regional employment growth rate. This result is illustrated also in the figure 3, where the average annual growth rate of the KSI is plotted against the regional employment growth rate. A positive correlation is obvious, and this impression is confirmed by our statistical results.

11 Due to the low number of observations ($n=28$) we chose not to perform an analogous analysis for the implications of geographical concentration for sectoral employment growth.

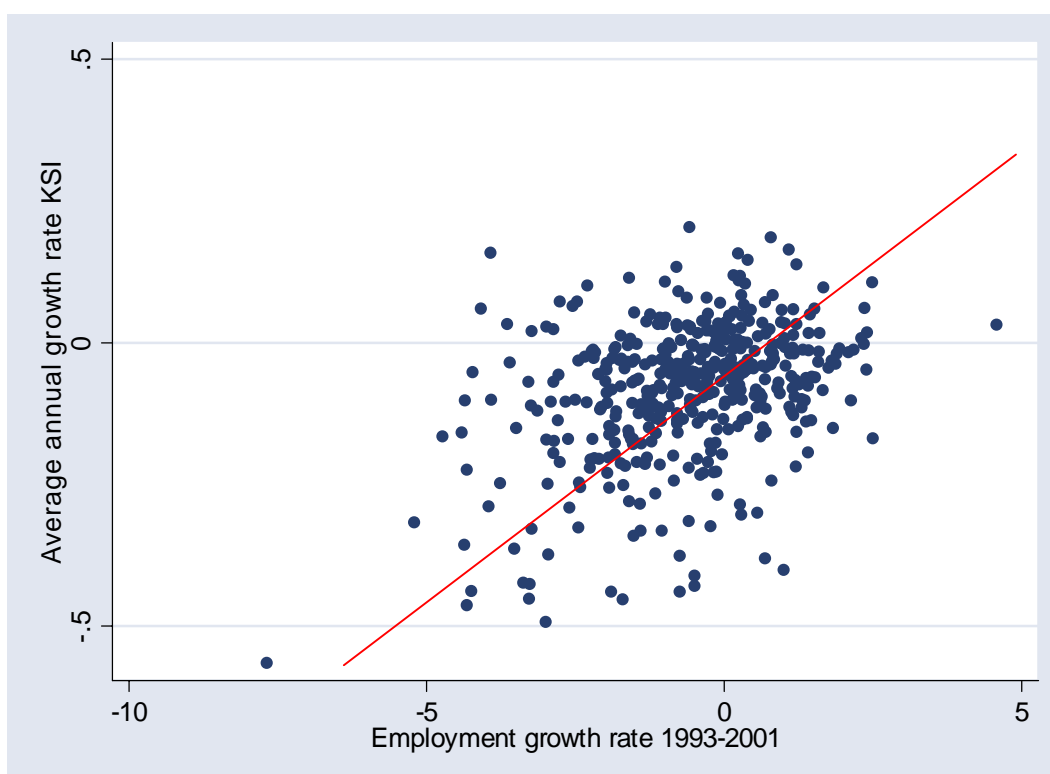
12 Results do not change if we use base year figures instead of time averages for the explanatory variables.

Table 7: Regional specialization and employment growth – Regression results

Variable	Coefficient (t-statistic)
Log (average density _t)	-0.0220*** (-3.50)
Average KSI _t	0.0263 (0.64)
Average annual growth rate KSI _t	0.0186*** (6.18)
Av.portion big firms _t	-0.2311*** (-3.01)
Av.portion high skilled _t	0.5257*** (2.58)
Dummy East Germany	-0.1786*** (-11.28)
Constant	0.1123*** (4.84)

N=439, R²=0.4333

Figure 3: Regional specialisation and regional employment growth



The other estimation results reported in table 7 are straightforward to interpret. East German districts grew significantly slower (or better: lost full-time employment much faster) than West German ones. A high employment proportion in large firms is harmful for growth, whereas a large fraction of high skilled workers is conducive. Both results agree with findings of Suedekum/Blien (2004), who adopt an even more disaggregated view and analyze employment growth on the level of single district-industries by using a shift-share regression approach. The intuition is that more high skilled workers may raise the total factor productivity in region r via an aggregate human capital externality and thereby contribute to job creation. An overrepresentation of large firms is bad for growth, because this might represent a high degree of local monopolisation. Firm sizes have often been used as a proxy for the degree of competition in local product markets (see e.g. Glaeser et al., 1992), and the negative effect that we obtain is in line with the general results obtained in this literature.

Lastly, the negative coefficient associated with employment density can be interpreted as an indicator for sub-urbanisation. That is, Germany experiences a long-run trend of spatial de-concentration of economic activity. Employment secularly shifts away from dense core cities, towards surrounding areas. This phenomenon is documented e.g. in Bode (1999), who also surveys the literature of sub-urbanisation, as well as in Moeller/Tassinopoulos (2000). Note that this latter finding complements the descriptive statistics from the last section quite nicely. In section 5 we have found that regions with urban characteristics (high density, many high skilled, high employment share in big firms) tended to de-specialize faster than the average German region. In this section we find that low density and a specialisation trend over time (i.e. non-urban characteristics) are both conducive to local employment growth. This suggests that employment growth should be more rapid in non-urban than in dense urban areas, which in fact seems to be the case.

7. Summary and conclusion

Over the recent time period from 1993 to 2001, there was neither a process of regional specialisation, nor one of geographical concentration of industries in Germany. Some regions became more specialised, and some industries became more concentrated. But this was more the exception than the rule. This also holds, albeit to a smaller extent, if we eliminate the artificial de-concentration and de-specialisation process in East Germany and focus exclusively on West Germany.

Once more reliable data become available at the pan-European level, these results should be set into a broader perspective. If Germany as a whole becomes more idiosyncratic compared to other EU-countries, then a similar conclusion might follow for the German regions. However, we can conclude with confidence that there was no strong internal specialization or concentration process in Europe's biggest economy. In other words, for Germany as an individual large country we find no compelling evidence for the Krugman-hypothesis, according to which the ongoing process of economic integration should result in more idiosyncratic economic patterns across space.

However, those regions which, against the trend, have increased specialisation over the recent decade performed significantly better in terms of employment growth. These were predominantly non-urban areas. Urban districts with a high employment density are usually stronger specialised than rural and surrounding areas. But the general de-specialisation process also went on faster in these regions, and the urban centres lost employment faster than the average German region.

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Table 2a: Gini-coefficient, NUTS3, Whole Germany, 439 districts

Nr	Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average growth rate (%)
1	Agriculture& Forestry	0.21	0.22	0.26	0.27	0.28	0.27	0.41	0.40	0.40	0.30	9.05
2	Utilities& Electric Industry	0.33	0.31	0.30	0.28	0.27	0.27	0.26	0.27	0.26	0.28	-2.88
3	Mining	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.01
4	Chemical Industry	0.65	0.65	0.64	0.64	0.64	0.63	0.62	0.62	0.62	0.63	-0.57
5	Synthetic Material	0.45	0.44	0.44	0.44	0.44	0.43	0.43	0.43	0.44	0.44	-0.51
6	Nonmetallic Mineral Mining	0.33	0.33	0.32	0.32	0.32	0.33	0.33	0.34	0.34	0.33	0.16
7	Glass & Ceramics	0.78	0.78	0.77	0.77	0.76	0.76	0.76	0.76	0.76	0.77	-0.35
8	Primary Metal Manuf.	0.37	0.34	0.34	0.34	0.34	0.34	0.33	0.33	0.33	0.34	-1.18
11	Machinery	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.39
10	Motor Vehicles	0.42	0.42	0.41	0.41	0.40	0.40	0.39	0.39	0.40	0.41	-0.64
11	Office Supplies, IT, Optics	0.32	0.33	0.32	0.32	0.33	0.33	0.33	0.32	0.32	0.33	-0.15
12	Musical Instrum., Jewelry, Toys	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.01
13	Wood-working	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.38	0.37	0.34
14	Paper & Printing	0.40	0.40	0.39	0.39	0.38	0.37	0.37	0.37	0.37	0.38	-1.01
15	Leather & Apparel	0.50	0.50	0.50	0.51	0.51	0.52	0.52	0.52	0.53	0.51	0.89
16	Food & Tobacco	0.14	0.14	0.14	0.15	0.15	0.15	0.16	0.17	0.18	0.15	2.63
17	Building & Construction	0.03	0.06	0.08	0.08	0.08	0.07	0.06	0.04	0.03	0.06	3.65
18	Commerce	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	-0.26
19	Information & Transportation	0.19	0.19	0.19	0.17	0.15	0.15	0.13	0.13	0.12	0.16	-5.23
20	Finance & Insurance	0.18	0.18	0.19	0.19	0.20	0.19	0.19	0.21	0.20	0.19	1.21
21	Hotels & Gastronomy	0.18	0.17	0.17	0.17	0.17	0.16	0.16	0.17	0.17	0.17	-0.87
22	Health Care & Social Assistance	0.06	0.06	0.06	0.06	0.05	0.05	0.06	0.05	0.05	0.06	-2.94
23	Economy-Related Services	0.18	0.18	0.19	0.19	0.20	0.19	0.20	0.21	0.21	0.19	1.56
24	Education	0.29	0.30	0.29	0.28	0.27	0.25	0.28	0.27	0.27	0.28	-0.77
25	Leisure-Related Services	0.45	0.45	0.45	0.45	0.45	0.44	0.44	0.44	0.43	0.45	-0.70
26	Household-related Services	0.06	0.05	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.05	-0.61
27	Social Services	0.25	0.26	0.25	0.25	0.24	0.23	0.22	0.22	0.21	0.24	-2.13
28	Public Sector	0.19	0.16	0.14	0.14	0.13	0.14	0.11	0.10	0.10	0.13	-7.36

Table 2b: Gini-coefficient, NUTS3, Only West Germany, 326 districts

	Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average growth rate (%)
1	Agriculture& Forestry	0.16	0.16	0.16	0.16	0.16	0.17	0.23	0.23	0.23	0.19	5.13
2	Utilities& Electric Industry	0.25	0.25	0.26	0.25	0.25	0.26	0.26	0.27	0.26	0.26	0.45
3	Mining	0.90	0.90	0.90	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.08
4	Chemical Industry	0.61	0.62	0.61	0.61	0.61	0.60	0.60	0.60	0.60	0.61	-0.19
5	Synthetic Material	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.40	0.39	0.21
6	Nonmetallic Mineral Mining	0.34	0.34	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.28
7	Glass & Ceramics	0.78	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	-0.09
8	Primary Metal Manuf.	0.38	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	-0.66
9	Machinery	0.30	0.31	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.09
10	Motor Vehicles	0.43	0.42	0.42	0.42	0.42	0.42	0.41	0.42	0.42	0.42	-0.15
11	Office Supplies, IT, Optics	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.04
12	Musical Instrum., Jewelry, Toys	0.81	0.81	0.80	0.80	0.79	0.80	0.80	0.80	0.80	0.80	-0.12
13	Wood-working	0.38	0.38	0.38	0.38	0.39	0.40	0.40	0.40	0.40	0.39	0.60
14	Paper & Printing	0.32	0.32	0.31	0.31	0.30	0.30	0.30	0.31	0.30	0.31	-0.56
15	Leather & Apparel	0.46	0.47	0.47	0.48	0.47	0.48	0.49	0.49	0.50	0.48	0.86
16	Food & Tobacco	0.13	0.13	0.13	0.13	0.14	0.17	0.16	0.16	0.17	0.14	3.43
17	Building & Construction	0.01	0.011	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	13.00
18	Commerce	0.07	0.07	0.07	0.07	0.06	0.07	0.06	0.07	0.06	0.07	-1.33
19	Information & Transportation	0.16	0.17	0.16	0.15	0.14	0.14	0.13	0.13	0.13	0.14	-3.12
20	Finance & Insurance	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.16	0.16	0.15	1.15
21	Hotels & Gastronomy	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.16	0.16	0.17	-1.83
22	Health Care & Social Assistance	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.06	-3.05
23	Economy-Related Services	0.19	0.19	0.19	0.20	0.20	0.21	0.21	0.22	0.22	0.20	1.97
24	Education	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.21	0.20	0.21	-1.53
25	Leisure-Related Services	0.45	0.45	0.44	0.45	0.45	0.44	0.44	0.43	0.42	0.44	-0.69
26	Household-related Services	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.04	6.84
27	Social Services	0.24	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.22	0.23	-1.51
28	Public Sector	0.11	0.11	0.10	0.09	0.09	0.09	0.08	0.08	0.08	0.09	-4.22

Table 2c: Gini-coefficient, NUTS2, Whole Germany, 40 districts

Nr	Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average growth rate (%)
1	Agriculture & Forestry	0.21	0.23	0.26	0.26	0.27	0.27	0.40	0.38	0.39	0.30	8.40
2	Utilities & Electric Industry	0.16	0.16	0.15	0.14	0.14	0.14	0.13	0.14	0.14	0.14	-1.50
3	Mining	0.69	0.71	0.72	0.72	0.72	0.73	0.73	0.72	0.70	0.72	0.13
4	Chemical Industry	0.45	0.45	0.43	0.43	0.43	0.41	0.40	0.40	0.39	0.42	-1.69
5	Synthetic Material	0.31	0.31	0.30	0.30	0.29	0.28	0.29	0.28	0.28	0.29	-1.16
6	Nonmetallic Mineral Mining	0.27	0.26	0.26	0.25	0.25	0.26	0.26	0.27	0.27	0.26	0.20
7	Glass & Ceramics	0.52	0.52	0.51	0.53	0.50	0.49	0.48	0.48	0.48	0.50	-0.87
8	Primary Metal Manufacturing	0.29	0.28	0.28	0.28	0.28	0.28	0.27	0.28	0.27	0.28	-0.92
9	Machinery	0.24	0.24	0.25	0.26	0.27	0.28	0.28	0.27	0.27	0.26	1.75
10	Motor Vehicles	0.32	0.33	0.33	0.32	0.32	0.32	0.31	0.32	0.32	0.32	-0.02
11	Office Supplies, IT, Optics	0.29	0.27	0.27	0.27	0.28	0.28	0.28	0.27	0.27	0.28	-0.67
12	Musical Instrum., Jewelry, Toys	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.53	0.53	0.54	-0.67
13	Wood-working	0.32	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.31	0.31	-0.31
14	Paper & Printing	0.27	0.26	0.26	0.25	0.25	0.25	0.24	0.24	0.24	0.25	-1.43
15	Leather & Apparel	0.39	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.40	0.40	0.25
16	Food & Tobacco	0.19	0.18	0.17	0.18	0.18	0.18	0.18	0.18	0.19	0.18	-0.31
17	Building & Construction	0.16	0.18	0.20	0.20	0.20	0.19	0.18	0.17	0.16	0.18	-0.15
18	Commerce	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-2.14
19	Information & Transportation	0.20	0.19	0.18	0.17	0.17	0.17	0.15	0.15	0.15	0.17	-3.65
20	Finance & Insurance	0.20	0.20	0.20	0.20	0.20	0.19	0.19	0.20	0.20	0.20	-0.39
21	Hotels & Gastronomy	0.18	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15	-3.27
22	Health Care & Social Assistance	0.08	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.07	0.07	-1.68
23	Economy-Related Services	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.97
24	Education	0.24	0.25	0.24	0.24	0.23	0.22	0.25	0.24	0.26	0.24	1.38
25	Leisure-Related Services	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.25	0.82
26	Household-related Services	0.11	0.07	0.07	0.07	0.06	0.07	0.07	0.07	0.08	0.08	-2.32
27	Social Services	0.22	0.18	0.19	0.19	0.18	0.18	0.18	0.18	0.17	0.19	-2.46
28	Public Sector	0.25	0.21	0.20	0.20	0.19	0.20	0.16	0.16	0.17	0.19	-4.37

Table 2d: Gini-coefficient, NUTS2, Only West Germany, 30 district

Nr	Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average growth rate (%)
1	Agriculture& Forestry	0.19	0.19	0.19	0.19	0.20	0.20	0.24	0.24	0.24	0.21	3.05
2	Utilities& Electric Industry	0.13	0.13	0.13	0.13	0.12	0.12	0.11	0.13	0.13	0.13	-0.32
3	Mining	0.77	0.77	0.77	0.77	0.77	0.77	0.76	0.77	0.74	0.76	-0.39
4	Chemical Industry	0.42	0.4	0.41	0.40	0.40	0.39	0.38	0.38	0.37	0.40	-1.25
5	Synthetic Material	0.21	0.22	0.21	0.21	0.22	0.21	0.22	0.22	0.232	0.22	1.09
6	Nonmetallic Mineral Mining	0.28	0.28	0.28	0.27	0.27	0.28	0.28	0.28	0.29	0.28	0.12
7	Glass & Ceramics	0.52	0.51	0.51	0.50	0.50	0.49	0.49	0.49	0.50	0.50	-0.55
8	Primary Metal Manufacturing	0.32	0.30	0.30	0.30	0.30	0.30	0.29	0.30	0.29	0.30	-0.95
9	Machinery	0.21	0.21	0.21	0.21	0.22	0.23	0.23	0.23	0.23	0.22	1.17
10	Motor Vehicles	0.29	0.29	0.29	0.28	0.28	0.29	0.28	0.31	0.30	0.29	0.15
11	Office Supplies, IT, Optics	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.23	0.32
12	Musical Instrum., Jewelry, Toys	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.53	0.53	0.55	-0.81
13	Wood-working	0.32	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	-0.02
14	Paper & Printing	0.16	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	-0.00
15	Leather & Apparel	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.34	0.35	0.35	-0.14
16	Food & Tobacco	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.20	0.19	1.55
17	Building & Construction	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.10	1.15
18	Commerce	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	-1.29
19	Information & Transportation	0.17	0.16	0.16	0.16	0.15	0.15	0.14	0.14	0.14	0.15	-2.334
20	Finance & Insurance	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.16	0.89
21	Hotels & Gastronomy	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.13	0.13	0.14	-1.89
22	Health Care & Social Assistance	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	-0.76
23	Economy-Related Services	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.58
24	Education	0.15	0.15	0.16	0.15	0.15	0.14	0.12	0.13	0.13	0.14	-2.23
25	Leisure-Related Services	0.25	0.25	0.25	0.24	0.24	0.25	0.25	0.26	0.25	0.25	0.33
26	Household-related Services	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	-0.64
27	Social Services	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.1	0.15	0.16	-0.91
28	Public Sector	0.11	0.11	0.11	0.10	0.10	0.11	0.11	0.10	0.11	0.11	-0.61

Table 2e : Gini-coefficient, NUTS1, Whole Germany, 16 districts

Nr	Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average growth rate (%)
1	Agriculture& Forestry	0.24	0.25	0.27	0.27	0.28	0.28	0.43	0.41	0.41	0.32	7.82
2	Utilities& Electric Industry	0.13	0.12	0.11	0.11	0.10	0.10	0.09	0.10	0.12	0.11	-0.51
3	Mining	0.60	0.65	0.67	0.67	0.68	0.69	0.69	0.68	0.65	0.67	1.06
4	Chemical Industry	0.41	0.40	0.39	0.39	0.39	0.38	0.37	0.37	0.35	0.38	-1.84
5	Synthetic Material	0.31	0.29	0.28	0.28	0.27	0.26	0.26	0.26	0.26	0.27	-2.26
6	Nonmetallic Mineral Mining	0.25	0.23	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.24	0.75
7	Glass & Ceramics	0.37	0.38	0.37	0.36	0.35	0.35	0.35	0.36	0.36	0.36	-0.49
8	Primary Metal Manufacturing	0.28	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.26	-1.12
9	Machinery	0.21	0.22	0.23	0.24	0.24	0.25	0.25	0.24	0.24	0.23	1.55
10	Motor Vehicles	0.27	0.293	0.29	0.27	0.28	0.28	0.27	0.28	0.27	0.28	0.30
11	Office Supplies, IT, Optics	0.26	0.22	0.23	0.22	0.23	0.23	0.23	0.22	0.22	0.23	-2.00
12	Musical Instrum., Jewelry, Toys	0.46	0.45	0.44	0.44	0.44	0.43	0.42	0.42	0.42	0.44	-1.30
13	Wood-working	0.19	0.22	0.22	0.21	0.21	0.21	0.21	0.21	0.22	0.21	1.32
14	Paper & Printing	0.30	0.29	0.28	0.28	0.27	0.27	0.25	0.25	0.25	0.27	-2.39
15	Leather & Apparel	0.30	0.32	0.32	0.32	0.31	0.31	0.31	0.31	0.31	0.31	0.63
16	Food & Tobacco	0.179	0.13	0.12	0.12	0.12	0.12	0.13	0.12	0.13	0.13	-2.96
17	Building & Construction	0.17	0.19	0.20	0.21	0.21	0.19	0.18	0.18	0.16	0.19	-0.03
18	Commerce	0.11	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.09	-3.74
19	Information & Transportation	0.19	0.18	0.18	0.17	0.16	0.16	0.15	0.15	0.14	0.17	-3.71
20	Finance & Insurance	0.21	0.21	0.21	0.21	0.21	0.20	0.20	0.21	0.20	0.21	-0.97
21	Hotels & Gastronomy	0.19	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.13	-4.03
22	Health Care & Social Assistance	0.06	0.05	0.05	0.05	0.06	0.06	0.05	0.05	0.06	0.06	0.50
23	Economy-Related Services	0.09	0.11	0.12	0.12	0.11	0.11	0.12	0.12	0.13	0.11	4.81
24	Education	0.20	0.23	0.22	0.22	0.21	0.20	0.22	0.21	0.23	0.21	1.66
25	Leisure-Related Services	0.20	0.22	0.22	0.21	0.21	0.22	0.22	0.23	0.23	0.22	1.99
26	Household-related Services	0.15	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.08	0.07	-3.79
27	Social Services	0.22	0.14	0.15	0.16	0.15	0.15	0.14	0.15	0.1435	0.16	-4.65
28	Public Sector	0.25	0.20	0.19	0.19	0.18	0.18	0.15	0.16	0.16	0.18	-4.62

Table 4a: KSI, NUTS3, Whole Germany , 439 districts

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average Growth Rate (%)
Max	1.40	1.40	1.37	1.37	1.36	1.32	1.32	1.26	1.23		
Min	0.26	0.25	0.23	0.22	0.20	0.20	0.20	0.20	0.20		
Average	0.51	0.50	0.49	0.49	0.49	0.48	0.48	0.48	0.48	0.49	-0.68
Weighted Average	0.49	0.48	0.48	0.47	0.47	0.47	0.47	0.47	0.47	0.47	-0.72
Std. Deviation	0.13	0.13	0.12	0.13	0.12	0.12	0.12	0.12	0.12		

Table 4b: KSI, NUTS3, Only West Germany , 326 districts

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average Growth Rate (%)
Max West	1.38	1.39	1.36	1.36	1.34	1.30	1.31	1.25	1.25		
Min West	0.23	0.24	0.23	0.22	0.22	0.22	0.22	0.23	0.22		
Average	0.50	0.49	0.49	0.48	0.48	0.48	0.48	0.48	0.48	0.48	-0.44
Weighted Average	0.48	0.47	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	-0.38
Std. Deviation	0.14	0.14	0.13	0.14	0.14	0.13	0.13	0.13	0.13		

Table 4c: KSI, NUTS2, Whole Germany, 40 districts

	District	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average Growth Rate
1	Schleswig-Holstein	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.23	0.23	0.22	0.99
2	Hamburg	0.46	0.45	0.45	0.43	0.43	0.43	0.42	0.43	0.44	0.44	-0.70
3	Braunschweig	0.34	0.33	0.33	0.33	0.33	0.33	0.30	0.32	0.33	0.33	-0.22
4	Hannover	0.17	0.16	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.16	-0.53
5	Lueneburg	0.31	0.31	0.31	0.31	0.32	0.32	0.33	0.33	0.34	0.32	1.10
6	Weser-Ems	0.24	0.25	0.24	0.25	0.25	0.25	0.26	0.25	0.25	0.25	0.57
7	Bremen	0.40	0.39	0.37	0.37	0.36	0.36	0.35	0.35	0.35	0.37	-1.78
8	Duesseldorf	0.26	0.25	0.25	0.25	0.25	0.24	0.23	0.23	0.23	0.24	-1.75
9	Koeln	0.22	0.22	0.22	0.22	0.23	0.22	0.22	0.23	0.23	0.22	0.04
10	Muenster	0.30	0.30	0.29	0.29	0.28	0.26	0.24	0.24	0.23	0.27	-3.12
11	Detmold	0.37	0.37	0.36	0.36	0.34	0.33	0.32	0.32	0.32	0.34	-2.03
12	Arnsberg	0.34	0.32	0.33	0.33	0.32	0.32	0.30	0.29	0.28	0.32	-2.23
13	Darmstadt	0.33	0.33	0.32	0.33	0.33	0.34	0.34	0.36	0.36	0.34	0.95
14	Giessen	0.28	0.28	0.28	0.28	0.29	0.28	0.29	0.30	0.30	0.29	0.64
15	Kassel	0.23	0.23	0.22	0.22	0.22	0.23	0.22	0.23	0.23	0.22	0.00
16	Koblenz	0.23	0.23	0.22	0.22	0.22	0.23	0.22	0.22	0.23	0.22	0.16
17	Trier	0.30	0.30	0.30	0.30	0.32	0.34	0.33	0.34	0.34	0.32	1.63
18	Rhein Hessen-Pfalz	0.28	0.28	0.28	0.27	0.26	0.25	0.25	0.25	0.23	0.26	-2.44
19	Stuttgart	0.36	0.35	0.34	0.34	0.35	0.34	0.34	0.33	0.33	0.34	-0.86
20	Karlsruhe	0.23	0.22	0.21	0.21	0.21	0.21	0.21	0.20	0.20	0.21	-1.97
21	Freiburg	0.30	0.31	0.31	0.31	0.30	0.31	0.30	0.29	0.29	0.30	-0.48
22	Tuebingen	0.35	0.34	0.33	0.33	0.32	0.31	0.30	0.29	0.30	0.32	-1.70
23	Oberbayern	0.26	0.25	0.25	0.25	0.25	0.24	0.25	0.25	0.26	0.25	-0.30
24	Niederbayern	0.37	0.38	0.37	0.37	0.37	0.37	0.37	0.38	0.38	0.37	0.20
25	Oberpfalz	0.31	0.29	0.29	0.28	0.28	0.29	0.30	0.32	0.31	0.30	0.29
26	Oberfranken	0.42	0.40	0.40	0.39	0.39	0.39	0.38	0.38	0.37	0.39	-1.44
27	Mittelfranken	0.34	0.32	0.31	0.30	0.29	0.29	0.27	0.27	0.25	0.29	-3.49
28	Unterfranken	0.22	0.22	0.23	0.23	0.23	0.23	0.23	0.24	0.23	0.23	0.52
29	Schwaben	0.26	0.26	0.25	0.26	0.26	0.25	0.23	0.25	0.25	0.25	-0.64
30	Saarland	0.36	0.35	0.35	0.35	0.34	0.33	0.33	0.32	0.30	0.34	-1.97
31	Brandenburg	0.48	0.45	0.44	0.43	0.41	0.39	0.40	0.41	0.39	0.42	-2.39
32	Mecklenb.-VP	0.49	0.46	0.45	0.46	0.45	0.44	0.45	0.45	0.44	0.46	-1.09
33	Chemnitz	0.35	0.34	0.32	0.32	0.31	0.28	0.29	0.26	0.26	0.30	-3.56
34	Dresden	0.36	0.35	0.36	0.34	0.34	0.32	0.31	0.29	0.28	0.33	-3.20
35	Leipzig	0.38	0.37	0.39	0.39	0.39	0.38	0.36	0.34	0.34	0.37	-1.61
36	Dessau	0.45	0.45	0.45	0.43	0.40	0.39	0.37	0.36	0.38	0.41	-2.02
37	Halle	0.50	0.48	0.49	0.48	0.47	0.45	0.43	0.41	0.43	0.46	-1.77
38	Magdeburg	0.47	0.45	0.44	0.46	0.47	0.44	0.43	0.42	0.44	0.45	-0.57
39	Thueringen	0.36	0.34	0.34	0.34	0.33	0.29	0.29	0.28	0.27	0.32	-3.65
40	Berlin	0.49	0.37	0.38	0.38	0.38	0.39	0.40	0.41	0.42	0.40	-1.39
	Average	0.34	0.32	0.32	0.32	0.32	0.31	0.31	0.31	0.31	0.32	-1.16
	Weighted Average	0.33	0.31	0.31	0.31	0.31	0.30	0.30	0.30	0.29	0.31	-1.35
	Std.Dev.	0.09	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07		
	Average (WEST)	0.29	0.29	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	-0.63
	Weighted Average (WEST)	0.28	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.27	0.27	-0.52
	Std.Dev. (WEST)	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07		

Table 4d: KSI, NUTS1, Whole Germany, 16 States

Nr	Sector	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average Level	Average Growth Rate
1	Schleswig-Holstein	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.23	0.235	0.22	0.98
2	Hamburg	0.46	0.44	0.44	0.42	0.42	0.43	0.42	0.43	0.43	0.43	-0.69
3	Niedersachsen	0.17	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.17	1.05
4	Bremen	0.39	0.39	0.37	0.36	0.36	0.35	0.34	0.34	0.34	0.36	-1.78
5	Nordrhein-Westfalen	0.18	0.18	0.18	0.17	0.16	0.15	0.14	0.14	0.13	0.16	-3.91
6	Hessen	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.22	0.21	0.21	0.93
7	Rheinland-Pfalz	0.18	0.19	0.19	0.18	0.19	0.19	0.18	0.184	0.18	0.18	0.20
8	Baden-Wuerttemberg	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.23	0.24	0.25	-1.00
9	Bayern	0.17	0.17	0.17	0.17	0.16	0.159	0.15	0.15	0.15	0.16	-1.60
10	Saarland	0.35	0.35	0.34	0.34	0.34	0.32	0.32	0.32	0.30	0.33	-1.97
11	Brandenburg	0.47	0.44	0.44	0.43	0.40	0.39	0.39	0.40	0.39	0.42	-2.38
12	Mecklenburg-Vorpommern	0.48	0.45	0.45	0.45	0.45	0.44	0.44	0.45	0.44	0.45	-1.09
13	Sachsen	0.34	0.32	0.33	0.33	0.32	0.29	0.28	0.26	0.24	0.30	-3.96
14	Sachsen-Anhalt	0.44	0.43	0.43	0.43	0.42	0.41	0.40	0.39	0.42	0.42	-0.58
15	Thueringen	0.36	0.33	0.34	0.34	0.33	0.288	0.29	0.28	0.26	0.31	-3.64
16	Berlin	0.48	0.36	0.38	0.38	0.38	0.38	0.40	0.40	0.41	0.40	-1.39
	Average	0.32	0.31	0.30	0.30	0.30	0.29	0.29	0.29	0.28	0.30	-1.46
	Weighted Average	0.26	0.25	0.251	0.24	0.24	0.23	0.23	0.22	0.22	0.24	-1.89
	Std.Dev.	0.12	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		