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The industrial innovation potential of the regions: Stuttgart and Munich further ahead

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Innovation potential is not only an elementary precondition for economic efficiency and affluence for nations, but also for regions. Measured on R&D employment in the manufacturing industry, regional concentration has continued to remain high since 1998. The regions of Munich and Stuttgart lead by a wide margin. However, the study shows that not only strong regions benefit from structural change but also less favored regions. Conversely, for regions with a leading edge, there is no guarantee of a future leadership role. Urbanized regions have primarily gained. It is noticeable that—apart from exceptions—East Germany lags behind as a research location.

The competitiveness of companies is increasingly determined by the extent to which they succeed in developing new products and production processes and establishing new products on the market. Increasing complexity and division of labour are leading to companies not only carrying out research and development themselves, but also sourcing knowledge from other companies, from universities and research institutions. Proximity to the cooperation partners can simplify the exchange processes. A whole series of theoretical and empirical studies refer to these coherences.[1]

The German federal government, the Bundesländer and the European Commission rely on these findings and have included the spatial dimension more intensively into their policy, in approaches for a "regionalized" innovation policy, which is aimed at the formation and development of regional innovation potential[2] (also in structurally weak regions), as well as in approaches for a national innovation policy, which intends to induce overall economic growth effects by promoting a leading cluster.[3]

This study investigates the regional innovation potential in Germany's manufacturing industry during the period from 1998 to 2007. So far, the information available is not very differentiated and not very current.[4]

1 Cf. e.g. Simmie, J.: Innovation and Space: A Critical Review of the Literature. In: Regional Studies vol. 39, 2005, 789–804.

2 Such as the "Unternehmen Region" programmes of the Federal Ministry of Education and Research (BMBF).

3 A current example is the top cluster competition of the BMBF within the context of the "High-tech strategy" of the federal government.

4 Cf. Legler, H., Gehrke, B., Belitz, H., Grenzmann, C.: Forschungslandschaft Deutschland. Essen 2008; Kreuels, B.: FuE des Wirtschaftssektors 2003 in den Regionen. In: Legler, H., Grenzmann, C. (eds.): FuE-Aktivitäten der deutschen Wirtschaft. Essen 2006.

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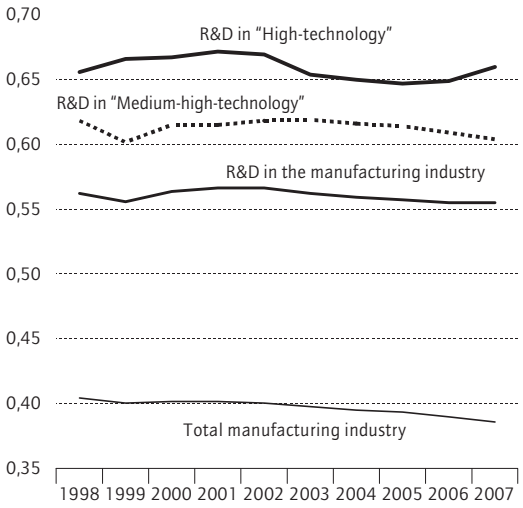
In this study it is investigated,

- how intensively the industrial innovation potential is spatially concentrated and
- how large the disparities are between the individual regions.

The indicator for industrial innovation potential employed here is the number of employees in research and development (R&D) in the manufacturing industry. The basis of the information is formed by the statistics on employees who are subject to social insurance contributions (box).

As it can be assumed that the relative positions of the regions vary according to technology fields, the analysis of the spatial development processes are differentiated according to groups of industries with different technological intensity.[5] This industry classification is based on the criterion of the extent to which R&D is carried out by the companies. This records a significant element in the innovation process. However, no statements can be made on the quality of the R&D, or other innovation activities.

Figure 1
Development of the spatial concentration of R&D employment in the manufacturing industry
Gini Coefficients



Sources: Employment statistics; calculations by DIW Berlin.
DIW Berlin 2008

Industrial research and development very intensively concentrated

In 2007, 353,000 employees who are subject to social insurance contributions were active in R&D in the manufacturing industry. This is 54 percent of all R&D employees in Germany. In comparison: The share of the manufacturing industry, as a proportion of all employees who are subject to social insurance contributions, is at 24 percent. The concentration of R&D is therefore in the manufacturing industry, at least, on the basis of this definition.

The Gini Coefficient provides an image of the degree of regional concentration of R&D activities. It is a measurement of the inequality of the distribution. The coefficient can have values of between 0 (completely equal distribution across all regions) and 1 (full concentration on one region). The concentration of the R&D employment in the manufacturing industry is at a value of 0.55 (Figure 1). The R&D activities were therefore significantly more highly concentrated than total employment in the manufacturing industry (0.39).

In the so-called "High-technology"—this includes the pharmaceutical industry, the IT equipment industry, radio and communication technology, medical, measurement and control technology and the aviation industry—the Gini Coefficient is the highest, in the "Low-technology"—consumer goods industry and media—it is the lowest. The degree of spatial concentration has remained quite stable over the course of time. However, in "Low-technology", a slight trend toward deconcentration of R&D activities can be identified. This also applies to total employment in the manufacturing industry.

Stuttgart and Munich affirm their leading role

Out of all R&D employees in Germany's manufacturing industry, in 2007, ten percent were active in the region of Stuttgart and nearly nine percent in the region of Munich (Table 1). Nearly a quarter of all industrial innovation capacities in Germany were attributable to the three leading regions. The following seven regions (Hamburg, Düsseldorf, Berlin, Rhine-Main, Brunswick, Karlsruhe and Cologne) account for a further fifth. In total, just under 45 percent of all innovation capacities are concentrated in these ten regions. In contrast, these regions had a share of only 29 percent of total employment in the manufacturing industry.

From 1998 to 2007, the number of R&D employees in the manufacturing industry increased by 14.9 percent. At the same time, the total number of employees in the manufacturing industry declined by nearly nine percent, so that the R&D intensity increased significantly. During the course of this development,

5 The delineation by the OECD and Eurostat was used. Cf. box.

Table 1
R&D employment in the manufacturing industry by selected regions and region types
Shares in percent

1998			2007		
	R&D employees	Total employees		R&D employees	Total employees
Stuttgart	10,0	5,3	Stuttgart	10,1	5,3
Munich	7,9	3,3	Munich	8,7	3,3
Düsseldorf	4,6	3,8	Nuremberg/Erlangen	4,1	2,3
The 3 leading regions	22,4	12,4	The 3 leading regions	22,9	10,9
Berlin	4,1	2,8	Hamburg	4,1	3,0
Rhine-Main	4,1	2,5	Düsseldorf	3,8	3,8
Nuremberg/Erlangen	3,9	2,3	Berlin	3,3	2,8
Cologne	3,6	2,2	Rhine-Main	3,2	2,5
Hamburg	3,5	3,0	Brunswick	2,6	2,0
Darmstadt	2,5	1,3	Karlsruhe	2,4	1,7
Brunswick	2,2	2,0	Cologne	2,4	2,2
The 10 leading regions	46,1	28,4	The 10 leading regions	44,7	28,8
Agglomerations	65,1	50,9	Agglomerations	62,1	48,3
Urbanized areas	28,4	37,3	Urbanized areas	30,8	39,0
Rural areas	6,5	11,8	Rural areas	7,1	12,7
West Germany	87,9	87,4	West Germany	89,3	86,7
East Germany	12,1	12,6	East Germany	10,7	13,3
For information: Manufacturing industry in 1 000 persons	307,4	7 348,4	*For information:* Manufacturing industry in 1 000 persons	353,3	6.693,4

Sources: Employment statistics; calculations by DIW Berlin. **DIW** Berlin 2008

the concentration of the industrial R&D activities in the leading three regions has increased slightly (from 22.4 to 22.9 percent), while the share of the ten leading regions has declined slightly (from 46.1 to 44.7 percent). Nothing has changed at the top of the ranking. Stuttgart and Munich have further expanded their leading position. There were shifts on the following rankings. Three regions improved their ranking positions (Nuremberg/Erlangen, Hamburg and Brunswick) and four regions fell behind (Düsseldorf, Berlin, Rhine-Main and Cologne). The region of Karlsruhe (9th place) was not yet among the leading ten regions in 1998, while Darmstadt is now no longer included.

If the regions are combined according to population density (agglomerations, urbanized areas and rural areas), it is shown that the concentration of industrial R&D employment has declined in agglomerations (from 65.1 to 62.1 percent), and the share of urbanized areas in R&D employment has become larger. It is obvious that regions with a low population density have become more attractive for R&D. It is noticeable that the significance of East Germany has declined as a location for industrial R&D (from 12.1 to 10.7 percent), however, its meaning as a location for production has risen (from 12.6 to 13.3 percent). This is due to the structural change toward more R&D (expansion of R&D employment, shrinkage of employment in the total manufacturing industry) primarily has taken place in West Germany. In contrast, R&D employment in East Germany only grew slightly and total employment only declined marginally. It is obvious that the emphasis is on production with the industrial renewal in East Germany, while the build-up of R&D capacities is only sluggish.

The spatial concentration of R&D employment in "High-technology" is particularly intensive. In this industry group, 28.9 percent of the R&D employees is attributable to the top three regions, while more than half is attributable to the top ten regions. The leading regions are Munich, Hamburg and Stuttgart. The lower the technological intensity of the industries is, the weaker the trend toward spatial concentration of R&D activities. However, the regions of Stuttgart and Munich are also among the leading R&D locations in industries with medium or low technology intensity. Differentiated according to population density, R&D employment in "Medium-high-technology" is concentrated somewhat more intensively in agglomerations than R&D in other sectors of the manufacturing industry (Table 2).

There were also differences between the individual industry groups with regard to the change in the spatial concentration of R&D. The share of the top

Fundamentals

The number of researchers and developers (R&D) in manufacturing industry is selected as an indicator for measuring the industrial innovation input. Information in the necessary in-depth regional classification is provided by the statistics on employees subject to payment of social security contributions (Employment statistics). The group of persons includes employees active in the professions of engineers, chemists, physicists and other specialist scientific fields, according to the Classification of Professions 1988 by the Federal Employment Office.[1] Data has been processed as of 30th June, for the years 1998 to 2007.

As regional units, so-called "Planning regions" (Raumordnungsregionen, ROR), delineated by the Federal Agency for Construction and Regional Planning (BBR) were chosen.[2] By combining municipalities, they approximate the socioeconomic relationships between the core and the surrounding area of a region. However, the city states of Berlin, Bremen and Hamburg are exceptions from this. In order to also ensure a corresponding delineation and achieve nationwide, comparable regions, the BBR has formed so-called "Analysis regions" and combined the ROR Berlin with the surrounding municipalities, into the Berlin Region—the adjacent ROR will correspondingly be smaller or lapse entirely—as well as ROR Bremen and

1 Cf. Bade, F.-J.: Regionale Beschäftigungsentwicklung und produktionsnahe Dienstleistungen. Special Issue 143 of DIW Berlin, Berlin 1987.

2 Cf. Federal Agency for Construction and Regional Planning (ed.): Indicators and maps on land use and urban development [electronic resource]. INKAR. Issue 2007, Bonn 2008.

R&D employment by business sectors of the manufacturing industry 2007
In percent

	R&D employees	Share of all employees	*For information:* All employees
Total manufacturing industry	100	5.3	100
"High-technology"	**28.2**	**11.8**	**12.7**
Manufacture of pharmaceutical products	2.4	6.6	1.9
Manufacture of office equipment, data processing devices and systems	1.4	13.7	0.6
Radio and communication technology	8.8	15.6	3.0
Medical, meas., control and regulation technology optics, clock production	11.4	10.0	6.0
Aviation and aerospace engineering	4.2	18.9	1.2
"Medium-high-technology"	**56.3**	**7.9**	**37.4**
Manufacture of base chemicals	3.9	8.7	2.4
Manufacture of insecticides, pesticides and disinfectants	0.1	7.9	0.1
Manufacture of paints, print dyes and putties	0.5	4.2	0.6
Manufacture of soaps, detergents, body care and aromas	0.5	4.3	0.6
Manufacture of other chemical products	0.9	6.2	0.8
Manufacture of chemical fibers	0.3	5.1	0.3
Mechanical engineering	20.8	7.1	15.5
Manufacture of power generators and distributors, etc.	12.7	11.4	5.9
Manufacture of motor vehicles and parts	15.9	7.8	10.8
Rail industry	0.7	9.9	0.4
"Medium-low-technology"	**12.1**	**2.5**	**25.7**
Coking, crude oil processing and fissile and fertile Material processing	0.7	8.7	0.4
Manufacture of rubber and plastic goods	2.7	2.5	5.7
Glass industry, Manufacture of ceramics, processing of stones and soils	1.2	2.0	3.1
Metal production and processing	2.6	2.9	4.7
Manufacture of metal products	4.4	2.0	11.4
Ship and boat building	0.5	7.4	0.4
"Low-technology"	**3.3**	**0.7**	**24.2**
Food industry	1.0	0.5	9.8
Tobacco processing	0.1	2.0	0.1
Textile industry	0.3	1.1	1.3
Clothing industry	0.0	0.3	0.6
Leather industry	0.0	0.4	0.3
Wood and furniture industry	0.2	0.6	2.1
Paper industry	0.6	1.6	2.0
Publishing, printing industry. Duplication of recorded audio, video and data media	0.5	0.6	4.7
Manufacture of furniture, jewelry, musical instruments, sports equipment and other products	0.5	0.9	2.9
Recycling	0.1	1.0	0.6
Employees in 1000 persons	353.3	–	6693.4

Sources: Employment statistics; calculations by DIW Berlin. **DIW** Berlin 2008

Hamburg, with the respective, adjacent ROR. According to their population density, the regions can be combined into three so-called "basic region types", the "agglomeration areas" (25 regions), the "urbanized areas" (42 regions) and the "rural areas" (25 regions). 71 regions are located in West Germany, 21 in East Germany. In order to facilitate the readability of the names of the regions, with several regions, the official name was replaced by the names of the largest city in the region.

The basis for differentiation of the industries according to their technological intensity is the classification by the OECD and Eurostat.[3] The criteria for the delineation are the expenditures for R&D, measured as a share of sales. The groups are differentiated by "High-technology" (pharmaceuticals, IT devices, parts of electrical engineering, aviation and aerospace), "Medium-high-technology" (chemicals, parts of electrical engineering, mechanical engineering, automobile industry),"Medium-low-technology", and "Low-technology".

As anticipated, the classification of the employees subject to payment of social security contributions shows that the R&D employees are particularly active in the industries, which belong to "High-technology" and "Medium-high-technology" (table). Nearly 85 percent (300,000) of the R&D employees are attributable to both industry groups. 43,000 R&D employees are active in "Medium-low-technology" and 12,000 in "Low-technology". As expected, the R&D intensity—share of R&D employees as a proportion of all employees—is higher in "High- technology" and in "Medium-high-technology" than in the other industry groups.

3 Cf. Hatzichronoglou, T.: Revision of the High-Technology Sector and Product Classification. OECD Science, Technology and Industry Working Papers, 1997/2, Paris.

ten regions in "High-technology" in 2007 has increased somewhat compared with 1998—with a strong rise in the number of employees—, while it has declined in the other technology sectors. Similar to the manufacturing industry, the concentration on agglomerations has also declined in the technology-intensive industries. The decline was particularly strong in "Medium-high-technology" (from 67.9 to 63.3 percent). The winners were the urbanized areas.

Overall, the results show that the innovation potential of the industry is intensively concentrated on densely populated areas. This particularly applies to the "High-" and "Medium-high-technology" sectors. These regions obviously offer particularly good conditions for the innovation activities of companies.

The distribution pattern is quite stable over the course of time. The trend of spatial deconcentration observed in the 1990s has not continued at the same speed.[6] But this does not mean stability of the regional rankings among one another. Munich and Stuttgart reign supreme in the two top rankings. Urbanized regions have become more important, East German regions have become less important.

Major research locations are also strong industrial locations

The comparison of R&D employment and total employment shows that locations combining the majority of industrial R&D capacity are also strong industrial locations overall (Figure 2). Therefore, not only most of the R&D employees are active in Stuttgart, but also most of the employees in manufacturing. Nevertheless, this relationship is not linear. Therefore, the R&D intensity, the share of

Table 2
R&D employment in technology intensive industries of the manufacturing industries by region types
Share in percent

	1998		2007	
	R&D employees	Total employees	R&D employees	Total employees
"High-technology"	100	100	100	100
Agglomeration areas	65.8	56.0	65.1	53.8
Urbanized areas	29.5	35.6	28.7	36.7
Rural areas	4.7	8.4	6.2	9.5
West Germany	87.6	88.1	87.7	86.1
East Germany	12.4	11.9	12.3	13.9
In 1000 persons	77.3	798.4	99.7	846.1
"Medium-high-technology"	100	100	100	100
Agglomeration areas	67.9	55.2	63.3	51.6
Urbanized areas	26.3	35.2	30.2	37.4
Rural areas	5.8	9.6	6.5	11.0
West Germany	90.1	91.0	91.9	90.2
East Germany	9.9	9.0	8.1	9.8
In 1000 persons	174.3	2614.5	199.0	2504.8

Sources: Employment statistics; calculations by DIW Berlin. **DIW** Berlin 2008

6 Cf. e.g. ISI (Coordination), DIW, IfW, NIW: Regionale Verteilung von Innovations- und Technologiepotentialen in Deutschland und in Europa. Reseach project on behalf of the BMBF, Karlsruhe 2000; or Schönert, M.: Das personelle Innovationspotenzial. Bremen 2000. Most studies from the 1990s have only been related to West Germany.

R&D employees as a proportion of all employees, varies.

In 2007, 5.3 percent of all employees in the manufacturing industry were active in R&D professions. The R&D intensity is by far the highest in the Munich region, at 13.8 percent. This is 2.6 times the average of all regions (Table 3). The R&D intensity is also particularly high in the regions of Stuttgart, Nuremberg/Erlangen, Darmstadt and Bremen—it exceeds the national average by more than half. While this top group of regions is comprised of West German regions, without exception, the other regions with relatively high industrial R&D intensity also include an East German conurbation (Dresden) and a range of urbanized and rural regions, such as Friedrichshafen, Kiel, Regensburg and Schwedt (map).

R&D intensity is the lowest in the region of Trier. Only 1.3 percent of industry employees are active in R&D professions there. This corresponds to 24 percent of the national average. In total, 19 of the 63 regions with below-average R&D intensity reach not more than half of the value for Germany, seven of these are East German regions.

The regional differences are also reflected in the fact that the R&D intensity in the agglomerations are nearly one-third above the average, at 6.8 percent. However, the urbanized areas, at 4.2 percent and in the rural areas, at 3.0 percent, are far below this. East Germany only reaches 81 percent of the national average.

With "High-" and "Medium-high-technology", the hierarchy by population density is similarly distinctive. The share of above-average endowed regions is also significantly higher in West Germany than in East Germany. Differentiated assessments for the group of industries that have minor R&D intensity ("Low-technology") show a different picture. The share of above-average endowed regions is higher in East Germany than in West Germany. East German regions have an above-average number of low-research industries, but in these industries, the R&D intensity is significantly higher in some regions than in West German regions.

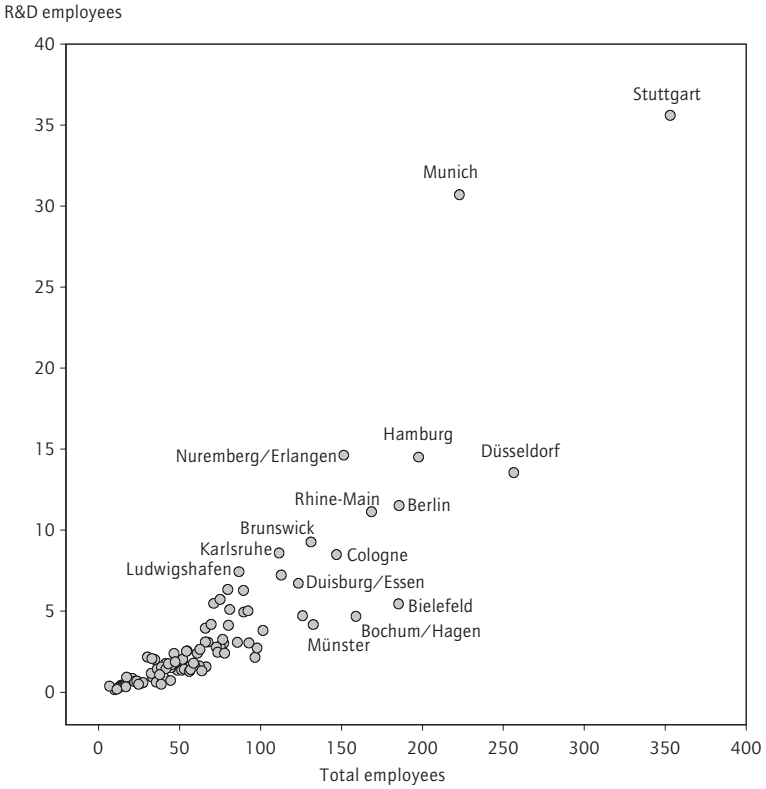
Deficit caught up—or lead lost

The R&D intensity in the manufacturing industry has risen continuously between 1998 and 2007—and largely uninfluenced by cyclical fluctuations—from 4.2 percent to 5.3 percent (Figure 3). How the position of the individual regions has changed in this process is shown, when the relative position in the

Figure 2

R&D employment in technology intensive industries of the manufacturing industries 2007 by region types

Share in percent



Sources: Employment statistics; calculations by DIW Berlin. **DIW** Berlin 2008

Table 3

R&D intensity in the manufacturing industry by selected regions and region types

Share of R&D employees as a proportion of all employees

1998			2007		
	In percent	Index[1]		In percent	Index[1]
Total	4.2	100	Total	5.3	100
Thereof:			*Thereof:*		
Munich	10.9	260	Munich	13.8	261
Stuttgart	7.7	184	Stuttgart	10.1	191
Nuremberg/ Erlangen	7.7	183	Nuremberg/ Erlangen	9.7	183
Darmstadt	6.8	163	Darmstadt	8.6	163
Friedrichshafen	6.5	155	Bremen	7.9	150
Rhine-Main	5.8	139	Karlsruhe	7.7	146
Bremen	5.7	137	Dresden	7.7	146
Cologne	5.7	137	Friedrichshafen	7.6	145
Ludwigshafen	5.6	134	Hamburg	7.3	139
Dresden	5.6	133	Kiel	7.2	136
Agglomeration areas	5.3	128	Agglomeration areas	6.8	128
Urbanized areas	3.2	76	Urbanized areas	4.2	79
Rural areas	2.3	55	Rural areas	3.0	56
West Germany	4.2	101	West Germany	5.4	103
East Germany	4.0	96	East Germany	4.3	81

1 Germany = 100.

Sources: Employment statistics; calculations by DIW Berlin. **DIW** Berlin 2008

Table 4

R&D intensity in technology intensive sectors of the manufacturing industry by region types

Share of R&D employees as a proportion of all employees

	1998		2007	
	In percent	Index[1]	In percent	Index[1]
"High-technology"	**9.7**	**100**	**11.8**	**100**
Agglomeration areas	11.4	117	14.3	121
Urbanized areas	8.0	83	9.2	78
Rural areas	5.5	56	7.6	65
West Germany	9.6	99	12.0	102
East Germany	10.1	104	10.4	88
"Medium-high-technology"	**6.7**	**100**	**7.9**	**100**
Agglomeration areas	8.2	123	9.8	123
Urbanized areas	5.0	75	6.4	81
Rural areas	4.0	60	4.7	59
West Germany	6.6	99	8.1	102
East Germany	7.3	109	6.6	83

1 Germany = 100.

Sources: Employment statistics; calculations by DIW Berlin.

DIW Berlin 2008

R&D intensity of a region in 1998 is compared with the change in this position by 2007. In doing so, five groups have been differentiated: Regions that have increased their lead, that have decreased their deficit, that have lost their lead, that have increased their lead or that have not changed their position (Figure 4 and Table 5).[7]

More than half of the regions have significantly changed their position with regard to the R&D intensity of the manufacturing industry. Not all agglomeration areas were able to improve their position. Only five out of fifteen densely populated areas with above-average intensity achieved this, but four declined. And among the seven agglomerations in deficit, none were able to notably catch up their deficit, two even declined further.

The catch-up process is noteworthy in the group of urbanized regions: Nearly two-fifths of the regions of this type have caught up on their deficit or expanded their lead. This is more than in the group of rural areas (24 percent of them are catching up) or the agglomerations (20 percent).

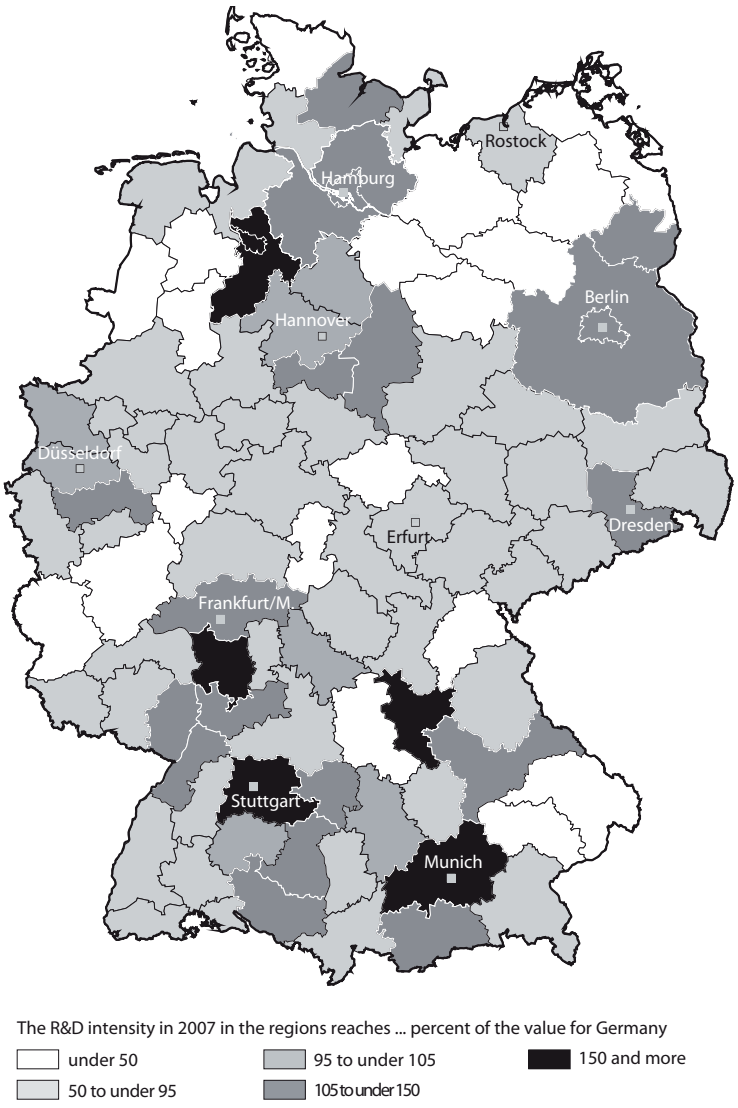
The major differences between West and East Germany are noticeable: Among the few East German regions showing above-average R&D intensity in 1998, only one was able to further expand its position. But none of the deficit regions was able to improve their position. By contrast, most of the deficit regions were able to catch up in West Germany.

In the region of Munich, the R&D intensity of the industry was already around 2.6 times the national average ten years ago. It has remained that way to this day. The regions of Stuttgart, Nuremberg/Erlangen and Darmstadt have also asserted their strong position. The region of Bremen is expanding its position intensively and climbed from 7th place to 5th place. In contrast, the region of Friedrichshafen declined significantly.

Map

R&D intensity in the manufacturing industry 2007 by regions[1]

Index[2] Germany = 100



1 In the BBR delineation.
2 Share of R&D employees as a proportion of all employees in the manufacturing industry.

Sources: Employment statistics; calculations by DIW Berlin.

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7 Regions that have achieved R&D intensity in 1998 of between 95 and 105 percentage points of the national average, have been combined into regions with average intensity and regions whose relative position has changed by less than five percentage points compared with 2007, are regarded as regions whose position has remained constant.

These results are reflected in the "High-" and "Medium-high-technology". For both sectors, it applies that in the group of urbanized regions, the share of "catch-up regions" is higher than in the group of rural regions or agglomerations. Also among the East German regions, the share of "catch-up regions" is significantly lower than among the West German regions.

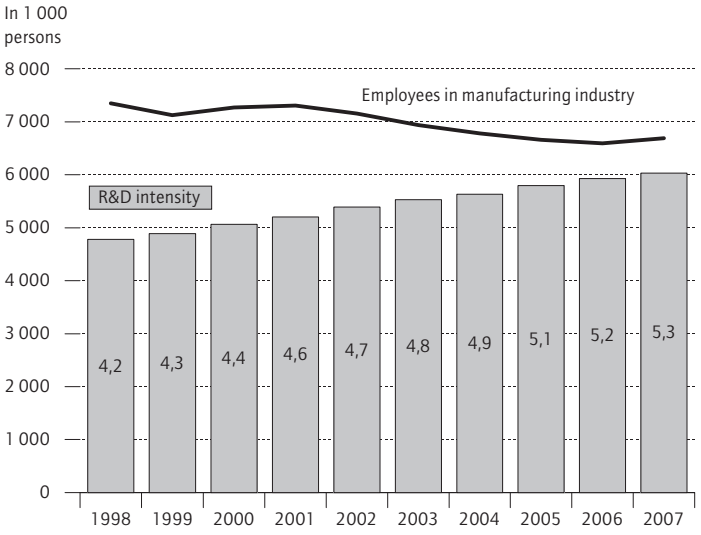
Conclusion

All in all, we come to the conclusion that the R&D activities in the manufacturing industry are significantly more regionally concentrated than total employment in the manufacturing industry. During the course of time, the regional concentration has remained approximately the same, while for the manufacturing industry as a whole, a trend can be observed toward spatial deconcentration. Munich and Stuttgart continue to reign supreme as leading R&D regions. Nevertheless, the results show that shifts in the ranking are not rare and, in addition to conurbations, urbanized regions are also increasingly appearing as locations for industrial R&D.

The R&D intensity, measured as a share of the R&D employees as a proportion of all employees, is widely spread. It is highest in Munich and Stuttgart, the regions with the absolute majority of R&D employees. During the course of the structural change, Munich has maintained its top position with R&D intensity, while Stuttgart has expanded its position. Among the other regions, around half have maintained their position. The numbers of regions that have caught up and regions that have declined are more or less equal. Some of the R&D-intensive regions have

Figure 3

Development of R&D intensity and employment in the manufacturing industry



Sources: Employment statistics; calculations by DIW Berlin. **DIW** Berlin 2008

Table 5

Region types by change in R&D intensity between 2007 and 1998

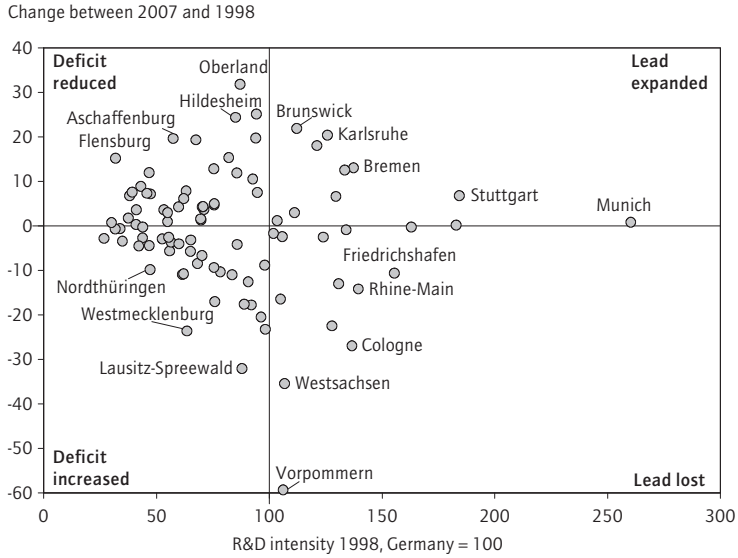
Share in percent of the respective group

	Regions that, between 2007 and 1998,				
	expanded their lead	reduced their deficit	lost their lead	increased their deficit	have not changed their position
Manufacturing industry	**8**	**22**	**8**	**17**	**46**
Agglomeration areas	20	0	16	8	56
Urbanized areas	5	33	2	21	38
Rural areas	0	24	8	20	48
West Germany	8	28	4	7	52
East Germany	5	0	19	52	24
"High-technology"	**5**	**25**	**15**	**21**	**34**
Agglomeration areas	2	24	19	17	38
Urbanized areas	0	40	4	28	28
Rural areas	5	25	15	21	34
West Germany	6	28	10	20	37
East Germany	5	14	33	24	24
"Medium-high-technology"	**5**	**29**	**12**	**24**	**29**
Agglomeration areas	12	12	32	0	44
Urbanized areas	2	38	5	26	29
Rural areas	4	32	4	44	16
West Germany	7	35	7	15	35
East Germany	0	10	29	52	10

Sources: Employment statistics; calculations by DIW Berlin. **DIW** Berlin 2008

Figure 4

Relative position of the regions with R&D intensity in the manufacturing industry in 1998 and their change compared with 2007



Sources: Employment statistics; calculations by DIW Berlin. **DIW** Berlin 2008

expanded their lead, while others have lost it. Conversely, there are winners and losers among the weakly endowed regions.

However, despite the differences and heterogeneousness, it becomes clear that among the urbanized regions, there is a particularly large number of climbers. It is also noticeable that, apart from exceptions, East Germany has continued to lag behind as a research location.

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