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Article

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Large and lasting regional disparities in municipal investments

By Felix Arnold, Ronny Freier, René Geissler, Philipp Schrauth

The regional dispersion of local public investment in Germany is very uneven. Even a comparison between the states shows considerable differences in gross investment. Municipalities in Bavaria currently invest more than three times as much per capita as those in Mecklenburg-Western Pomerania.

There are even greater differences between districts and independent cities, both nationwide and within the federal states. In 2013, the district of Munich invested 724 euros per inhabitant, in other words, almost 700 euros more than the independent city of Wilhelmshaven in Lower Saxony (35 euros per inhabitant). There are disparities within Bavaria, too, with the independent city of Weiden spending 560 euros less (160 euros per inhabitant) than the district of Munich.

Our analysis demonstrates that there have been virtually no changes in the regional dispersion of investment spending over time. Around 83 percent of the weakest quartile of all municipalities in 2000 were still in the lower half of the distribution 14 years later.

Overall, investment in economically strong municipalities is considerably higher than in the structurally weak regions. The level of investment has a positive correlation with high tax revenues and a negative one with high social security spending, a negative fiscal balance, and high levels of debt. Municipalities that are less competitive today will continue to struggle in the long term due to a lack of investment. This compounds differences in infrastructure and quality of location which are important general conditions for future economic performance.

Policy-makers and umbrella organizations have highlighted the inadequate levels of, and regional disparities in, investment by municipalities for many years now. Structurally underdeveloped regions are unable to keep pace with prosperous regions in the long term. In March 2015, the German government reacted by creating a fund to promote local public investment. It set aside a total of 3.5 billion euros between 2015 and 2018. The special feature of this fund is that the money is allocated according to the budgetary situation of the municipalities. The aim of the program is to specifically target structurally underdeveloped municipalities. The need for this approach is verified by financial statistics: since 2003, net investment by municipalities has been negative (see Gornig et al. in this issue of *DIW Economic Bulletin*). The loss of infrastructure continues to be a prerequisite for private investment, growth, and the economic and consequently financial strength of the municipalities. Added to this, the level of gross investment is widely supported by strong economic and financial municipalities. The low investment capacity of structurally weak municipalities is at risk of being forgotten in view of aggregated national or federal state data. However, investment differences that persist over many years compound the disparity of future opportunities for municipalities and therefore their citizens. The present paper examines, for the first time, the regional and temporal development of local public investment on the level of districts and independent cities and reveals the initial causes of inequalities.

Public investment in Germany is usually made on the federal state and municipality level. Of the 43.2 billion euros invested in general government infrastructure in Germany in 2013, 23 percent came from central government (and social security insurance), 26 percent from the federal states, and 51 percent from municipalities.

Looking at construction spending as a major part of local public investment highlights typical areas of expenditure. In 2013, construction spending totaled 16 billion euros, accounting for around two-thirds of total munic-

Box 1

Investment Spending

A variety of data sources were used for this analysis of local public investment. Municipality data for the years 2000 and 2008 are taken from regional and local statistics (regional database of federal state and central government statistical offices) and refer to the financial statistics of the districts and municipalities. The data from 2013 were provided by the Genesis Service of the German Federal Statistical Office. Again, these are financial statistics. Since there is no information on the municipalities in Saarland, NRW, Lower Saxony, Brandenburg, and Mecklenburg-Western Pomerania, these data were supplemented from the websites of their state statistical offices. They are calculated annually with the exception of Saarland.

The years 2000, 2008, and 2013 were selected for reasons of content and statistical data validity. They are more comparable than most other years in this period with regard to economic conditions and the overall financial situation. After 2008, the resilience of the financial statistics suffered in some years due to a change in the budgeting process from fiscal to double-entry accounting. In these years, investment figures and/or entire financial statistics were often not published at all. In addition, investment in 2009 and 2011 was above normal levels due to the central government's stimulus packages. They are not representative of other years. To a small degree, there was a systematic reduction in reporting of investment in the wake of the double-entry accounting system.

In defining the concept of investment, for the purpose of comparability over time, we have restricted ourselves to investment in fixed assets in three subgroups: construction measures, acquisition of movable assets, and acquisition of immovable assets. Here, we distinguish between the acquisition of investments, loans, and investment grants. Measured against accounting statistics for 2013, around 80 percent of local public investment is recorded in these three subgroups. Construction spending is by far the most important area of local public investment.

Gross investment is the fourth-largest local public spending item after personnel expenses, operating expenses, and social security payments. It should also be mentioned that there are frequently difficulties distinguishing between operating expenses and investment. The maintenance costs of a school can be entered as current operating expenses or under construction measures (and therefore as an investment). Similar gray areas arise when entering construction measures for own personnel (construction yards). Furthermore, our report focuses on the municipalities' core budgets. First, this part of local government administration can be distinguished most clearly. Second, this is where actual local policy discussions take place and, third, investment here is primarily based on the municipalities' taxable capacities. However, outsourced investment activity (municipal funds, institutions, or companies) is partly covered by economic activity.¹

¹ See report by Cullmann and Nieswand in this issue of DIW Economic Bulletin

ipality investment. The largest sums were spent on municipality and district roads (4.2 billion euros). This was followed by all types of school building (2.6 billion euros), daycare centers (1.6 billion euros), administrative buildings (1.3 billion euros), sewage treatment plants (1.2 billion euros), as well as sports facilities and swimming pools (0.6 billion euros).

Investment comprises a considerable share (350 euros per inhabitant) of adjusted total spending by municipalities (2,730 euros per inhabitant) (see Box 1). It represents the fourth-largest budget item after personnel expenditure (around 700 euros), social security spending (660 euros) and current operating expenses (575 euros).

Considerable Differences on the Federal State Level

A simple comparison of federal states already highlights considerable regional dispersion in the 13 area states. The economically strong states of Bavaria and Baden-Würt-

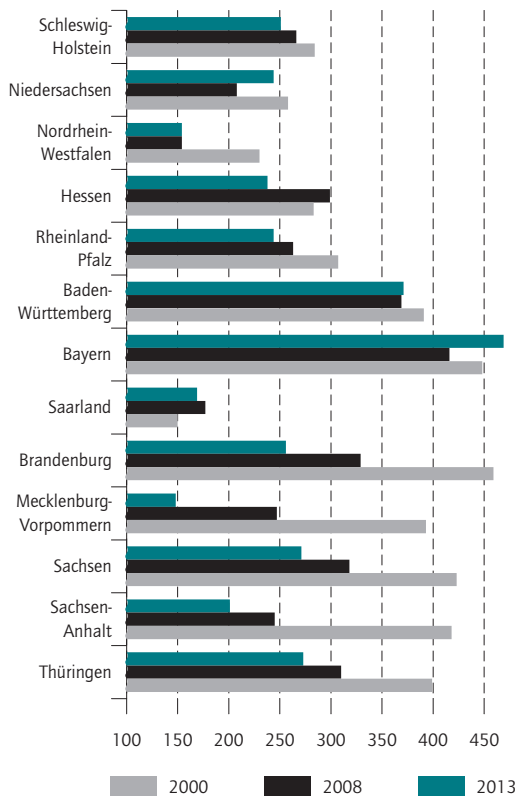
temberg invested heavily in all the years under observation. In 2013, Bavaria had the highest per capita spending nationwide with 469 euros, followed by Baden-Württemberg with 371 euros. Investment spending in other western German states, however, was markedly lower. In North Rhine-Westphalia (NRW) and Saarland, investment in all years was well below 300 euros and often less than 200 euros per capita (see Figure 1).

The rapid decline in investment in eastern Germany has been remarkable. While municipalities in eastern Germany still had the highest investment spending in 2000, per capita spending in most areas had fallen to half that level by 2013. In Mecklenburg-Western Pomerania, for example, a state with one of the highest per capita investment levels in 2000 at 393 euros, levels of investment spending fell to only 148 euros in 2013, the lowest level in Germany.

This development in eastern Germany can largely be explained by the Solidarity Pact. The Solidarity Pact II as-

Figure 1

Municipal investments at state level
Euro per capita



Source: Own calculations based on data from the Federal Census Bureau (Fachserie 14, Reihe 2 für 2013; Genesis Datenbank des Statistischen Bundesamtes für 2000 und 2008).

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East-Germany registers a significant decline for investments over time, while Bavaria and Baden-Württemberg exhibit high-level persistence.

signs eastern German municipalities a total of 156 billion euros from 2005 to 2019, with a detour through federal state budgets. These funds serve merely to compensate for their low taxation and financial power, and as investment incentives. These annual allocations have fallen steadily since 2009. The lower these special allocations from central government, the more evident their low tax and financial power is. This phenomenon is also reflected in the population decline in eastern Germany over this period since it reduces the volume of financial equalization at the municipality level. It is also conceivable that federal states will reduce investment allocations to municipalities, especially given the debt brake that comes into effect as of 2020.

Investment Equally High throughout Bavaria and Baden-Württemberg Region

In addition to differences between the federal states, the level of investment spending also varies from district to district. To illustrate these disparities, we have outlined per capita spending on investment in all the regional districts and independent cities¹ for 2000 and 2013 in two detailed regional maps for the whole of Germany (see Figure 2).

A north-south divide is evident with high investment in Baden-Württemberg and Bavaria (with a few exceptions) and low investment in large parts of the rest of western Germany. The lower levels of investment in eastern Germany are also clearly discernible. In addition, it is evident that investment spending is heterogeneously distributed among the federal states. Investment is equally high throughout Bavaria and Baden-Württemberg.² In most other federal states, however, there are often several federal districts with high or low investment in the immediate vicinity. While investment in some areas of northern Hesse was extremely low, the situation in other parts of this federal state is much more favorable. A comparison of the Ruhr district with its surrounding regions shows clear differences within North Rhine-Westphalia. In Brandenburg, the full range of investment levels are represented between the Teltow-Fläming and Dahme-Spreewald regional districts close to Berlin and the more remote Prignitz in the northwest. It is no coincidence that the two districts in the south of Berlin with the highest tax revenues in eastern Germany also have the highest investment.³

Additional insights are provided by the ten regional districts and/or independent cities with the highest and lowest investment spending in 2013, that is, the distribution extremes of per capita investment spending (see Figure 3).

The top ten municipalities with the highest investment spending are all in Bavaria. Nine of the ten municipalities are regional districts. The district of Munich has by far the highest spending. This district has one of the strongest regional economies in Germany overall.

¹ Here, for graphical illustration we refer to the concept of regional districts. This summarizes the investment activity of all municipalities and local government associations (rural districts, municipal associations, communal unions, and administrative levels such as municipality departments) according to the geographical boundaries of the relevant regions. This aggregation is unnecessary for independent cities because all the levels are taken together.

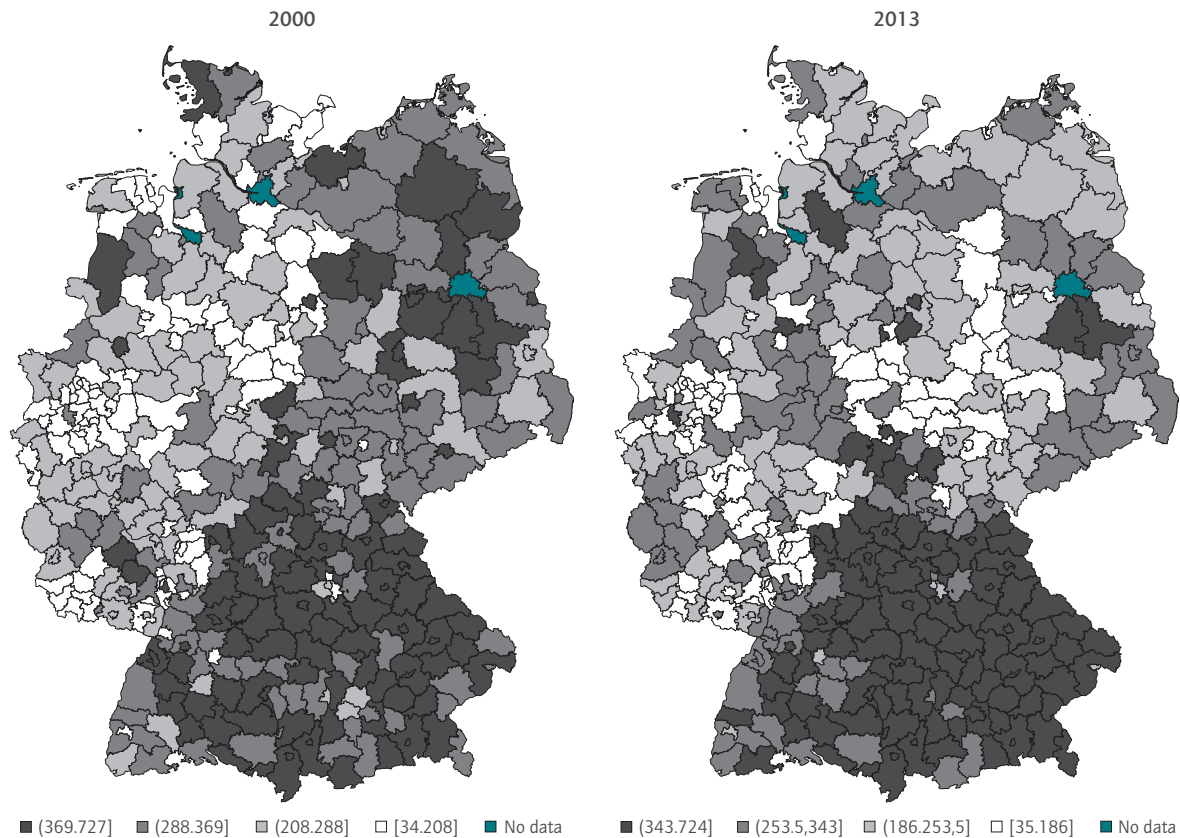
² The situation in Bavaria is quite remarkable since there are also municipalities in the north and east with low tax revenues. The high level of investment throughout the government supports the argument for a functioning fiscal transfer or incentive program at local government level.

³ Bertelsmann Stiftung (2015b), 89.

Figure 2

Investments on municipality level

Euro per capita



Source: Own calculations based on data from the Federal Census Bureau (Vierteljährige Kassenstatistik from www.regionalstatistik.de for 2000 and 2013; Federal Census Bureaus for Lower Saxony, NRW, BB and Saarland for 2013).

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Large differences not only between Federal states, but also between counties within states.

The headquarters of Infineon AG, Swiss Re, Münchener Rück, ProSieben Sat1 Media AG, and Kabel Deutschland are all based here, as are many others. In fact, in 2013, this region also had the highest municipality tax revenues anywhere in Germany.⁴

Nine of the Ten Weakest Investment Districts Are Independent Cities

The picture is much more heterogeneous among municipalities with low investment. These ten municipalities are spread over seven different federal states and nine of them are independent cities. The lowest level of spending was recorded by the independent city of Wil-

helmshaven in Lower Saxony at around 35 euros per capita. NRW is represented by Bielefeld, Hagen, and Duisburg. Interestingly, Hagen, Duisburg, and Wilhelmshaven, three cities with the weakest levels of investment, are also among the highest on the list of cash loans⁵ for the whole of Germany. At the same time, no municipality from Saarland or Mecklenburg-Western Pomerania is represented, although these federal states have the lowest average levels of investment.

It may be surprising that Halle (Saxony-Anhalt) and Jena (Thuringia) are the only two eastern German municipalities among the ten regions with the weakest investment. However, an important statistical effect can

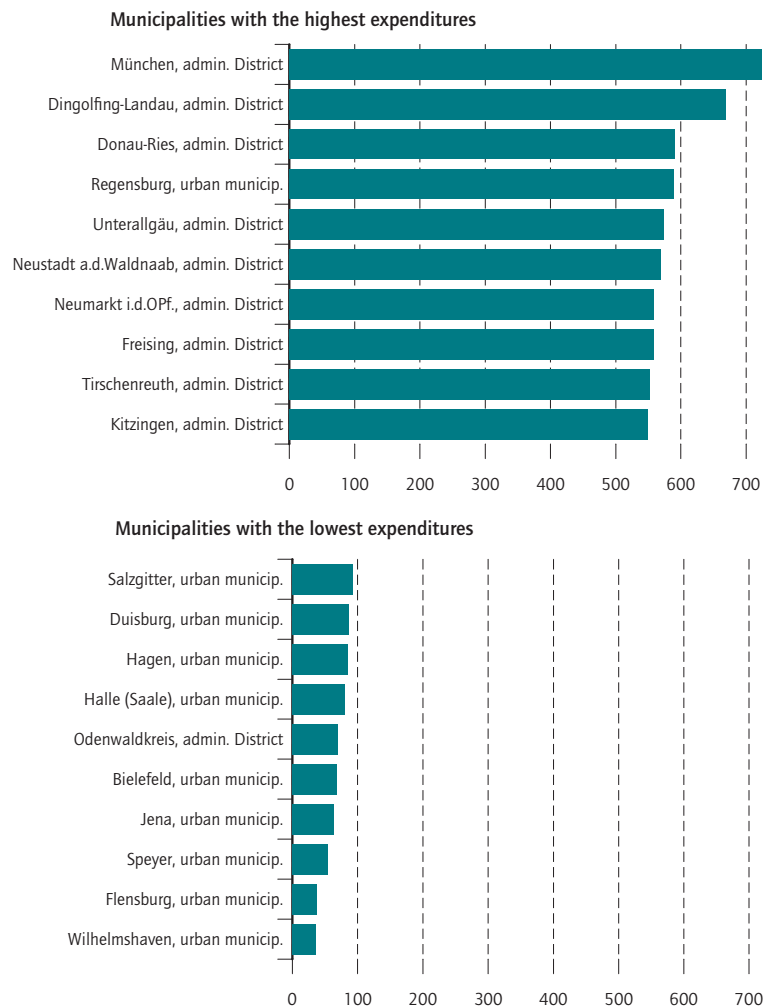
⁴ Bertelsmann Stiftung (2015b), 91.

⁵ DIW Glossary (in German only), http://www.diw.de/de/diw_01.c.422698.de/presse/diw_glossar/kassenkredite.html

Figure 3

Municipalities with highest respectively lowest per-capita investments in 2013

Euro per capita



Source: Own calculations based on data from the Federal Census Bureau.

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Municipalities with the highest per-capita investments all lie within Bavaria, while municipalities with low per-capita investments are scattered over various states north of the river Main.

be illustrated by the city of Jena. Like many other major cities, maintaining and developing local government property, including the corresponding investment payments, are outsourced to a government-operated enterprise.⁶ The only regional district among the ten municipalities with the weakest investment is Odenwaldkreis

6 The government-operated enterprise's 2013 business plan contains investment totaling around 139 euros per inhabitant.

in Hesse. Measured by the extremes, investment activity appears to be greater in the regional districts than in the independent cities. This might be due to the different level of social security spending⁷ or the trend toward more outsourcing.

Table 1 shows a general overview of the distribution of investment among the federal states. Here, we analyze the disparities between the districts of the relevant federal states based on selected distribution measures (range, decile ratio, and Gini coefficient). All values are based on gross investment per capita on the regional district level for the years 2000, 2008, and 2013.⁸

The *range* is the gap between the minimum and maximum per-capita investment in the relevant federal state. Values in the western German federal states range between 220 and 380 euros. However, there are also considerable outliers over 500 euros (see Bavaria or Baden-Württemberg in 2000). The eastern federal states have substantially lower ranges on average. Most values here are well below 300 euros per inhabitant. The federal state of Saarland is also unique as it invested 133 euros (or considerably less) in all years. There is no recognizable trend in the span during the years under observation. The range increased from 2000 to 2013 in six federal states and fell in seven.

The *decile ratio* is less prone to extreme outliers.⁹ Throughout Germany, this ratio is a factor of around three. This means the top decile spends three times more on investment than the lowest decile. The decile ratio among the federal states is usually smaller at a factor of approximately two. What is interesting here is that the decile ratio is relatively similar despite considerable differences in the ranges. A comparison of Bavaria and Saarland in 2000 shows a huge difference in the range (500 to 100) but both have a decile ratio of two. This indicates that the differences between the municipalities in Bavaria and Saarland are mainly due to the enormous difference in the level of investment. The relative distribution in both federal states is then comparable.

The *Gini coefficients*¹⁰ for investment reveal a similar picture within each federal state, and consequently between the municipalities. This measure varies between zero (all districts investing the same) and one (one district investing everything and all the others investing nothing).

7 Bertelsmann Stiftung, *Kommunale Sozialausgaben* (2015a), 79.

8 Bertelsmann Stiftung (2015b), 75–76.

9 The decile ratio compares the 90-percent and the 10-percent deciles. This allows most maximum and minimum values to be discounted.

10 The Gini coefficient is commonly used as a measure of income inequality.

Table 1

Selected measures of dispersion regarding per capita investments

	Range			Decile ration			Gini coefficient (regional district level)		
	2000	2008	2013	2000	2008	2013	2000	2008	2013
Schleswig-Holstein	219	332	269	2.39	1.54	1.68	0.16	0.12	0.12
Niedersachsen	509	263	492	2.31	3.15	2.61	0.17	0.18	0.17
Nordrhein-Westfalen	341	349	377	2.07	3.46	2.65	0.17	0.23	0.23
Hessen	234	283	274	2.34	2.17	2.38	0.12	0.15	0.18
Rheinland-Pfalz	312	285	268	2.13	2.62	2.25	0.13	0.19	0.17
Baden-Württemberg	513	329	289	2.80	1.96	1.72	0.17	0.12	0.12
Bayern	504	654	564	1.94	1.89	2.18	0.15	0.14	0.15
Saarland	99	28	133	2.02	1.17	2.10	0.13	0.03	0.17
Brandenburg	477	351	285	2.67	1.91	2.94	0.15	0.14	0.15
Mecklenburg-Vorpommern	226	328	152	2.07	5.85	1.97	0.10	0.18	0.12
Sachsen	200	151	133	1.65	1.55	1.51	0.10	0.10	0.10
Sachsen-Anhalt	163	209	149	1.56	1.99	2.02	0.08	0.17	0.17
Thüringen	292	374	344	1.86	2.94	2.81	0.13	0.20	0.24
Deutschland insgesamt	693	755	689	2.86	3.18	3.19	0.21	0.24	0.24

Source: Own calculations based on data from the Federal Census Bureau (Vierteljährige Kassenstatistik from www.regionalstatistik.de for 2000 und 2008, and 2013; Federal Census Bureaus for Lower Saxony, NRW, BB and Saarland for 2013).

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Baden-Württemberg registers the biggest change regarding the span width over time. Relatively low gini coefficients indicate relatively low differences between municipalities.

ing).¹¹ Here too, Bavaria and Saarland were very similar in 2000. Throughout Germany, the Gini coefficient for investment activity in 2013 was 0.24. This value is comparable to the distribution of tax revenues (Gini coefficient of 0.19) and less than the distribution measures for housing and heating costs (Gini coefficient of 0.31), debt (Gini coefficient of 0.41), and municipal cash loans (0.73) in 2013.¹² The Gini coefficient has also remained constant over the years. If there are shifts up or down in some federal states, these changes are not significant, nor do they exhibit a clear trend.

Investment Spending Virtually Unchanged over Time

As shown, the distributions of investment activity have remained virtually unchanged in the relevant years. There could be several reasons for this. It is possible that the municipalities retained their place in the distribution between the two years under observation. However, it is also possible that sometimes one or the other municipality is in the lower and upper part of the distribution without the distribution itself changing (because of bundled investments here or there, for instance). In

order to give policy-makers an estimate of long-term investment disparities, it is essential to analyze fluctuations within the distribution.

To achieve this, we use transition matrices (see Box 2), in which we divide the per-capita investment spending of the 396 regional districts and cities into quartiles¹³ and then show the fluctuations of individual municipalities on the quartile boundaries in a table. We performed these analyses for 2000 to 2008 (Panel 1), 2008 to 2013 (Panel 2), and for the entire period 2000 to 2013 (Panel 3) (see Table 2).

In 2000, around 100 municipalities were in the lowest quartile of the distribution (municipalities with investment of less than 210 euros per inhabitant) and 66 of these municipalities still had the lowest investment in 2008. When the second quartile is added, the full extent of this persistence is revealed. More than 90 percent of municipalities in the lowest quartile in 2000 remained below the distribution median in 2008. The situation is very similar at the other end of the distribution. More than 85 percent of municipalities with the highest investment in 2000 have also remained above the median.

¹¹ When Gini coefficients were calculated, per capita gross investment in the districts was weighted according to the population figures for those districts.

¹² Bertelsmann (2015b), 77, 92, 107, 113.

¹³ Given the fact that we have a total of 396 regional districts and independent cities in around 100 municipalities per quartile, the entries in the transition matrix can also be read as percentages.

Table 2

Transition matrices regarding per-capita investments on municipal level

In percent

Transition matrix from 2000–2008						
		Euro per capita	Dispersion 2008			
			1. Quartile	2. Quartile	3. Quartile	4. Quartile
Dispersion 2000	1. Quartile	34 to 210	66	25	7	2
	2. Quartile	211 to 294	23	42	21	13
	3. Quartile	295 to 373	6	22	46	26
	4. Quartile	374 to 727	5	10	26	58

Transition matrix from 2008–2013						
		Euro per capita	Dispersion 2013			
			1. Quartile	2. Quartile	3. Quartile	4. Quartile
Dispersion 2008	1. Quartile	48 to 169	63	27	9	1
	2. Quartile	172 to 243	26	45	26	2
	3. Quartile	244 to 324	8	21	43	28
	4. Quartile	325 to 803	3	6	22	68

Transition matrix from 2000–2013						
		Euro per capita	Dispersion 2013			
			1. Quartile	2. Quartile	3. Quartile	4. Quartile
Dispersion 2000	1. Quartile	34 to 210	48	35	15	2
	2. Quartile	211 to 294	28	29	38	4
	3. Quartile	295 to 373	13	26	32	29
	4. Quartile	374 to 727	11	9	15	64

Source: Own calculations based on data from the Federal Census Bureau (Vierteljährige Kassenstatistik from www.regionalstatistik.de for 2000 und 2008, and 2013; Federal Census Bureaus for Nds, NRW, Bb and SL for the year 2013).

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There are hardly any movements between quartiles. More than 80 percent of municipalities, which lay in the first quartile in 2000, did not exceed the second quartile in 2013.

An almost identical picture emerges for the 2008 to 2013 period. Again, the majority of municipalities remained in the same quartile or moved into the next quartile.

The picture is only different when we examine the entire period from 2000 to 2013. We would normally expect mobility between quartiles to increase over a longer period of time. Although the persistence values here are actually slightly lower, they are still very high. Of all the regional districts and independent cities in the lowest quartile in 2000, 83 percent of municipalities were still below the distribution median 14 years later. These high figures are all the more surprising because our analyses have shown that municipalities in eastern Germany invested less in this period due to the expiry of the Solidarity Pact, and so had exceptionally high

Box 2

Transition Matrix

The purpose of transition matrices is to illustrate mobility within a distribution at two points in time using an indicator. The aim of this transition matrix is to identify the “changers” between the quartiles. Are individual observation units able to change their position within the distribution over time? The transition matrix provides information about mobility between quartiles, both upward and downward.

To this end, all observations in both years were first sorted according to their rank in the distribution and divided into four quartiles. The transition matrix is then a juxtaposition of both these quartile divisions. Each cell of the transition matrix shows the combination of one quartile of the distribution in the first period and a second quartile of the distribution in the second period. The figures in the cells indicate how often this combination applies to the observation units.

If there was no mobility, all observations in the two years would be in the same quartile (and therefore with values only on the main diagonal). Once there is a “changer,” there will also be values off the main diagonal. The more values there are along the main diagonal, the lower the mobility over time.

mobility in the distribution. Taking these special factors into account, the persistence of the distribution has in fact been considerably higher over these longer periods.

Social Security Spending Reduces Scope for Investment

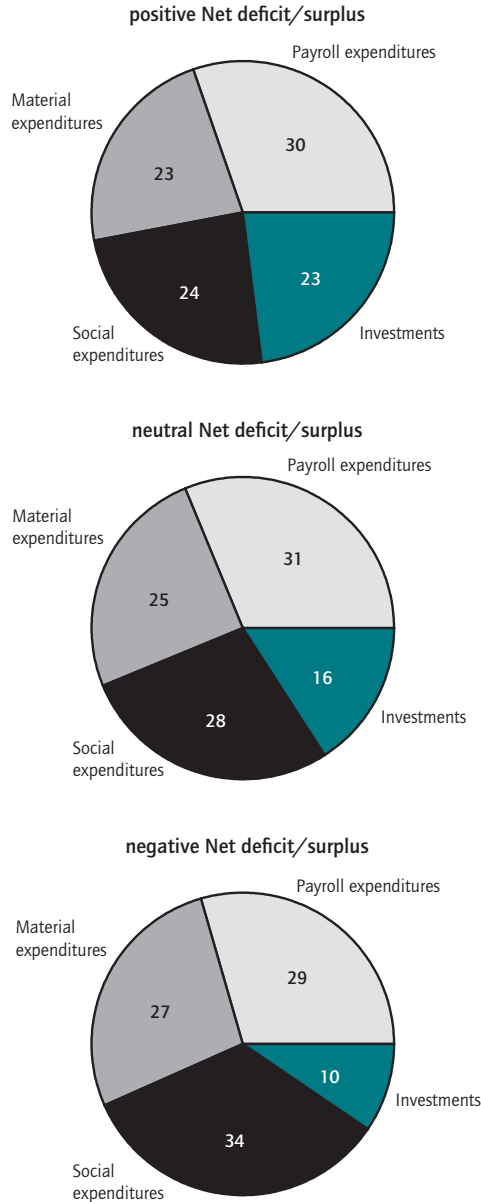
How can these sometimes extreme regional disparities be explained? Where does the money go if there is no investment? Figure 4 shows the budget shares of the four main items, depending on the fiscal balance. We have divided the municipalities into three groups: those with a positive fiscal balance (a surplus of more than 50 euros per capita), those with a negative fiscal balance (a deficit of more than 50 euros per capita), and those with a neutral fiscal balance.

The total amount of spending is roughly comparable in all three groups. Accordingly, the differences in the balances are driven by revenue. Expenditure on personnel and other administrative expenses is proportionally similar in the relevant groups. The main difference is expenditure on social security. Financially strong mu-

Figure 4

Relationship between net lending of municipalities and counties and type of expenditure

In percent



Source: Own calculations based on data from the Federal Census Bureau.

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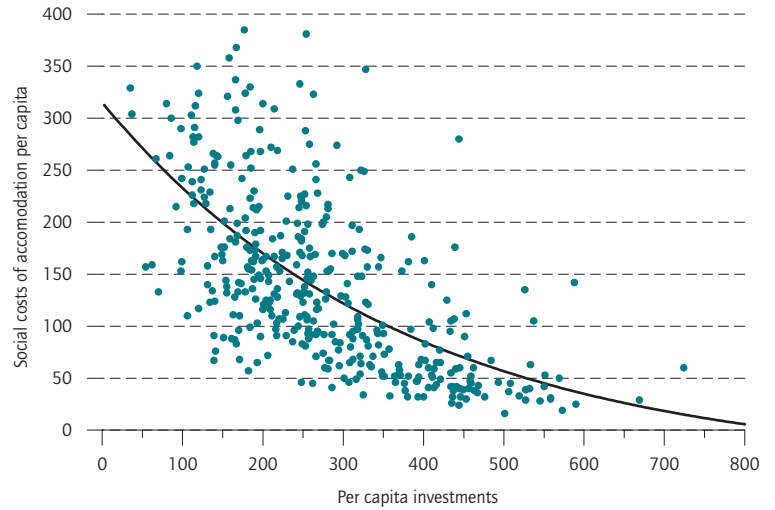
The better the net deficit/surplus, the more is spent for investments and the less for social expenditures.

municipalities only spend 24 percent of their budgets on social security payments, leaving 23 percent for investment. By contrast, the financially weaker municipalities only have ten percent remaining for investment. In

Figure 5

Correlation between social costs of accommodation and expenditures for investments on municipal level

In Euro per capita



Source: Own calculations based on data from the Federal Census Bureau.

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There is a clear relationship between the costs of accommodation and per-capita investments. The higher the costs of accommodation per capita on municipal level, the lower are per capita investments.

these municipalities, spending on social security is in fact the largest budget item at 34 percent.

When considering the correlation between housing and heating costs in accordance with Book Two of the German Social Code, Housing Costs (*Sozialgesetzbuch II, Kosten der Unterkunft (SGB II, KdU)*) and investment spending (both per capita), the correlation between the constraints of social functions on the one hand and investment spending on the other become even more evident. Not only are housing costs one of the most important items of social security spending (24.7 percent of social security spending and the main cost item according to Book Two of the German Social Code), they cannot generally be influenced by the individual municipalities because they are determined by the number of dependent households and local prices. Figure 5 shows housing costs for the individual municipalities in relation to investment spending. This highlights the considerable negative correlations between these two municipal spending items.¹⁴

¹⁴ Bertelsmann (2015b), 67.

Conclusion

The amount of money invested by the municipalities varies continuously. The municipalities of the economically strong federal states of Bavaria and Baden-Württemberg have, over the years, invested considerably more than the remaining western German federal states. Poor investment not only affects individually weak municipalities but, essentially, entire federal states. While the decline in investment in eastern Germany is to some extent systematic, the lack of investment in western Germany is a direct consequence of ailing municipal budgets.

However, the federal state averages are not universally representative. There is sometimes a considerable spread across the individual municipalities. There are major differences between the federal states of Lower Saxony, North Rhine-Westphalia, and Bavaria. Investment in Saarland, Mecklenburg-Western Pomerania, and Saxony-Anhalt is relatively low, while that of Baden-Württemberg is high across the board.

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An analysis of the mobility of all 396 independent cities and regional districts between 2000 and 2013 shows a high degree of stability at the upper and lower ends of the distribution. For instance, 83 percent of municipalities in the weakest quarter of investment in 2000 were also ranked below average in 2013.

One decisive cause of long-term underinvestment is social security spending which reduces the scope for investment. Bearing in mind that high social security spending is incurred in those municipalities that already tend to be economically weak, it is clear that these municipalities suffer a double setback as a result of economic malaise.

The foundation for future growth is sounder in the economically strong communities than in the weaker regions in any case. This creates a self-reinforcing growth effect—positive for the strong municipalities but negative for the weaker ones.

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