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The DIW Economic Bulletin contains selected articles and interviews from the DIW Wochenbericht in English. As the institute’s flagship publication, the DIW Wochenbericht provides an independent view on the economic development in Germany and the world, addressing the media as well as leaders in politics, business, and society.

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Real estate price polarization projected to increase until 2030 in Germany

By Christian Westermeier and Markus M. Grabka

Demographic projections for Germany indicate a drop in the population of many regions by 2030. This is likely to have an impact on the real estate market. Our report presents the result of a model calculation of asking prices for residential real estate in Germany up to 2030 based on market data from empirica-systeme GmbH and a population projection from the Bertelsmann Foundation. Depending on the model specifications, it appears that real estate price polarization will increase by 2030. As with all model calculations, the results are subject to uncertainty. In the scenario presented here, we strictly focus on the demographic effect on real estate prices. According to our projections, in one-third of all rural districts (Landkreise) and urban districts (kreisfreie Städte), the market value of condominiums will fall by over 25 percent. This will also be the case for single- and two-family homes in one-quarter of all districts. Some regions in eastern Germany will be hit particularly hard by this development. In and around urban centers, however, the trend of rising prices is expected to continue. Our findings also show that the polarization of real estate prices might cause the inequality of wealth in Germany to rise slightly.

The demographic trend in Germany is predominantly determined by three main factors: fertility, mortality, and the sum of cross-border migration. At present, Germany’s birth rate is below the sustainable level and at the same time, life expectancy is on the rise. As a result, the size and age structure of the population is changing significantly. According to the 13th coordinated population forecasts of the German Federal Statistical Office, the population level is predicted to fall by 7.7 million to 13.2 million persons by 2060 in comparison to base year 2013—depending on the assumed scope of migration.

Changing population demographics and the associated regional variations in age structure will also have an effect on the real estate market. We presume that in regions with population shrinkage, the demand for real estate will fall and with it, prices. In expanding regions, prices will rise. This effect will be reinforced by a change in the population’s composition: demand for living space is lower among older people than it is among younger people.

And population movement within Germany plays a role alongside migration. The continuing trend toward urban center growth and migration away from rural areas—especially by the young—reinforces the aging process in structurally weak regions. Since the supply of real estate is long-lasting yet inflexible in the short term, the housing stock will most likely react sluggishly to changes in demand. This should heighten the phenomenon of diverging price trends. Despite great uncertainty with regard to migration, we can presume that regional dis-

1 Olga Pötzsch and Felix Rößger, “Bevölkerung Deutschlands bis 2060. 13. koordinierte Bevölkerungsvorausberechnung,” (PDF, German Federal Statistical Office, Wiesbaden, 2015). (available online; retrieved May 31, 2017. This applies to all other online sources cited in this report unless otherwise noted).

2 The composition of the age groups will also radically change, in particular with regard to the proportion of very old persons. For example, the dependency quotient—the proportion of persons ages 65 and older in relationship to 20 to 65-year-olds—is predicted to substantially increase between 2013 and 2060 (34 percent in 2013, 56 percent in 2030 and 65 percent in 2060).

3 This information refers to the scenario with constant birth frequency (L1) and a moderate rise in life expectancy (G1).

parities in population structure will continue to increase by 2030.5

The goal of this study supported by the Hans Böckler Foundation6 is to generate a model-based projection of real estate prices dependent upon the demographic trend up to 2030. Real estate prices are the focus since private real estate ownership represents the most important component of private household wealth in Germany by far.7 For this reason, changes in the assessment and structure of this component of wealth would definitely have an effect on the overall distribution of wealth.

Real estate prices react strongly to changes in demand

Real estate prices are influenced by both demand- and supply-side determinants. Demographic developments such as changes in age structure and total population are the primary demand-side factors that influence price structures.8 The demand-side also encompasses changes in household composition (e. g., an increasing number of one-person households) and changes in preference with regard to acquiring real estate. General economic growth—as manifested by level of disposable income, the interest rate, and the unemployment rate, for example—is another key determinant on the demand side.9

Supply-side determinants of real estate prices include construction activity, availability of land for both residential and commercial usage, prices in the surrounding regions, urban development and infrastructure-related trends (such as transport connections) or the availability of public infrastructure (e. g., daycare, schools, retailers or leisure time programs), housing policy (e. g., subsidy of owner-occupied housing), and the condition and quality of the buildings themselves.10

A special feature of real estate market is the “virtually impossibility” of adjusting the real estate inventory to changing demand-side real estate market determinants in the short term, due to the longevity of real estate and the relatively long periods required for planning and completing construction. For this reason, prices react strongly to unanticipated changes in demand in the short term.11

Regional differences in real estate prices are already significant

A relationship between population growth and real estate prices can be shown for the five districts with the largest percentage population growth and largest population decline (see Table 1). For example, in the city of Leipzig, the total population has grown by 6.8 percent and at the same time, median asking prices have increased by 20 percent. On the contrary, in the Elbe-Elster rural district in Brandenburg, the population fell by 3.7 percent and asking prices by over 25 percent.12

There is already evidence of marked polarization in real estate prices. The information on asking prices from the empirica-systeme market data shows high regional variation for single- and two-family houses in 2015 (see Figure 1). For example, the majority of median


6 We would like to express our gratitude to the Hans Böckler Foundation for financing the research project “Vermögen in Deutschland—Status-quo-Analysen und Perspektiven” (Project number: S-2012-610-4, conducted by DIW Berlin and the Hertie School of Governance under the project direction of Markus M. Grabka). We would also like to thank empirica-systeme for allowing us to use microdata from the empirica regional database.


8 In addition to primary demographic effect on real estate prices, birth cohort effects on demand for living space also affect overall demand and therefore, real estate prices. See Philipp Deschermeier and Ralph Henger, “Die Bedeutung des zukünftigen Kohorteneffekts auf den Wohnflächenkonsum” IW Trends 3 (2015): 23-39. Available online (Accessed May 31, 2017). The authors argue that the cohort effect prevails over the pure age effect, since per capita living space consumption increases only slightly with age.

9 Deutsche Bundesbank, the German central bank, assumes that due to the drop in overall population and the aging of wage earners, economic growth will trend sharply downward in the medium term. See Deutsche Bundesbank, “Demographischer Wandel, Zuwanderung und das Produktionspotenzial der deutschen Wirtschaft,” (PDF, Deutsche Bundesbank, Frankfurt am Main, 2017). (available online). As a key demand-side determinant of real estate prices, this can accordingly have a dampening effect on real estate prices in the future. The quantitatively key determinants of real estate prices are real disposable per capita income, population growth, level of urbanization, and the long-term real interest rate. See Konstantin A. Kholodilin, Jan-Oliver Menz, and Boris Silverstov, “Immobilienkrise? Warum in Deutschland die Preise seit Jahrzehnten stagnieren.” DIW Wochenbericht no. 17 (2008): 214-220. (available online).


12 In the medium term, the negative price effect in shrinking regions can be stronger than the positive one in growing regions. In line with the ratchet effect, in regions with population growth there will be a price increase in the short term, but in the medium term an increase in supply will cause prices to fall again. However, there is hardly any adjustment on the supply side in regions with a shrinking population. Instead, real estate remains on the market and can therefore continue to affect prices negatively (see Tobias Just, Demografie und Immobilien (Munich: Oldenburg Verlag, 2013)).
In cities with significant population growth the asking prices of real estate appear to increase sharply.

prices in eastern German rural and urban districts were below €500 per square meter of living area. In urban centers such as Berlin, Hamburg, Frankfurt am Main, and Munich, asking prices were generally higher than in rural areas. At over €4,290 per square meter, asking prices were the highest in the Munich metropolitan area.

The asking prices of condominiums in 2015 deviated from those of single- and two-family homes in many regions (see Figure 2). We saw the largest differences in coastal regions. While asking prices for single- and two-family homes in the Rostock and Western Pomerania-Rügen rural districts were between €850 and €1,250 euros per square meter for example, they were between €1,950 and €2,420 euros per square meter for condominiums. With comparable price levels for houses and condominiums in rural districts in Saxony, Saxony-Anhalt, and parts of Thuringia, where both types of real estate have the lowest asking prices, or in and around Munich, which has the highest prices, the situation was different.

Demographic shift already showing an effect

In particular, low asking prices in large parts of eastern Germany indicate already present demand-side effects (e.g., of the demographic shift) on real estate prices. For example, the median asking price for single- and two-family homes in the Harz rural district (Saxony-Anhalt) was €644 per square meter of living space in 2015, less than half of the overall German median of €1,580 euros per square meter. According to the information in the Bertelsmann Foundation’s Wegweiser Kommune, a website with population statistics and forecasts for municipalities, in 2014 the average age in that rural district was 48.4 and the dependency quotient 44.2 percent. Since 2011, the population has fallen by 2.5 percent.

On the other hand, the population of the Biberach rural district (Baden-Württemberg) in 2014 was 1.6 percent higher than it was in 2011. There, the average age was 42.3 and the dependency quotient, 29.8 percent. At the same time, the median asking price for single- and two-family homes was €1,633 euros per square meter of living space in 2015, and therefore above the overall German median.

Many rural districts will have to face falling real estate prices

Due to the overall decrease in population forecast for Germany and the current trend toward urbanization, we can expect that real estate prices will continue to polarize. For example, the Federal Institute for Research on Building, Urban Affairs and Spatial Development (Bundesinstitut für Bau-, Stadt- und Raumforschung, BBSR) presumes that due to the demographic shift, the number of vacant apartments will continue to increase in the future: “Above all, in shrinking rural areas—and particularly for multi-story apartment buildings. According to calculations for the BBSR residential market forecast for 2030, 15 percent of rural districts can count on a very high risk of vacancies for rental apartments by 2030 and an additional 25 percent by 2040.”

In the following report, we provide median prices only since unlike arithmetic means, they have the advantage of being robust against outliers at the upper end of the distribution.
Population forecasts assume that in large parts of eastern Germany, the overall population will decline by 2030—in some regions at a rate in the two-digit range. In western Germany on the contrary, the population of most rural districts is expected to remain virtually constant. Using the information from the Bertelsmann Foundation projections on the population change in rural and urban districts up to 2030 and estimates of the change in real estate prices between 2012 and 2015 from the empirica-systeme market data, it is possible to estimate the development of real estate prices by district until 2030. As with all model calculations, our estimate is subject to uncertainty. However, according to our core specification, we find that real estate price polarization among regions in Germany will increase. The individual results presented vary depending on the model assumptions with regard to future growth of the job market or interest rate level, for example (see Box).

The results of the underlying regression model show the expected effect for all age groups considered, namely, that a change in population is positively correlated to the asking prices of real estate. The effect is strongest for the 45–64 age group. The additional explanatory variables, such as interest rate and regional unemployment rate, also show significant effects. As the regional unemployment rate increases, regional real estate prices fall.

The polarization of real estate prices across rural and urban districts can be described using an aggregate measure. In this report, we use a polarization index based on the work of Duclos, Esteban, and Ray. The index increases when the tails of the real estate price distribution gain in importance and at the same time, the mean that dominates the distribution’s center decreases in importance. A significant increase in polarization is already apparent in the period used for the model calculation (see Table 2). Up to 2030, we can assume a significant rise in the polarization of real estate prices for both condominiums and single- and two-family homes.

In eastern Germany, projected real estate prices will develop more weakly than those in the western part of the country (see Figures 3 and 4). In some rural districts of Brandenburg, Saxony, Saxony-Anhalt, and Mecklenburg-Western Pomerania, prices for single- and two-family homes are likely to fall by over 25 percent. This will probably be the case in 100 of the 402 rural and urban

19 The BBSR also forecasts an overall decline in demand for living space in eastern Germany. See Federal Institute for Research on Building, Urban Affairs and Spatial Development, “Entwicklung der Bevölkerung und Haushalte 2015 bis 2030,” (Map, BBSR, Bonn, 2015). Available online. Of course a positive immigration balance could disrupt this trend.

The situation is different in the Biberach rural district. There, the population is expected to grow by about two percent by 2030. The prices of single- and two-family homes are projected to rise by just under 150 euros per square meter of living space (almost ten percent).

To illustrate this, we present the Harz and Biberach rural districts as examples again. For the Harz rural district, Wegweiser Kommune presumes a decline in population by 2030 of around 15 percent (34,000 persons) compared to 2012. According to the model calculation used here, the price per square meter of living space for single- and two-family homes in Harz should fall by around 275 euros per square meter (40 percent).

To illustrate this, we present the Harz and Biberach rural districts as examples again. For the Harz rural district, Wegweiser Kommune presumes a decline in population by 2030 of around 15 percent (34,000 persons) compared to 2012. According to the model calculation used here, the price per square meter of living space for single- and two-family homes in Harz should fall by around 275 euros per square meter (40 percent).

districts of Germany. In and around urban centers, however, the projection indicates that the rise in prices will continue. This is the result of rising living space demand on the one hand, and domestic migration to urban centers, which should lead to a population increase in these districts, on the other hand. We also project an increase in real estate prices of over 25 percent for single- and two-family homes in 32 rural and urban districts.

In the short and medium terms, the prices of condominiums react more strongly to changes in demand than the prices of single- and two-family homes. In 133 districts (33 percent), owners will face a price decline of over 25 percent. At the same time, a significant price increase will be more strongly concentrated in urban centers and less so in the suburbs, unlike the case of single- and two-family homes. For over 50 rural districts (14 percent) the price increase in this case is projected to be over 25 percent on average.

Table 2

<table>
<thead>
<tr>
<th>Year</th>
<th>Condominiums l</th>
<th>u</th>
<th>Single- and two-family homes l</th>
<th>u</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>0.155</td>
<td>0.163</td>
<td>0.170</td>
<td>0.174</td>
</tr>
<tr>
<td>2015</td>
<td>0.170</td>
<td>0.178</td>
<td>0.186</td>
<td>0.188</td>
</tr>
<tr>
<td>2030</td>
<td>0.224</td>
<td>0.234</td>
<td>0.244</td>
<td>0.216</td>
</tr>
</tbody>
</table>


Source: empirica-systeme market data and own projections of values of owner-occupied property until 2030, private households.

Polarization of asking prices of residential properties is expected to increase.

The situation is different in the Biberach rural district. There, the population is expected to grow by about two percent by 2030. The prices of single- and two-family homes are projected to rise by just under 150 euros per square meter of living space (almost ten percent).
Box

Data and methods

Our projection of real estate prices by rural districts and urban districts in Germany up to 2030 is primarily based on three data sources. They are: the Socio-Economic Panel (SOEP) data, representative of the population and current to 2015, real estate price information for 2012-2015 from the empirica-system market data,1 which is divided into single- and two-family homes and condominiums, and information on future population growth from the Bertelsmann Foundation’s Wegweiser Kommune.

Our information on population growth up to 2030 (differentiated among six age groups) in 295 rural districts and 105 urban districts is based on a population projection by Bertelsmann Foundation, which in turn bases its assumptions on the birth rates and life expectancies in the 12th population projection, coordinated by the German Federal Statistical Office (Statistisches Bundesamt) and the Federal State Statistical Offices (Statistische Landesämter).2 Variant L1—a continued moderate rise in life expectancy and constant birth rate—underlies the data in our report. We assume a net migration rate to Germany of 400,000 persons in 2013 that will decline to 200,000 persons per year by 2020. The population extrapolation is based on the overall population as of December 12, 2012, which takes the results of the 2011 census into account.

We use a two-stage regression model for our estimates. First, a regression model describes the median price per square meter of living space for real estate—for single- and two-family homes and condominiums separately—depending on the existing population in six different age groups, the regional unemployment rate, the regional GDP, the average interest rate on mortgages, information on the stock and scope of new buildings, and region-specific fixed effects.

In most earlier studies, the effect of population aging was estimated separately from the effect of population growth. Studies influenced by Mankiw and Weil (1989) first estimate living space usage specific to age cohort and, based on the results, calculate aggregate living space demand—the latter’s impact on real estate prices is estimated next. DiPasquale and Wheaton’s approach (1992) has influenced researchers to derive the model’s regressors from a stock-flow model. Typically, the model takes variables into consideration that separate the effect of agglomeration (population density) from scarcity ratios (living space per resident) and from the effects of population composition (proportion of young vs. old residents) and control for unemployment and income growth. These models allow for analytical dissection of the demographic shift’s effects on real estate prices.

The regression model used in our study is specified much more simply. It is related to the ad hoc model formulated by Maenning and Dust (2008), who used the logarithmized prices of average residential real estate in different regions in order to estimate the direct effect of population changes on real estate prices.1 Unlike Maenning and Dust (2008), we use logarithmized median asking prices in rural districts and urban districts as dependent variables. Also unlike Maenning and Dust (2008),4 we do not employ interaction effects to identify population shrinkage or population growth. Instead, our study only takes the number of residents within a rural district (divided into different age groups) into consideration. All other effects that are usually controlled for, such as level of agglomeration or scarcity on the housing market, are captured as region-specific fixed effects. In this specification, the influence of age cannot be clearly separated from the effect of population change or changes in agglomeration. However, because we are using this model for forecasting and not for analytical purposes, we accept this imprecision.


1 (available online).
2 The results of the projection calculations can be retrieved by municipality, gender, and age. (available online).
REAL ESTATE PRICE POLARIZATION

One shortcoming is that due to data restrictions, the first-stage regression is based on the rather brief period from 2012 to 2015. A strong real estate market upswing occurred in that period. A priori, it is not clear whether this under- or overestimates the effects of population changes. In order to determine the average long-term effect, an observation period of between nine and 12 years would be required for Germany in order to cover an entire market cycle. Similar to Dust and Maenning (2008), since we do not explicitly differentiate between price reactions in already depopulating and currently growing regions, the prices simulated here are not precisely in focus for each different market. For this reason and also due to the imponderable nature of population projections, our simulation results should be understood as qualitative—that is, less than precise—estimates of the effects.

We use the estimated regression coefficients to project the price per square meter of real estate up to 2030. In the process, our main source of information is the development of the population structure for rural districts and urban districts based on information from the Bertelsmann Foundation’s population projections. We hold the region-specific unemployment rate constant and after 2016, the growth of region-specific GDP is also assumed to be constant at two percent. We also presume that the interest rates on mortgages will rise slightly and new construction activity will be constant at two percent. For rental property instead of ownership can rise. In this case, the model calculations in this report would be underestimates. The scenario we use assumes average new construction activity and an average interest rate of 2.5 percent.

5 In order to improve the validity of the estimate, a longer period would be helpful—in particular, for taking housing price cycles more fully into consideration. However, data for a longer period were not available. The period we selected does have advantages, including the fact that exogenous effects—such as the short-term effects of the financial crisis in 2008-2009 on real estate prices—were unable to influence the estimates. Earlier studies such as that of Maenning and Dust (2008) used only cross-sectional data, which would overestimate negative effects of a projection in the case of population shrinkage (see Just, Demografie und Immobilien).


7 The model calculation for condominiums may provide an exaggerated picture here. Condominiums were somewhat overvalued during the observation period, while single-family homes did not deviate from their fundamental value with any statistical significance (see Florian Kaputh, Thomas A. Knetsch, and Nicolas Pinkwart, “Assessing house prices in Germany: evidence from an estimated stock-flow model using regional data.” Deutsche Bundesbank Discussion Paper no. 46/2013 (2013). (available online).

gauge the expected average value of owner-occupied real estate and make meaningful statements about the distribution of wealth. The average gross value of owner-occupied real estate—without deducting any liabilities—was around 215,000 euros in 2012, according to the SOEP data (see Table 3). We were able to track the rise in real estate prices currently observable in Germany for the period 2012–2015. According to the SOEP data and considering the price trend from the empirica-systeme market data, there was an increase in gross value of 14 percent to an average value of 245,000 euros. Based on the model calculation, all things being equal the average value of owner-occupied real estate will not change by 2030.24 This is an aggregate result of different regional trends: the weak price development in shrinking regions will balance out price increases in urban centers. This is also reflected in the inequality of the value of owner-occupied real estate. Whereas the Gini index25 for this type of wealth was 0.36 in 2012, based on the model calculation and again all other things being equal, it will rise to 0.44 by 2030.

Impact on the distribution of wealth

We combined the price developments projected until 2030 with housing data from the SOEP23 in order to

Table 3

Mean value and distribution of owner-occupied properties

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean in Euro</th>
<th>Gini coefficient</th>
<th>Gini coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>214,076</td>
<td>0.36</td>
<td>0.74</td>
</tr>
<tr>
<td>2015</td>
<td>244,706</td>
<td>0.37</td>
<td>0.74</td>
</tr>
<tr>
<td>2020</td>
<td>246,186</td>
<td>0.39</td>
<td>0.74</td>
</tr>
<tr>
<td>2025</td>
<td>247,899</td>
<td>0.42</td>
<td>0.75</td>
</tr>
<tr>
<td>2030</td>
<td>243,968</td>
<td>0.44</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Source: SOEPv32 and own projections of the values of owner-occupied properties until 2030, private households.

Inequality of the distribution of owner-occupied property will increase until 2030.

Holding all other components of wealth constant and observing the stand-alone effect of real estate prices for owner-occupied real estate on the inequality of net household wealth, we find that inequality of wealth would

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23 SOEP is a recurring annual representative survey of private households. It began in West Germany in 1984 and expanded its scope to include the new federal states in 1990, see Gert G. Wagner et al., "Das Sozio-oekonomische Panel (SOEP): Multidisziplinäres Haushaltspanel und Kohortenstudie für Deutschland—Eine Einführung (für neue Datennutzer) mit einem Ausblick (für erfahrene Anwender)," ASIA Wirtschafts- und Sozialstatistisches Archiv 2 no. 4 (2008): 301-328.

24 However, it must be taken into consideration that we estimated the impact of the demographic shift alone on the prices of owner-occupied real estate here. We did not include other possible effects caused by a change in wealth portfolio.

25 Also see the term "Gini-Koeffizient" in the DIW Berlin glossary (available online in German only).
increase by at least two percent by 2030 as compared to 2012 (0.74 to 0.76).

**Conclusion**

Owner-occupied real estate is the quantitatively most important component of wealth in Germany. The model calculation presented here indicates increasing polarization of the prices of owner-occupied real estate in Germany by 2030. However, this also means that in a significant number of rural districts, investing in real estate should be less appealing from the economic viewpoint due to falling prices. Moreover, with increasing polarization of real estate prices wealth inequality is bound to increase as well.

**JEL:** G12, J11, D31

**Keywords:** Demographic change, property prices, projection, SOEP, Empirica-Systeme Marktdaten

**Figure 4**

Real estate development in Germany—Condominiums
Price changes in percent, 2015-2030
1. Mr. Grabka, you have studied the effects of the demographic shift on residential real estate prices in Germany. What does population growth in the coming decades look like? We based our work on the population forecast coordinated by the German Federal Statistical Office (Statistisches Bundesamt), which currently extends to 2060. According to that projection, the population of Germany will shrink by between eight and 13 million persons by then, depending on the level of migration to the country.

2. Your study’s goal is to generate a model-based projection of residential real estate prices dependent upon the demographic trend until 2030. What exactly does this involve? Residential real estate prices are influenced by both supply- and demand-side determinants. In the case of demand-side determinants, changes in overall population as well as changes in population structure should have an effect on residential real estate prices. This means the level of depopulation we expect Germany to experience in the coming decades should have an effect on residential real estate prices by region.

3. Are you saying that supply will remain the same, demand will drop, and the price of residential real estate will fall as well? That is a simplified yet accurate explanation. The supply side of the residential real estate market changes very slowly. The real estate market is special because its “goods” cannot react quickly to market trends. The advance-planning phase for new buildings is rather long. Accordingly, the market reacts to strong demand-side determinants such as depopulation quickly and decisively in comparison.

4. So will residential real estate prices in Germany plummet in the future? According to our calculations, prices will develop very different regional patterns. We presume that in Germany’s rural regions aging and depopulation will have a significant impact. In regions such as Saxony-Anhalt, for example, residential real estate prices will plummet in affected rural districts. At the same time, residential real estate prices in regions with population growth—in Germany, mainly large cities—will probably rise slightly.

5. Is there a general difference between eastern and western Germany in this regard or only between rural and urban regions? The relevant differences are no longer between eastern and western Germany. Instead, they are between regions that show population growth and those in which are trending toward depopulation, depending on the rural district in question and its population structure.

6. Which type of residential real estate will be most affected by a decline in price, single- and two-family homes or condominiums? Our simulation supports the findings described in the literature, which indicate that the price of condominiums reacts more strongly to demographic change than the price of single- and two-family homes. This is primarily because most condominiums are located in urban centers and the demographic shift exercises a stronger effect there than in rural areas.

7. What does a shift in residential real estate prices mean for the distribution of wealth in Germany? Owner-occupied real estate is still the most important component of wealth in Germany. Due to the increasing polarization of residential real estate prices, the inequality associated with this component of wealth will increase. Overall and for purely demographic reasons, this will probably lead to a slight increase in inequality in wealth in Germany until 2030.

Interview by Erich Wittenberg
REAL ESTATE PRICES

No Germany-wide housing bubble but overvaluation in regional markets and segments

By Konstantin Kholodilin and Claus Michelsen

Although the housing prices in the 127 largest German cities have surged strongly in recent years, there is still no sign of a Germany-wide housing bubble. In comparison with 2009, the price of condominiums has risen by around 55 percent. Single-family houses cost between 38 and 45 percent more in 2016 than seven years prior, and building lot prices have risen by around 63 percent. The study at hand shows that concerns about a national housing bubble are largely unfounded. There may, however, be bubbles on the local level—primarily in the relatively small segment of new multi-story apartment buildings but also with regard to the valuation of undeveloped residential land. Given the situation, it seems appropriate that financial regulators have opened up more policy options in order to intervene when the market trend proves unsustainable. But because the measures were diluted in the federal legislative process, the need for policy-related action remains.

The strong upsurge in the price of residential real estate in Germany shows no sign of stopping. Since 2010, the price of condominiums in large cities has risen by around 55 percent—an unparalleled development in recent German history. The prices of single- and terraced homes and of undeveloped residential land have also risen sharply (see Figure 1). The European Central Bank’s low interest-rate policy is a key driver. On the one hand, it relaxes the conditions for financing real estate investment—right now interest rates on residential construction loans are at an historic low. On the other hand, it reduces the yield of alternative investments. And the trend of moving to Germany’s cities that started at the beginning of the 2000s is ongoing. In many cities, construction activity is not able to satisfy the increase in demand. This is reflected in sharply rising housing rents, whose momentum has not been significantly reduced by regulatory intervention, such as the rental price brake.

Thus, there is abundant evidence that the development of housing prices is justified by the fundamental factors. From the mid-1990s until 2010, real estate prices in Germany stagnated, and as measured by the general inflation rate the price of living space actually fell. At least in part, today’s price increases are catch-up effects. The expectation that in the future the population will fall even more dramatically in rural areas and rise in urban regions could also be an explanatory factor in the current price trend.

1 See Philipp Deschermeier, et al., “Zuwanderung, Wohnungsnachfrage und Baubedarfe. Aktualisierte Ergebnisse des IW Wohnungsbedarfsmodells,” IW Report 18/2016 (PDF, Cologne Institute for Economic Research, Cologne, 2016). (available online; retrieved June 7, 2017. This applies to all other online sources cited in this report unless otherwise noted).


3 For example, rough estimates indicate that prices in rural regions will dramatically fall while they show significant potential to rise in urban centers. See Markus Grabka and Christian Westermeier, “Real estate price polarization projected to increase until 2030 in Germany,” DIW Economic Bulletin no. 25–26 (2016).
Since 2010, the housing prices and rents increased substantially.

In spite of this, there is some concern that a speculation-driven housing bubble could arise in Germany. As the USA, Spain, and Ireland have experienced, housing bubbles engender risks for the stability of the economic and financial system. Germany’s central bank, whose analyses indicate massive overvaluation of residential real estate in many regions of the country, sends out warnings at regular intervals. The International Monetary Fund has also been demanding that Germany develop instruments to enable effective intervention by banking authorities in cases of aggregate risk due to housing bubbles. The German Bundestag adopted a law to this effect in March 2017, but the set of instruments was significantly dilute in the federal legislative process.

It is difficult to identify cases of price overvaluation with accuracy. Descriptive analyses alone can lead to an incorrect impression. Examining national price indices is an ineffective means of early detection of housing bubbles. Since 2014, DIW Berlin has analyzed price trends in Germany’s 127 largest cities and used an elaborate statistical procedure to determine the existence of price bubbles.

The approach used by DIW Berlin is the only one based on regional price indices. It has the advantage of detecting speculative overvaluations in real time. Other procedures that attempt to explain price trends using fundamental factors can be applied on the regional level only with a significant delay due to the data availability. The present study updates the results of previous studies and supplements them with observations from additional market segments. The latter are based on a data set from Bulwienges AG containing housing prices and rents.

4 International Monetary Fund, Article IV consultation, Staff Report for the 2016 Article IV Consultation. 2016.
6 The number of studies concerning the possible speculative housing price bubble formation in Germany is still limited. The results of existing studies are controversial and do not provide a conclusive picture. Xi Chen and Michael Funke examined aggregated series a few years ago and concluded that there is no housing bubble in Germany; see Xi Chen and Michael Funke, “Renewed Momentum in the German Housing Market: Boom or Bubble?” CESifo Working Paper no. 4287 (2013). Two other researchers applied the same methodology to the seven largest cities in Germany; see Philipp an de Meulen and Martin Micheli, “Droht eine Immobilienpreisblase in Deutschland?” Wirtschaftsdienst 93(8) (2013): 539-544. They found that speculative motives contributed to the real estate price increases to a very limited extent. In Florian Kaputh, Thomas A. Knetsch, and Nicolas Pinkwart, “Assessing house prices in Germany: evidence from an estimated stock-flow model using regional data,” Deutsche Bundesbank Discussion Paper no. 46/2013 (2013), the authors concluded that some prices were significantly higher than the fundamentally justified level by up to 25 percent.
7 In spite of this, there is some concern that a speculation-driven housing bubble could arise in Germany. As the USA, Spain, and Ireland have experienced, housing bubbles engender risks for the stability of the economic and financial system. Germany’s central bank, whose analyses indicate massive overvaluation of residential real estate in many regions of the country, sends out warnings at regular intervals. The International Monetary Fund has also been demanding that Germany develop instruments to enable effective intervention by banking authorities in cases of aggregate risk due to housing bubbles. The German Bundestag adopted a law to this effect in March 2017, but the set of instruments was significantly dilute in the federal legislative process.

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Source: Bulwienges AG; own calculations.

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Regional real estate market development is relevant

Price series are not the only variable where aberrations relevant to the economy as a whole (bubbles) can show up. Housing affordability as measured by the relationship between housing prices and disposable income is another indicator. In the long run, housing prices should develop in harmony with disposable income. Although real estate prices have recently risen much faster than income, the relationship between selling prices and income has historically been and continues to be harmonious in Germany. A comparison with other countries indicates that fluctuations are not unusual (see Figure 2).

Another frequently mentioned indication of speculative bubbles is a jump in the volume of new housing loans. This does not apply to Germany at present: loan volume surged upward in Germany in 2015 but has recently stabilized at a constant level (see Figure 3). This is typically explained by the European Banking Authority’s Guidelines on Sound Remuneration Policies and Disclosures, that reportedly led to limitation of lending for specific types of households. However, the recent Bank Lending Survey of commercial banks did not indicate any long-term tightening of lending standards. The ratio of new housing loans to GDP is stable. The volume of loans with interest rates fixed for over five years continues to expand—partially due to an increase in loans with long-term fixed interest rates of over ten years (see Figure 4).

In view of these indicators, the overall risk of a speculative bubble occurring in the national German housing market appears low. Long-term fixed interest rates and the relatively stable volume of new loans support the assumption that most residential construction projects rest on a solid financial foundation. The excessive credit-driven investment activity in other countries such as the USA led to financial market distortions and when the property bubble burst, to the massive debt overload of many households. Currently, a scenario like this is unrealistic for Germany.

The data on price trends for real estate in Germany are meager in comparison to other countries. On the local level in particular, there are hardly any sources that allow for analysis over longer periods of time. German time series are typically very short, cover only a few locations, or only contain asking prices.

For the present study, we used rental and selling price data from Bulwiengesa AG, a consulting company that has generated data and indices on individual real estate market segments for over 30 years. The German central bank, for example, uses them to track trends in the real estate market. And the Organization for Economic Co-operation and Development (OECD) employs them as the basis for the Germany-wide housing price index embedded in its international database. The data encompass the average selling prices and rents for apartments in 127 large German cities between 1990 and 2016. It is a unique source of information with regard to geographical and temporal coverage of the market.1

In the present study, we included eight variables:

- average selling price for lots for multiple-family homes in the mid-price range
- average selling price for condominiums upon initial occupancy (new buildings)
- average selling price for condominiums upon resale (existing buildings)
- average selling price for townhouses upon initial occupancy (new buildings)
- average selling price for townhouses upon resale (existing buildings)
- average selling price for single-family homes (existing buildings)
- average rent for apartments upon initial occupancy (new buildings)
- average rent for apartments upon re-rental (existing buildings)

We also used the above variables to calculate the ratio of selling prices to annual rents for new and existing buildings. To calculate the price-to-rent ratio for lots, we used the annual rent for apartments in new buildings. And to find the ratio for single-family homes, we used the annual rent for apartments in existing buildings.

Bulwiengesa AG also classified the cities into four groups based on their importance, population, and liquidity in the urban real estate market. The classification system has become an industry standard. A-cities are the most important markets. There are seven of them: Berlin, Hamburg, Munich, Cologne, Düsseldorf, Frankfurt am Main, and Stuttgart. A-cities are internationally and/or nationally important and overall, feature excellent real estate market conditions. The annual turnover in these cities is over 2.5 percent of the national market. Fourteen cities are classified as B-cities. They are nationally and/or regionally important and have an annual turnover volume of over 1.5 percent of the market. The majority of the 22 C-cities are regional centers, but most cities (84) are classified as local centers: D-cities. Turnovers in these two city types are significantly lower than in the A- and B-cities. In the present study, we used this classification to look at individual cities in addition to conducting a differentiated analysis of the activity in the real estate market.

In the long run, the housing prices depend on the evolution of the rental yields and, therefore, on the overall income dynamics, the explo-

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1 For a detailed description of the data, see Bulwiengesa, "Immobilienmarktdaten für Deutschland und ausgewählte Staaten in Europa." (available online in English).
Box 2

**Identifying spikes**

Our analysis of property prices rests on two assumptions: prices are exclusively determined by the present value of future income, and market participants are fully informed and rational. Because these prices directly reflect all known information, they follow the random walk pattern. Applied to the real estate market, this means that housing prices are coupled to rent trends in the long run. If prices are not a perfect map of rental yield, additional factors such as real estate speculation obviously play a role. Speculation leads to expected future increases in real estate prices co-determining price trends alongside the expected trend of real demand. If this estimate becomes the consensus among market participants, the purchase of overvalued real estate is a rational individual choice leading to a speculation bubble and prices that increasingly decouple from demand.

There are a number of approaches to empirically detect speculative bubbles in the real estate market. Part of the relevant literature is explicitly based on the theoretical considerations described above. The Homm and Breitung test was developed to identify explosive behavior of price. If housing prices are discounted flows of expected rental revenues, it is extremely unlikely that they will grow at an exponential rate. Following this approach, it is possible to test whether or not a time series is following a random walk (null hypothesis) or exploding. The first option reflects the hypothesis of rational expectations and therefore, the fundamental long-run components of the prices.

The test assumes that the time series under examination is an autoregressive process AR(1):

\[ y_t = \rho y_{t-1} + u_t \]

in which coefficient \( \rho \) varies over time and \( \rho_i \) is a typical error term.

Under the null hypothesis, \( y_t \) follows a random walk in all periods:

\[ H_0: \rho_i = 1 \text{ for } t = 1, 2, ..., T \]

Under the alternative hypothesis, the process starts as a random walk but at a certain point in time \( t^* \) transforms into an explosive process (spikes).

\[ \rho_i = \begin{cases} 1, & \text{if } t = 1, 2, ..., t^*, \\ \rho > 1, & \text{if } t = t^* + 1, ..., T \end{cases} \]

To test the hypotheses, we used a Chow-type unit-root structural break test. We looked for the point in time \( t^* \) at which the process became explosive. With this approach, we were able to test whether speculative price trends are present on the city level and for groups of cities.

We followed two additional test strategies. First, we analyzed whether there were explosive trends for rents, prices, and the price-to-rent ratio on the individual city level. The second strategy consisted of extracting the most important common price trend and testing it for explosive behavior instead of examining each individual city separately. The common trend represents a weighted average of the price time series in the individual cities, whose weights were determined by performing a principal component analysis. There are two arguments in favor of this approach. First, price trends in individual cities are heterogeneous and the fluctuations compensate for each other when the overall trend is calculated. Second, an overall trend can be calculated for any set of cities, enabling an examination of the extent to which a property bubble already exists in a given market. We calculated the principal components for four city classes and Germany as a whole.

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sive housing price increases point out to a decoupling of the actual prices from those determined by the real demand for housing.

However, demand can fluctuate sharply, for example, as a consequence of intensified immigration. Real estate supply is rigid in the short run, so rents rise sharply. To account for developments like these, the analysis included both real estate prices and rents. If the patterns of rental and selling prices are similar, real estate valuation is in line with the market. If only prices are explosive, a bubble is likely to be building up. If only rents are explosive, potential investment opportunities are available at the location in question. We also tested price-to-rent ratio for explosiveness, being a standard overvaluation measure.

To account for the spatial dimension of the real estate market, we used a multi-step approach to assessing price development. In the first step, we explored a set of Ger-
many-wide price series from 1996 through 2016. Next, we analyzed price developments in locations classified as A, B, C, or D. This classification was developed by Bulwiengesa AG and is based on the figures on population and turnover of the real estate transactions. “A-cities” are internationally important locations, whereas “D-cities” are centers of local importance. Finally, we tracked price development in the individual cities to identify local bubbles. In the process, we differentiated between the existing and newly built stock of condominium dwellings and single-family houses as well value of residential lots.

Price increases in all segments remain strong

In Germany’s major cities, the price of residential real estate and undeveloped residential land continues to surge upward. In comparison to base year 2009, the price of undeveloped residential land in the 127 largest cities in Germany was around 63 percent higher and condominiums around 54 percent more expensive in both the existing stock and new building segments. For terraced houses—both new and existing—buyers must now pay 40 percent more than seven years prior. During the same period, single-family homes became around 38 percent more expensive (see Figure 1). In comparison, rents for new apartments rose by around 34 percent and for existing ones by around 32 percent—an expression of the rising demand for living space in large cities.10

The strongest driver is the market trend in A-cities. In these locations the price for undeveloped residential land has more than doubled since 2009; the price of new condominiums has risen by around 68 percent and existing ones by 78 percent; and price increases for homes were well over 50 percent. Rents, on the contrary, have only risen by one-third for the existing and by 38 percent for the newly built dwellings.

The weakest price increases were in D-cities. Residential lots in these locations rose by 40 percent; the price for condominiums of both types rose by around 50 percent; and single-family homes and terraced houses became 35–40 percent more expensive. The trends in B- and C-cities were within the range defined by the price trends in A- and D-cities (see Figure 5 and Table 1).

Bubbles likely in isolated market segments

The statistical tests showed that prices in almost all market segments display a temporary explosive behavior, but in almost all cases this trend is accompanied by corresponding rent increases. This indicates that the valuation is justified by the fundamental factors. However, the price-to-rent ratio in A-cities appears to indicate bubble formation for condominiums—in both the new building and existing building segments—and for residential lots. Prices in these two segments have risen significantly higher than rents, such that the ratio of the two variables shows an unusual pattern in these cases (see Table 2).

The trends in B- and C-cities are sound at present. Only existing apartments and the prices of existing terraced houses suggest possible overvaluation in D-cities, where skyrocketing selling prices out of line with the development of rents can be observed. However, judging by the price-to-rent ratio, this is not cause for alarm.

Throughout Germany, bubbles may be building up in the markets for new condominiums and single-family homes as prices further decouple from rents. The segment of newly built dwellings in apartment buildings

Especially in A-cities, the prices and rents substantially increased.
REAL ESTATE PRICES

represents only a small share of the overall market: new apartments built since 2010 make up around 1.4 percent of the housing stock in Germany. Single-family homes, on the contrary, are a significantly higher proportion, but not in the large cities included in our study where apartment buildings dominate.

Observations of individual local markets showed price trends in many cities that were not accompanied by parallel trends for rents. When using the price-to-rent ratio measure, the speculative bubbles in at least one market segment are detected in 20 of the 127 large cities in Germany (see Map 1 and Table 3). The values of new condominiums and undeveloped residential land in particular form a critical pattern. A-cities are affected rather frequently, but the trend in other city categories is less striking.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Germany</th>
<th>A-cities</th>
<th>B-cities</th>
<th>C-cities</th>
<th>D-cities</th>
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<tbody>
<tr>
<td>Land plots</td>
<td>64</td>
<td>71</td>
<td>52</td>
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<tr>
<td>Single-family houses</td>
<td>38</td>
<td>55</td>
<td>31</td>
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<td>Terraced houses (newly built)</td>
<td>45</td>
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<td>49</td>
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<tr>
<td>Terraced houses (existing)</td>
<td>41</td>
<td>62</td>
<td>38</td>
<td>51</td>
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<tr>
<td>Flats in condominiums (newly</td>
<td>54</td>
<td>68</td>
<td>56</td>
<td>59</td>
<td>51</td>
</tr>
<tr>
<td>built)</td>
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<tr>
<td>Flats in condominiums (existing)</td>
<td>54</td>
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<td>58</td>
<td>50</td>
</tr>
<tr>
<td>Rents (newly built)</td>
<td>34</td>
<td>33</td>
<td>36</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Rents (existing)</td>
<td>32</td>
<td>33</td>
<td>26</td>
<td>31</td>
<td>34</td>
</tr>
</tbody>
</table>

Source: Bulwiengesa; own calculations.

Table 2

Assessment of the market dynamics by segments and types of cities

<table>
<thead>
<tr>
<th></th>
<th>Price-to-rent ratios</th>
<th>Prices and rents tested separately</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-cities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flats in condominiums (existing)</td>
<td>possible speculative bubble</td>
<td>no signs of speculative bubble</td>
</tr>
<tr>
<td>Flats in condominiums (newly built)</td>
<td>possible speculative bubble</td>
<td>no signs of speculative bubble</td>
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<tr>
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<td>no signs of speculative bubble</td>
</tr>
<tr>
<td>Terraced houses (newly built)</td>
<td>no signs of speculative bubble</td>
<td>no signs of speculative bubble</td>
</tr>
<tr>
<td>B-cities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flats in condominiums (existing)</td>
<td>no signs of speculative bubble</td>
<td>no signs of speculative bubble</td>
</tr>
<tr>
<td>Flats in condominiums (newly built)</td>
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<td>no signs of speculative bubble</td>
</tr>
<tr>
<td>C-cities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flats in condominiums (existing)</td>
<td>no signs of speculative bubble</td>
<td>no signs of speculative bubble</td>
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<tr>
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<td>no signs of speculative bubble</td>
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<tr>
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<td>no signs of speculative bubble</td>
</tr>
<tr>
<td>D-cities</td>
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<tr>
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<td>no signs of speculative bubble</td>
<td>no signs of speculative bubble</td>
</tr>
</tbody>
</table>

Source: Bulwiengesa; own calculations.
Results of speculative bubble test for individual cities

The number of market segments in which the price bubble is likely

Source: Bulwiengesa; own calculations.
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Conclusions

In recent years, real estate prices in Germany’s large cities have risen significantly. However, the results of the present analysis show that to a great extent, this is in line with the development of rents. Some cities also experienced catch-up effects as a result of the real estate market’s long-lasting sluggishness—especially in international comparison. In retrospect, trends that seemed critical now appear to have been justified. The overall results show that the speculative investor behavior in the USA, for example, which triggered a severe global economic and financial crisis, is not evident in Germany at this time. Real estate transactions are being made on solid financial bases, the volume of loans is stable, and the statistical tests introduced in the present study show no sign of aggregate bubble build up. However, this does not mean that prices will remain stable at their present level. On the one hand, they have the potential to continue rising as a result of the housing shortage and sluggish construction activity in large cities. On the other hand, a more austere monetary policy could lead to a significant drop in demand for housing and an ensuing price correction. This would not be due to a bubble bursting, however. Instead, it would be the result of a fundamental change in the general conditions.

Including the separate tests using prices and rents separately demonstrated that in half of the cities examined, a speculative bubble is likely in at least one market segment (see Map 2). There as well, the value trend of new condominiums (47 cities) and undeveloped residential lots (28 cities) primarily indicates that selling prices have decoupled from rents. The proportion of cities with alarming price trends in the new building segment has significantly increased since the last study. Based on price information up to 2014, only 28 cities with possible aberrations were identified. The proportion of A-cities was relatively large at that time. But as measured by the separate tests of price and rent trends, the likelihood of a bubble in at least one market segment of all other city types is high.

The likelihood of a bubble in A-cities (large cities of international importance) has increased because selling prices are rising more rapidly in these locations than rents. However, many smaller cities are now exhibiting a lower likelihood of forming property bubbles than before. This is primarily because rents in smaller cities have virtually caught up—which could also be the result of the previous upsurge in prices. To ensure investment profitability in markets where real estate prices are surging upward, there is pressure to charge higher rents and set prices at the limit of what households are willing to pay.

But policy makers should not lapse into passivity as a result of the findings of the present study. Recently, the measures suggested by the International Monetary Fund and other institutions were adopted that allow intervening in lending and financing of real estate if worse-case scenarios arise. However, the regulatory measures were diluted and defused in the federal legislative process. The great challenge is to detect worrisome trends on the aggregate level. There are no clear criteria for doing so yet. Systematic monitoring that is suggested in this study would improve the early bubble detection and facilitate targeted application of the new instruments.

Table 3

Test results for individual cities

<table>
<thead>
<tr>
<th>Type of city (total number of cities)</th>
<th>Speculative bubble present in at least one segment (price-to-rent ratios)</th>
<th>Speculative bubble present in at least one segment (prices and rents tested separately)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-city (7)</td>
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<td>4</td>
</tr>
<tr>
<td>B-city (14)</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>C-city (22)</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>D-city (84)</td>
<td>14</td>
<td>41</td>
</tr>
<tr>
<td>Overall (127)</td>
<td>20</td>
<td>65</td>
</tr>
</tbody>
</table>

Source: Bulwiengesa; own calculations.

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JEL: C21; C23; C53.

Keywords: House prices, speculative bubble, explosive root, German cities