EMPIRA

RESIDENTIAL CONSTRUCTION IN GERMANY'S TOP 7 CITIES
DEVELOPMENT, DIFFERENTIATION, OUTLOOK

RESEARCH REPORT
OCTOBER 2018

Residential construction in Germany's Top 7 cities

Development, Differentiation, Outlook

The situation on the German housing market is currently the subject of a controversial debate. The public discussion revolves around questions of construction activity, but also of growing demand, especially in large cities. At the same time, developers are looking for properties and investors for promising markets. Particularly in the Top 7 locations, rising rents have been observed in recent years, often explained with a housing shortage. Suggested solutions are mainly based on the two models of tightening tenancy law and expanding residential construction. But there are significant differences in the quantification of the actual demand; often, there is a lack of hard evidence. For all real estate market players (especially investors and property developers, but also tenants, interest groups, public administrators and politicians), however, knowledge about current and future demand for residential space is essential. Prices, vacancy rates and other indicators signal a shortage of residential construction.

Markets are only balanced and sustainable if they both cover demand and offer profitable investments. The focus of this study is on demand analysis. In the context of the housing markets of the Top 7, it analyses the medium-term development and prioritizes the demand in the individual markets. The trends shown can also impact smaller markets in the surrounding area.

Content

1. Housing stock in Germany: Is there a general undersupply?

Over the last 20 years, Germany has experienced a rather moderate population development. In addition to years of slight growth, periods of decline were also recorded. However, the figures are by no means exact, both at the federal level and in relation to federal states and cities. They are influenced by statistical effects or different methods. Official population data are based on extrapolations and estimates and can usually only be regarded as final after a few years, subject to pending revisions. For example, the 2011 census, which had previously been postponed for a long time, led to a significant correction. The collapse of the data series this year is therefore not due to real developments, but purely to statistical factors. However, the upward trend in population statistics recorded since then is basically plausible. Has the increase recorded since then led to an undersupply of housing? Comparing the housing stock with population numbers does not confirm this assumption. Disproportionate to the population, the housing stock (by number of units) rose continuously over the period covered here. Relative indicators such as housing stock per 100 inhabitants or residential space per inhabitant improved (see Figure 2), thus representing a tendency towards better housing provision. The latest migration figures are not yet fully included in this longterm data series - which, due to the delayed official statistics, will for the time being end in 2016 - but they can be expected to exceed the corresponding increase in housing. Nevertheless, the current stock figures - even with further extrapolation - look significantly better than at the beginning of the time series. Accordingly, it is almost surprising that the housing shortage has been so strongly addressed in politics and the media.

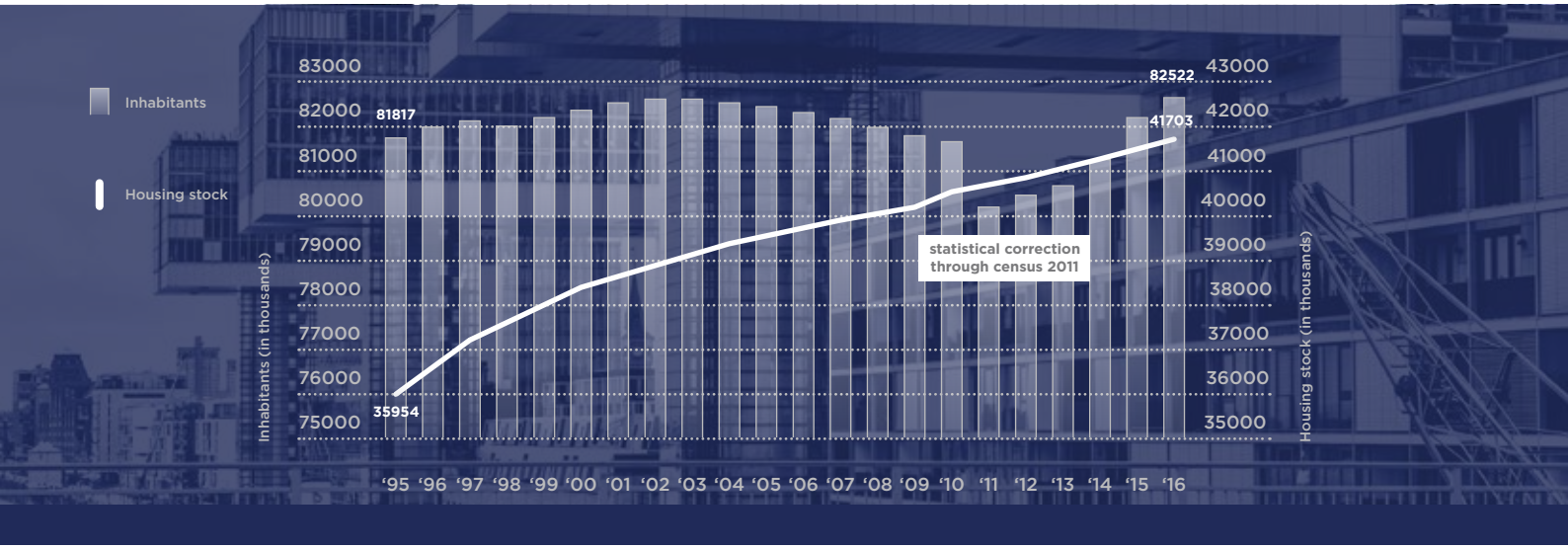

Figure 1: Development of inhabitants and housing stock (in thousands, residential units in residential and non-residential buildings)
Source: Federal Statistical Office; own illustration

An explanatory approach to the perceived or in certain market segments real housing shortage results at least in part from distribution- and quality-related indicators such as the average household size or the occupancy of residential space per capita. Both variables have developed in the direction of higher housing demand (see Figure 2). Ultimately, both trends are dependent on each other. Smaller households lead to a higher number of households assuming the same total population. Subject to statistical effects in details (several households per residential unit), an increase in the number of households generally leads to a need for additional housing.

In addition to the pure number, the total residential space typically also grows. In contrast to other goods (e.g. food, which could simply be distributed differently in case of different household sizes), there is an effect of the household size on the total consumption of residential space, i.e. the space requirement in total. Existing buildings cannot simply be redivided, for example by moving walls. Rather, there is a certain basic need for space for every apartment, for example for kitchens, bathrooms, entrances and corridors. If the number of households or apartments increases, this will ultimately result in an additional demand for this basic equipment and thus also for the total residential space, buildings, infrastructure and land.

It would therefore be interesting to examine to what extent the housing shortage results from social, cultural and economic trends in demand and how these changes can be influenced. Of course, construction activity, i.e. supply, also plays an important role. A differentiated analysis of trends, cycles and influencing factors is important in order to better assess, forecast and - at least at the level of policy and public administration - influence markets.

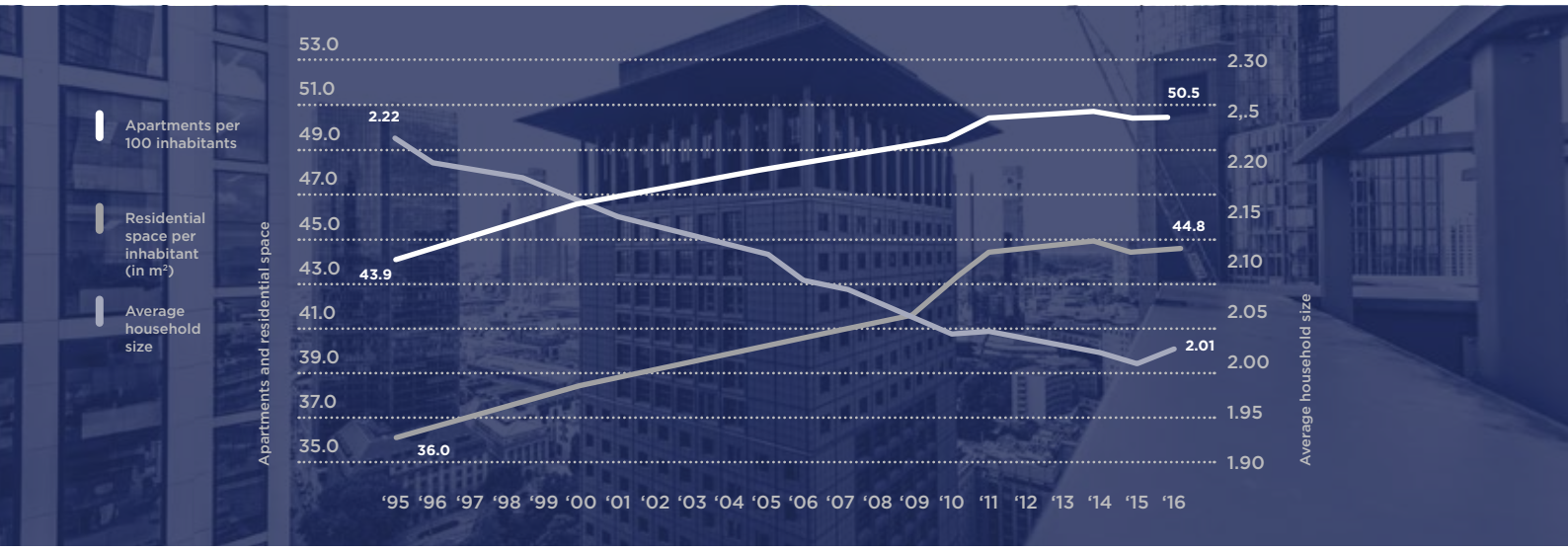

Figure 2: Development of apartments (in residential and nonresidential buildings) per 100 inhabitants, residential space (in residential buildings, in m²) per inhabitant and average household size
Source: Federal Statistical Office; own calculation and illustration

2. Goals of housing policy: Are rents more important than space?

Current discussions (some of which have been ongoing) in politics, science and the media focus strongly on the issue of rent. The available housing supply in terms of quantity in the sense of existing housing, loss of existing housing, rededication and new construction is occasionally discussed, but not approached on a marketwide basis. Individual projects and urban planning aspects play a primary role. Generally, politicians place the segment of rented apartments at the center of the debate. Demands for affordable housing are aimed at short-term effects. For this purpose, several, frequently adapted instruments are in particular housing law (rent control), advanced contract law (socalled Bestellerprinzip, obliging the commissioning party to pay realtor fees) and individual subsidies (housing assistance). The coverage provided by media, associations and interest groups is extremely intensive.

The segment of owner-occupied housing tends to be dealt with on a fiscal basis (e.g. tax benefits and subsidized loans) and without any fundamental discussion. The strong focus on the rental segment within the housing market as a whole can ultimately be explained in terms of the „economics of voting“ (regarding the number of voters who can be reached). Tenants are a majority both in Germany (ownership rate at approx. 45 %, thus tenant rate approx. 55 %) and especially in the cities (tenant rate in major cities: approx. 73 %). The real estate sector and its analysts must anticipate the expansion, or at least the maintenance, of such market interventions for the purpose of appealing to voters.

The question remains as to whether and to what extent the alleged shortage of housing is responsible for the – at times – significant rise in prices in some regions and cities in recent years. At the same time, it should also be discussed to what extent the creation of affordable, i.e. predominantly rent-controlled or subsidized housing can actually be a solution, that is to say in how far actual demand would be met. Or should the focus be primarily on the expansion of supply in affected regions, without always putting the question of the financial burden on the demand side first and thus regulating market mechanisms that explain theoretical price formation?

Politicians and researchers at least seem to agree that there is a need for increased construction activity in the housing segment. For example, the coalition agreement of the current federal government plans the construction of 1.5 million apartments by the end of the current legislative period. The German Economic Institute in Cologne, among others, has established that residential space is needed above all in (large) cities.

3. Quantification of the housing demand: Are there exact figures?

According to the Federal Statistical Office, in the first half of 2018, building permits were granted for 960 apartments less than in the same period of the previous year - at first glance a seemingly negligible figure. However, differences to previous years and trends in construction activity are always very strongly weighted in the debate about bottlenecks. In addition to the building permits mentioned above, completion is of course also relevant. Both together make it possible to assess construction activity and make short- to medium-term forecasts.

Although construction activity in the sense of planned or completed apartments as well as inventory counts are well recorded statistically, they are ultimately only a partial variable in the determination of scarcity and need for action. The decisive factor for the apartment seeker is the available supply in the sense of used (rented) and additional (vacant, rentable) units or space. The actual demand for new construction results from existing reserves, stock decreases and demand developments. There are no uniform statistical figures on this demand in the actual sense. Instead, numerous think tanks, authorities and companies are concerned with the German housing market and corresponding forecasts for demand. This leads to a certain range of results. The deviations can be explained partly with the methods used, partly with the data sets and partly with normative influences.

Figures 3 and 4 illustrate the development of completions at the federal level and provide a comparison with the forecast annual requirements of various institutions.

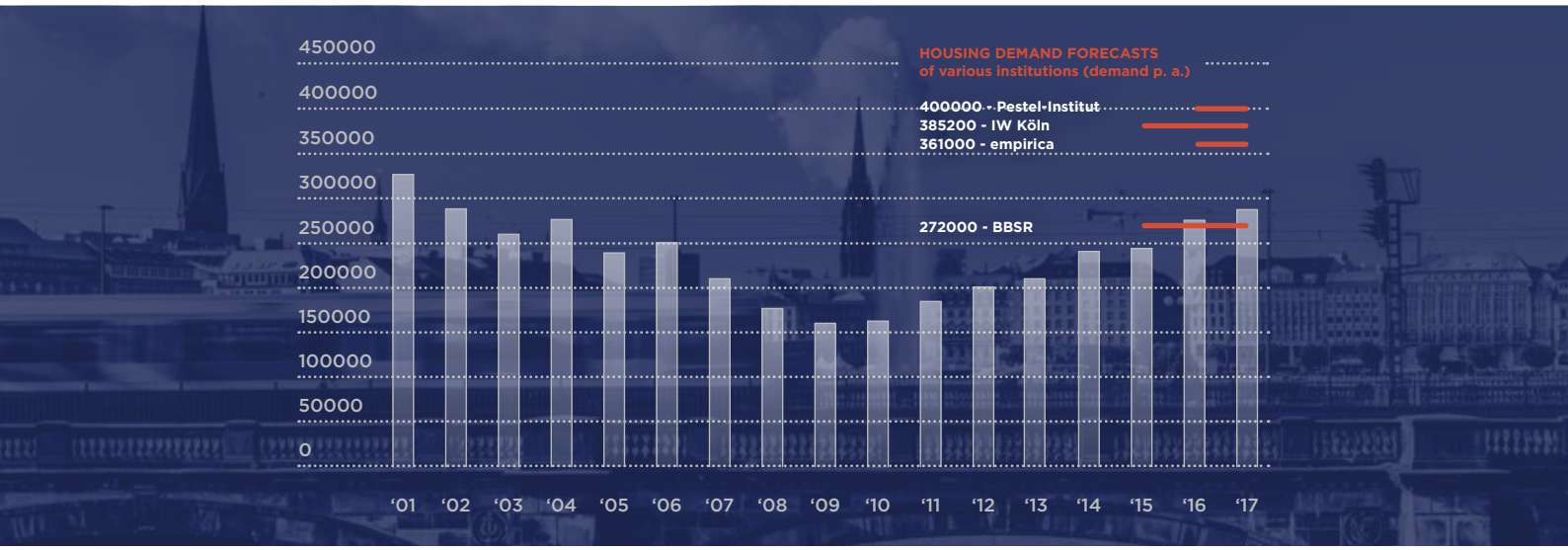

Figure 3: Development of annual construction completions in Germany (apartments in residential and nonresidential buildings) and forecast demand for new construction
Sources: Federal Statistical Office, Federal Institute for Construction, Urban and Spatial Research (BBSR), empirica, German Economic Institute Cologne (IW Köln), Pestel-Institut; own illustration

The graph above clearly shows that at the beginning of the millennium the number of apartments completed followed a negative trend that ended in 2009. Since then, construction activity has increased again, although it is still slightly below the level of the initial years of the time series presented. At first glance, construction activity does not appear

to be inflated, which may be due to a variety of reasons (e.g. bottlenecks in available land, construction capacity, building permits). An intensification of housing construction activity is often demanded. This raises the question of the annual completion rate at which the market will find its equilibrium, i.e. neither overcapacity nor undersupply would materialize.

It can be roughly assumed that a certain total housing stock exists (approx. 42 million housing units in Germany). In a blanket approach, an average service life of 100 years shall be assumed (lower, however, according to the valuation approaches of ImmoWertV or tax depreciation). According to this, mathematically speaking, one percent of the apartments would have to be newly built or comprehensively renovated each year, i.e. around 400,000 units, solely to maintain the existing stock. Naturally, differences in how many buildings were constructed at specific years are overlooked here. However, there are quite a lot of buildings from the Wilhelminian era, which are thus aged 100 years and more, particularly in the large cities. These have, however, often already been modernized several times. A shorter service life (e.g. because of new technical or energetic standards, which can no longer be retrofitted) increases the replacement demand, while an intensive maintenance and modernization on the other hand would reduce it.

Additional demand also results from qualitative shifts (size, standard, location) and from increased demand for housing units or residential space (e.g. due to positive net birth rates, migration). Efforts to conserve the stock are crucial. According to structural data of the construction industry (according to the DIW study commissioned by BMUB and BBSR in 2016/2017), over two thirds of housing construction services are concentrated on the existing housing stock. If this led to a complete renewal of existing buildings in equal proportions, at least 135,000 newly built apartments in the actual sense would still be necessary. As a result of the additional expenditure and the lower efficiency of existing buildings, the actual demand should ultimately lie between the two thresholds, i.e. within the range of 135,000 to 400,000 apartments.

In addition to these fundamental considerations, detailed models for estimating demand exist in housing research. The demand analyses presented as examples for the last three years are in some cases significantly higher than the actual housing completions. In its housing market forecast for 2030, the Federal Institute for Construction, Urban and Spatial Research assumes an annual demand for new housing of 272,000 apartments by 2020. The empirica housing market forecast 2016-2020 shows an annual need of 361,000, the housing demand model of the IW Cologne with an annual number of 385,200 apartments from 2015 onward is even higher. A study by the Pestel-Institut on social housing construction and housing needs even sets an annual demand for new housing of 400,000 residential units from 2016 onward. Figure 4 shows the differences between aforementioned demand analyses and the actual completion figures.

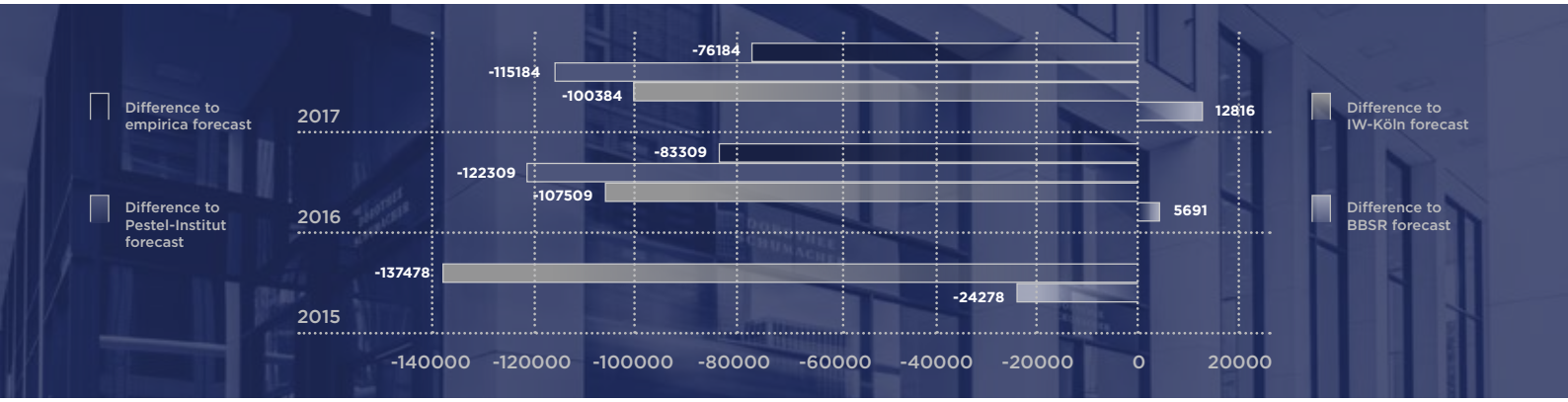

Figure 4: Difference between annual construction completions in Germany (apartments in residential and nonresidential buildings) and the forecast demand of various institutions
Sources: Federal Statistical Office, Federal Institute for Construction, Urban and Spatial Research (BBSR), empirica, German Economic Institute Cologne (IW Köln), Pestel-Institut; own illustration and calculation

Last year, the annual gap between demand and newly added supply ranged from around 76,000 apartments (according to the empirica analysis) to over 115,000 apartments (according to the Pestel-Institut). However, according to a forecast by the Federal Institute for Construction, Urban and Spatial Research, the residential construction projects finalized in 2017 would have been sufficient - with a surplus of almost 13,000 apartments.
However, in the case of all national demand estimates and new construction figures it is unclear whether construction will actually take place where housing is most urgently needed. A quasi-planned economy focused on individual years is also questionable since meeting demand can also be achieved with a certain delay (construction activity in previous periods, planned major projects in subsequent periods) - especially in view of economic cycles and planning procedures.

Looking at the figures for Germany as a whole, it therefore remains largely unclear to what extent there are enough apartments available in the regional markets (regional distribution). Furthermore, it is not clear to what extent the sizes, standard and price segments that are actually required are recorded (qualitative distribution). If these distribution-related factors are considered, there are likely to be considerable gaps (or surpluses) in some submarkets. It is only partly possible to achieve certain compensatory effects by adjusting the users (possible, for example, between multi-story housing construction and singlefamily houses, difficult or only through economic inefficiency between e.g. the higher-priced segment and social housing construction). The concrete housing demand and the corresponding housing development must therefore be specifically coordinated.

4. Top 7 housing markets: Are the locations developing uniformly?

It is interesting to break down the average nationwide demand analyses into individual regions or cities. Investors, tenants, politicians and the media are particularly interested in the Top 7 locations of Berlin, Hamburg, Munich, Cologne, Frankfurt am Main, Duesseldorf and Stuttgart. Do the demand forecasts shown above also apply proportionately to these cities? How are relevant key figures developing there?
The Top 7 cities with their large housing markets have several advantages for investors, such as better market transparency, high transaction numbers, concentrated demand

and higher asset liquidity. All in all, real estate investments in these markets are therefore considered to have an attractive riskreturn ratio. To some extent, this quality also radiates to the surrounding areas of the metropolises. Markets in the periphery of the Top 7 benefit from the sociodemographic and economic development in their respective regional centers; there are spillover effects - both positive and negative. Top 7 locations with their far-reaching significance for the real estate industry are therefore the subject of this study.

4.1. Rent: Main indicator

The scarcity of a resource in combination with a corresponding demand usually leads to price increases. In real estate, the total revenues of a market are a result of the factor volume (as space in m² or as residential units) and the factor rental price (per m² or per unit). This in turn depends on upstream economic factors such as purchasing power, income, employment, etc. If a certain amount of money is available for renting in a given economic situation, this will hardly lead to price increases in a market equilibrium. If, however, the amount of money increases in the sense of greater (and financially viable) demand, it will in the short term lead to a reduction in vacancies (if any exist). If these are used up, interested parties will outbid each other for the available space (which in the short term remains constant) until the financial „total budget" of the market is completely used up. This occurs de facto by redistributing the market in the sense of higher prices per area or per unit and possibly also smaller areas or fewer units per market participant. The price of rent therefore is a key indicator for the question of existing, increasing or possibly decreasing scarcity. In addition to purely quantitative considerations, prices and particularly their development can thus serve as indicators of the increasing or decreasing scarcity on the housing market.

The medium-term rental price development in the Top 7 markets suggests a certain shortage of residential space (see Figure 5).

The increase in net base rents can be assumed to be exceptional - and thus a scarcity indicator - since the rise by 45.7 % over the past ten years clearly exceeds general infla-

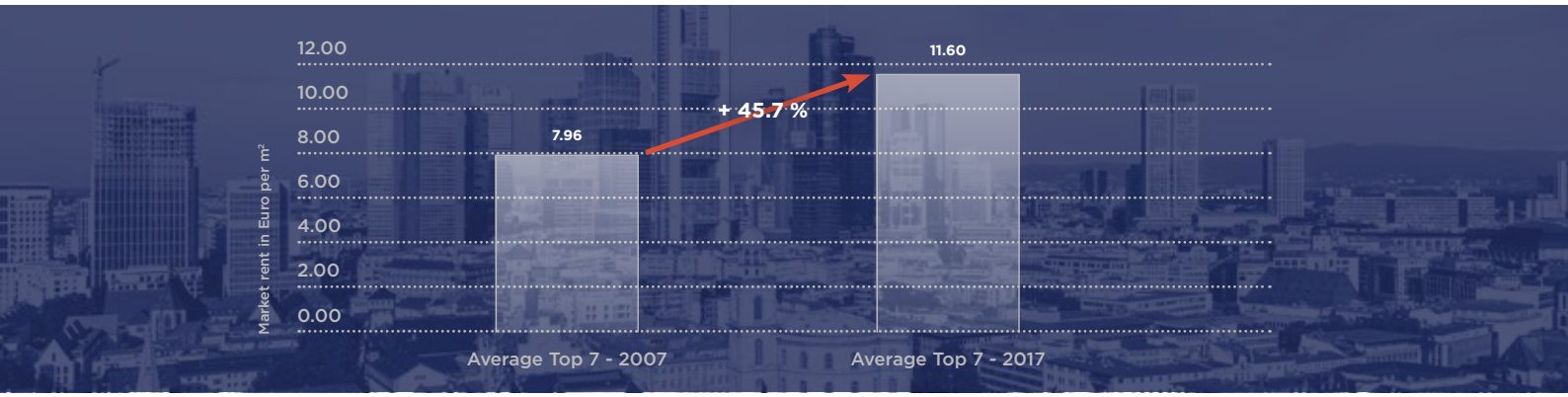

Figure 5: Development of average rent (new rentals, net base rent) in Top 7 locations - change 2017 to 2007
Source: F+B GmbH; own calculation and illustration

tion (consumer price index +13.7 %). Even the Germany-wide sub-index on residential rents (net base rent plus utilities), which is more similar in its focus, rose by only 13.6 % in the same period. New lettings in the Top 7 cities thus showed a markedly higher price increase in the period under review compared with these reference values.

The rent price rises observed at this point serve only as an indicator and do not reflect any quantity-related aspects such as property stock, vacancies, new rental space or growth in space. The causality of the price increases should therefore be further investigated.

4.2. Demand: Population and households

The development of demand determines the growth of a (real estate) market and the success of a real estate investment. Demand becomes tangibly measurable when a corresponding supply is taken up, i.e. by concluding a rental agreement (or purchase agreements and other transactions). Any demand that goes beyond this remains statistically almost invisible. It hardly generates any data if, for example, there is no adequate supply in terms of apartment size, number of rooms, building standard or micro location in marketing platforms. Such demand can only be estimated using indicators such as price trends, waiting times, search ads, survey results or purchasing power figures. In addition, there are qualitative differentiations, since apartments are not a homogeneous good. Even if demand therefore cannot be fully determined, a number of significant developments can still be mapped and analyzed. These include above all socio-demographic and economic indicators, which can have a high impact on the respective housing markets (see Empira study April 2018).

Socio-demographic development

Population development is regarded as an important indicator. The number of inhabitants has risen in all seven cities surveyed in recent years. The population growth differed a lot between the Top 7 cities, however (Figure 6). Not surprisingly, Berlin was the fastest-growing city in absolute terms in recent years. The capital was able to increase its population by almost 300,000 between 2006 and 2016. In percentage terms, Munich and Frankfurt dominate with strong increases of 15.0 % and 14.6 % respectively. By way of comparison, growth in Germany amounted to only 1.5 % in the same period. It can therefore be stated that the Top 7 have a population development far above the average - an indication of the popularity of these locations as residences.
It is also interesting to look at the composition of the population. Since 2006, the proportion of inhabitants under 25 (U25) has risen in almost all Top 7 cities - albeit mostly only marginally -, most strongly in Frankfurt from 22.6 to 24.3 %. Only in Berlin is there a slight decline in the younger population from 23.4 % to 23.3 % in 2016. Due to the population growth that has taken place, however, in absolute figures there is an increase in young people across the Top 7. This development is predominantly attributable to a positive migration balance of the under-25s to these metropolises.

Somewhat more movement can be seen in the proportions of the population over 55 years of age (O55). In Berlin (from 30.0 to 31.2 %) and Duesseldorf (from 31.3 to 31.5 %) the proportion of older people increased, while in Hamburg it remained at the same level. In the other Top 7, the population of O55 decreased relative to the total population from 2006 to 2016. The most significant decrease took place in Frankfurt (from 28.7 % to 26.5 %).

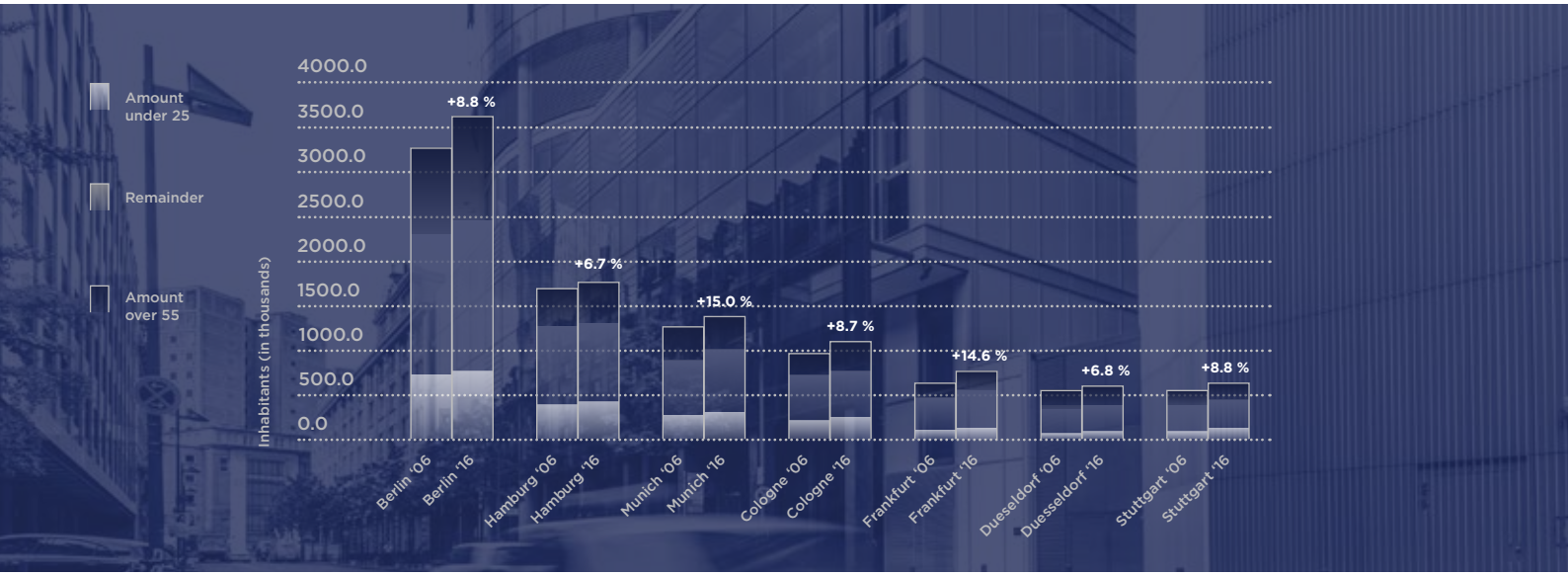

Figure 6: Population development (in thousands) and age cohorts (U25, O55, remainder) in Top 7 locations - change 2016 to 2006
Sources: Federal and State Statistical Offices, Labor Market Monitor of the Federal Employment Agency;
own calculation and illustration

However, population figures cannot be directly mapped onto demand for apartments. The quantification for the real estate segment is instead based on the development of households. Figure 7 shows the absolute and relative change in household figures in the Top 7 since the 2011 census survey. The additional points (right axis) show the household figures for 2011 and 2016 per 100 inhabitants. Duesseldorf and Munich lead the field of the Top 7 with values of 57.9 and 57.1 in 2016, while Stuttgart has the lowest ratio of households per 100 inhabitants with 51.8. The reciprocal value of this indicator could also be used to determine the average household size at least approximately (however, slightly overestimating it, due to residents who do not live in regular households but in dormitories, retirement homes or similar institutions being counted as well).

An increase in both absolute and relative household numbers can be seen in all Top 7 locations. In addition to population growth, the growing number of households per 100 inhabitants also contributes to an increase in demand. The household structures in Duesseldorf and Frankfurt, where the ratio has increased by 3.8 and 3.6 households per 100 inhabitants respectively, are likely to have a significant impact. Frankfurt also shows the highest relative increase in the number of households with +17.0 %. With just under 170,000 households, Berlin has the highest absolute growth (relatively „only“ +9.4 %). With a rate of change of +8.8 %, Cologne is still further behind Berlin and thus in last place.

Both cities, Berlin and Cologne, also show the lowest growth rates among the Top 7 in terms of households per 100 inhabitants (+1.0 and +1.3 households per 100 inhabitants respectively). At 51.8 households per 100 inhabitants, Stuttgart has the lowest ratio in 2016. Accordingly, the state capital of Baden-Wurttemberg appears to have the largest households. However, the medium-term trend of a decreasing household size also applies here with an increase in this ratio.

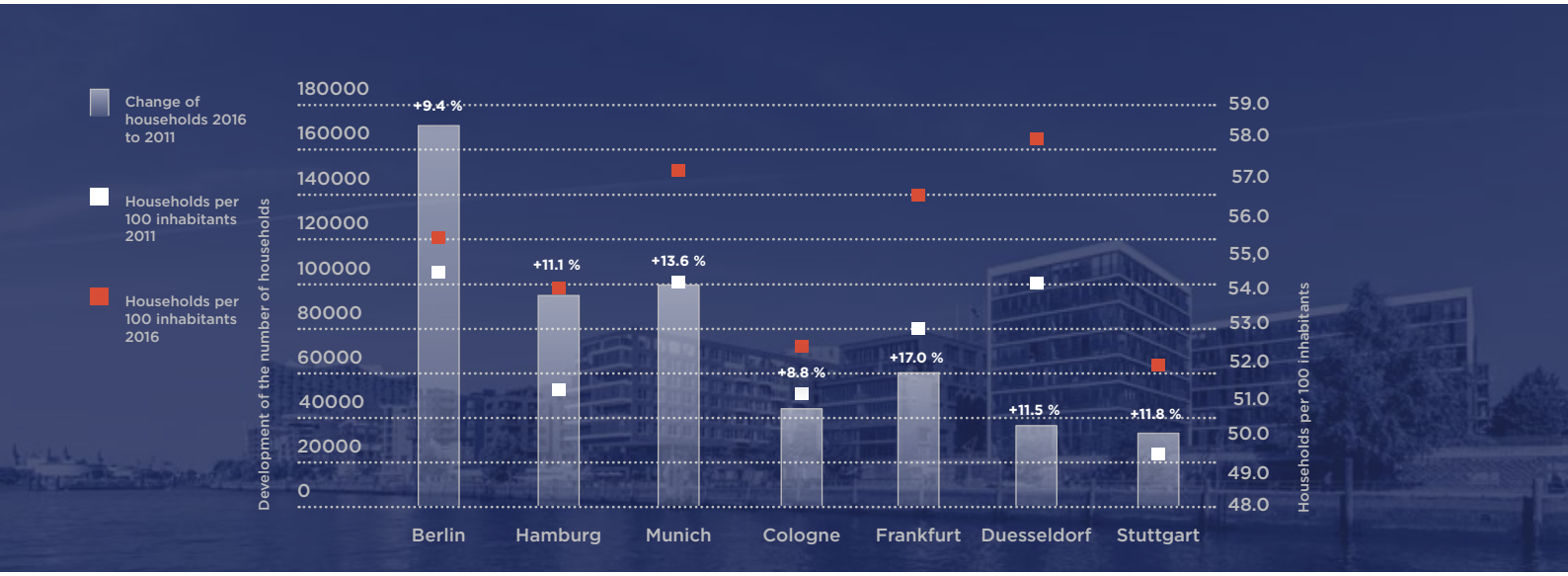

Figure 7: Development of the number of households (absolute and relative) and households per 100 inhabitants - change 2016 to 2011
Sources: Federal and State Statistical Offices, Municipal statistical offices; own calculation and illustration

The trends and structures of population and household figures are of considerable importance for the planning of housing requirements. One example is the residential space per capita, which often increases with age. Reasons for this include purchasing power, which generally increases as working life goes on, demand patterns that change with age, and people leaving the household (children moving out, death of a spouse or life partner). Younger population groups, on the other hand, are more likely to be found in shared apartments. Statistically, several economic households (e.g. several students) form one residential household. As a result, smaller residential space per capita is to be expected, but combined with a higher demand for larger apartments (especially regarding the number of rooms).
The future qualitative and quantitative forecast of a market is important for project developers and investors. However, the development of population and household figures is determined by numerous factors. A population increase often results from a positive labor market situation. Cities with a younger population appear more dynamic, but often have lower purchasing power. Generally, it is therefore also important to consider economic indicators.

Economic development

Various indicators can be used to assess the economic situation of a region, e.g. gross domestic product, gross value added in individual sectors, income figures or various labor market data. Above all, an attractive labor market that can absorb more workers and offers good earning opportunities in addition to interesting fields of activity is a major draw or at least prevents emigration on a large scale. Forecasts are thus based on the population that is present and will remain (already working residents, students), and on people who are entering the market as potential migrants (people moving in for work-related reasons, commuters with an interest in moving).
Figure 8 shows the development of the labor market based on employees making social insurance contributions. Berlin stands out clearly here - despite the consistently positive development in all the Top 7 cities. The capital has made considerable progress not only in absolute but also in relative terms. From 2006

to 2017, more than 400,000 employees with an employment contract subject to social insurance contributions were added here. This corresponds to an increase of almost 40 % over the period under review. However, it should be noted that Berlin also started from a comparatively low level with very high unemployment rates. In 2005 unemployment was at 19 %, in the current reporting month (August 2018) it was still 8.2 % (Germany: 5.2 %). Nevertheless, improved labor market opportunities are unmistakable. The other Top 7 cities can also all boast growth rates of at least 21 %. This is particularly remarkable in view of the relatively strong labor markets (e.g. in Stuttgart and Munich) in the past and can therefore also provide an explanation for the overproportionate population growth of the Top 7.

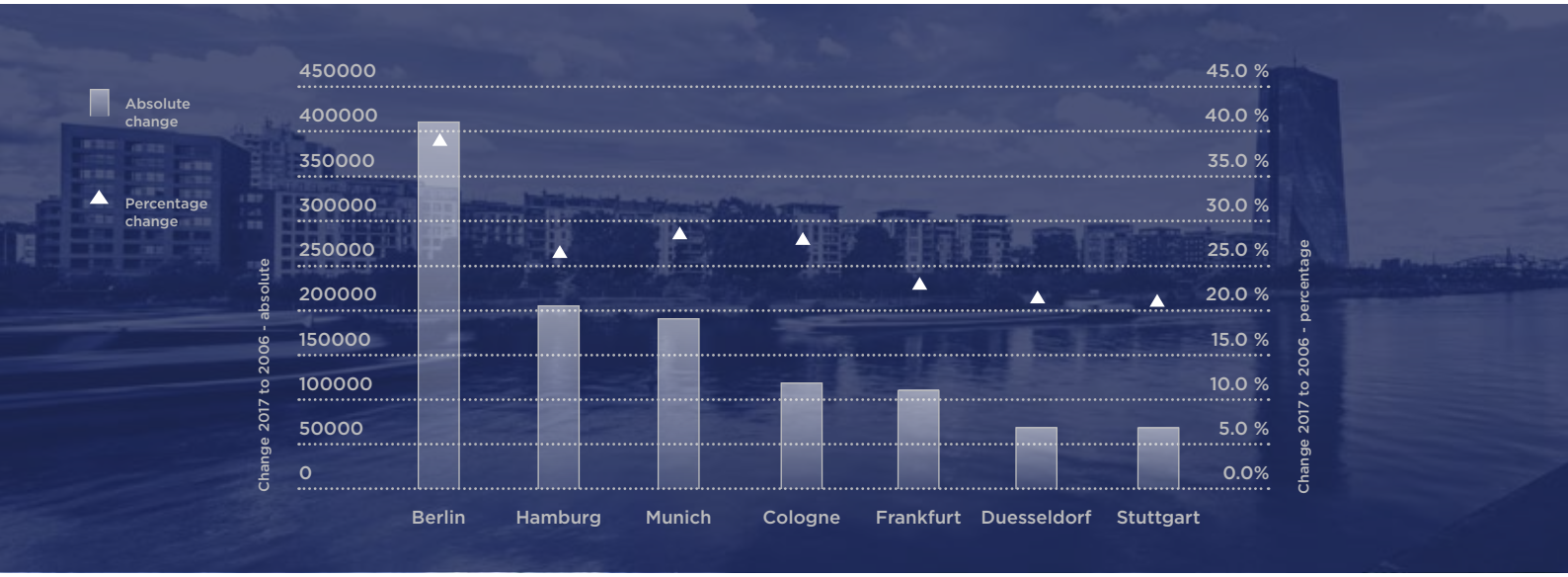

Figure 8: Development of employees making social insurance contributions in Top 7 locations - change 2017 to 2006 (as of December respectively)
Source: Federal Employment Agency; own calculation and illustration

Figure 9 also compares the cities based on current labor market data and their short-term development. It shows the change in the number of reported vacancies year-on-year (August 2018 to August 2017) and the ratio of unemployed persons to registered jobs. Except for Cologne, where there has been a slight reduction in the number of newly registered jobs compared with the same period of the previous year – in relation to the month under review –, this indicator continues to grow in the other cities. In the month under review, August 2018, the number of vacancies ranged from 6,816 in Duesseldorf to 26,482 in Berlin. It should also be noted that these are only the vacancies reported to the employment agency. The actual number of vacancies is therefore likely to be much higher.

It can therefore be assumed that labor markets in the Top 7 will continue to be able to absorb newcomers. In the short to medium term, this could be a factor for sustained inflows. This can be assumed mainly due to the abovementioned ratios of unemployed persons to registered jobs (Figure 9: points, right axis). The lower this ratio, the more difficult it will be to fill registered jobs with the unemployed in the respective employment agency or job center district. Stuttgart and Frankfurt are currently ranked the lowest with ratios of

fewer than two unemployed per registered job. Even with a higher ratio of unemployed persons to jobs, the number of unrecorded vacancies mentioned must be considered, as must the question of matching the requirements of open positions with the qualifications of the local unemployed. In summary, it can be stated that further labor market immigration into the Top 7 is likely - subject to the choice of place of residence depending on individual preferences (moving into the surrounding area, accepting longer commuting distances) as well as the housing supply.

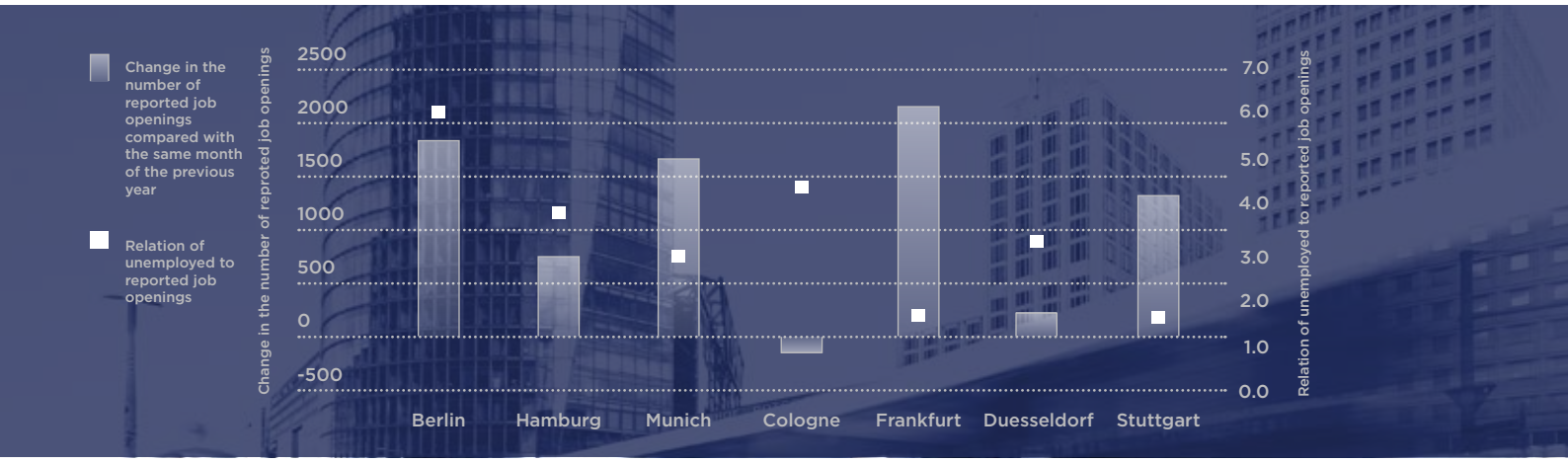

Figure 9: Development of the number of registered jobs and ratio of unemployed to registered jobs - basis for each reporting month August 2018
Source: Federal Employment Agency; own calculation and illustration

A stable labor market development should – after a certain delay – lead to an increase in disposable income per inhabitant, as more people generate wages and salaries from employment relationships and nominal wage increases often occur when the economy is positive at the same time. The relevance for the real estate market arises from the associated purchasing power, which in turn is reflected in the consumption behavior of households. Changes in housing preferences in terms of location, residential space and standard can often be attributed to changes in income. Ultimately, regional incomes and prices (including rents) must always be considered in tandem. Investors can draw conclusions from the income trend with regard to achievable rents or purchase prices, occupancy rate or the level of construction costs.

As with the labor market data, Berlin also leads the ranking in terms of income development (Figure 10). Here, too, the starting level must be considered, which in some cases was well below that of the other cities. Starting from their already high level, the comparatively moderate growth figures for Stuttgart and Munich can be explained.

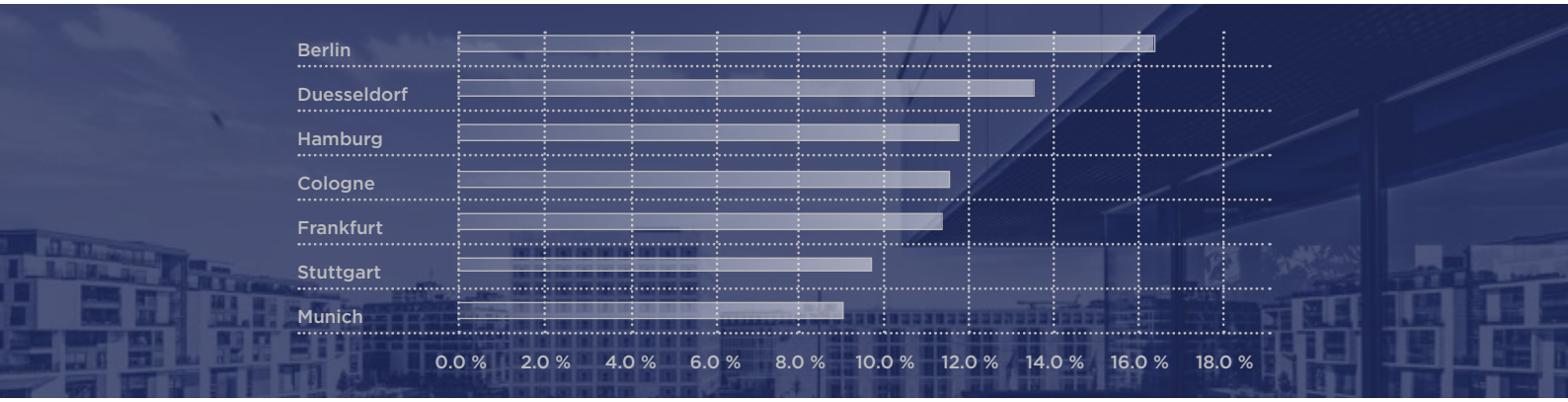

Figure 10: Change in disposable income per inhabitant of private households - change from 2015 to 2005
Sources: Federal and State Statistical Offices; own calculation and illustration

4.3. Supply: Residential construction

Construction activity is essential for meeting demand in a market segment. In a stable market environment, this activity must at least compensate for properties that can no longer be used due to technical or economic reasons. If demand grows and/or supply is already too scarce (excess demand), construction activity that goes beyond the mere required replacement is needed. The existing supply of space and the additional supply of space to be created must be viewed as a whole.

In order to get a general understanding of the supply situation in the Top 7, construction activity in these cities will first be examined in more detail. Figure 11 shows the cumulative construction completions of the Top 7 cities and Germany since 2005. For the sake of comparability, the values were put in relation to 1,000 inhabitants.

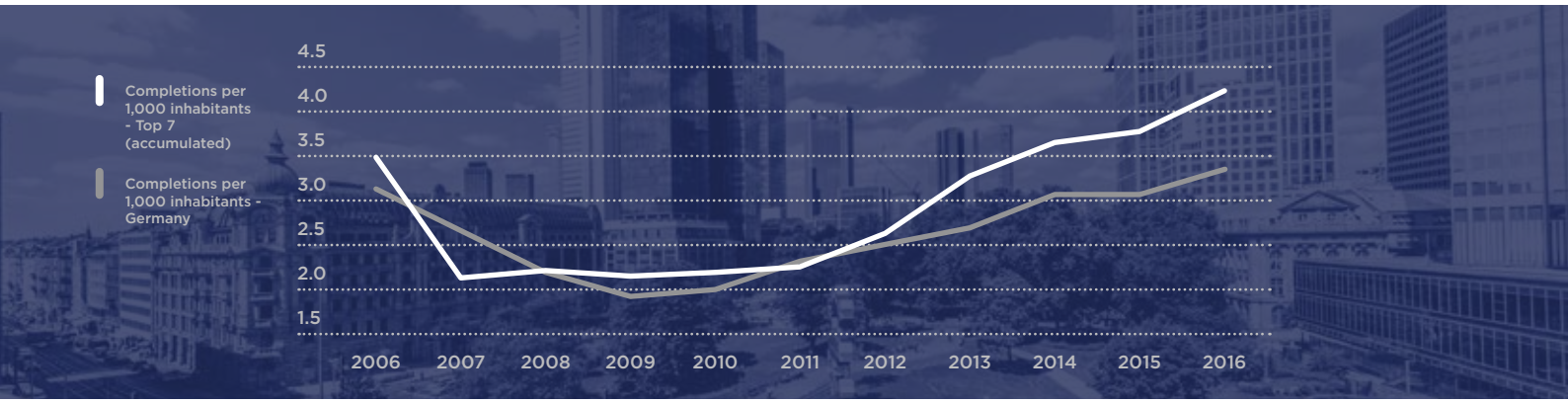

Figure 11: Development of annual construction completions (apartments in residential and non-residential buildings) in Germany and Top 7 locations (cumulated) per 1,000 inhabitants
Sources: Federal and State Statistical Offices; own calculation and illustration

With the exception of a few years, construction in the Top 7 is higher than in the country as a whole. Recently, almost one apartment per 1,000 inhabitants more was built in these cities

than in the country as a whole. Small apartments are relatively common, with almost 37 % having one or two rooms (Germany 25 %). By contrast, large apartments are less common in the Top 7. Less than 20 % of completions in 2016 were apartments with five or more rooms (Germany 40 %). The lowest share was in Munich with 13 %, the highest in Duesseldorf with 24 %. Small apartments are a relatively new trend in the Top 7. Even in 2012, apartments with five or more rooms dominated (36 % of completions) and the share of small apartments was correspondingly low (20 %). New construction activity thus appears to have adapted to the changing household sizes in recent years, which will also change the structures in the existing stock in the medium term. However, the newly created housing supply does not seem to be sufficient. Construction activity in the Top 7 apparently lags behind the increase in demand and therefore does not reach a level that meets demand. In a study conducted in 2017 on immigration to large cities the German Economic Institute (IW Cologne) found an exemplary supply gap for the segments of large apartments as well as single-family and two-family houses.

Within the Top 7 there are major differences in the percentage change in the housing stock between 2006 and 2016 (Figure 12). The Frankfurt residential market saw the strongest construction activity. In the banking city, stock grew by 9 %. Although Cologne, Munich, Hamburg, Stuttgart and Duesseldorf are slightly behind this growth rate, they still feature growth levels of over 5 %. Only the federal capital is falling far behind by comparison. In Berlin, stock has only increased by 1.7 % and is thus clearly behind the other Top 7 locations as well as below the German average of 4.9 %. Taken together, the Top 7 markets are roughly in line with the national average. Excluding the negative outlier Berlin, average growth was even 6.8 % and thus almost two percentage points higher than in Germany as a whole.

The change in residential space (in residential buildings) confirms this finding. While Frankfurt again occupies the top position with an increase of more than 14 %, Berlin is at the end of the Top 7 with a growth rate of only 5.4 %. All other locations (except for Stuttgart) also recorded doubledigit percentage growth rates. In Germany, the available residential space grew by 10.3 % between 2006 and 2016, i.e. twice as much as in the federal capital.

Although the seven largest cities (except for

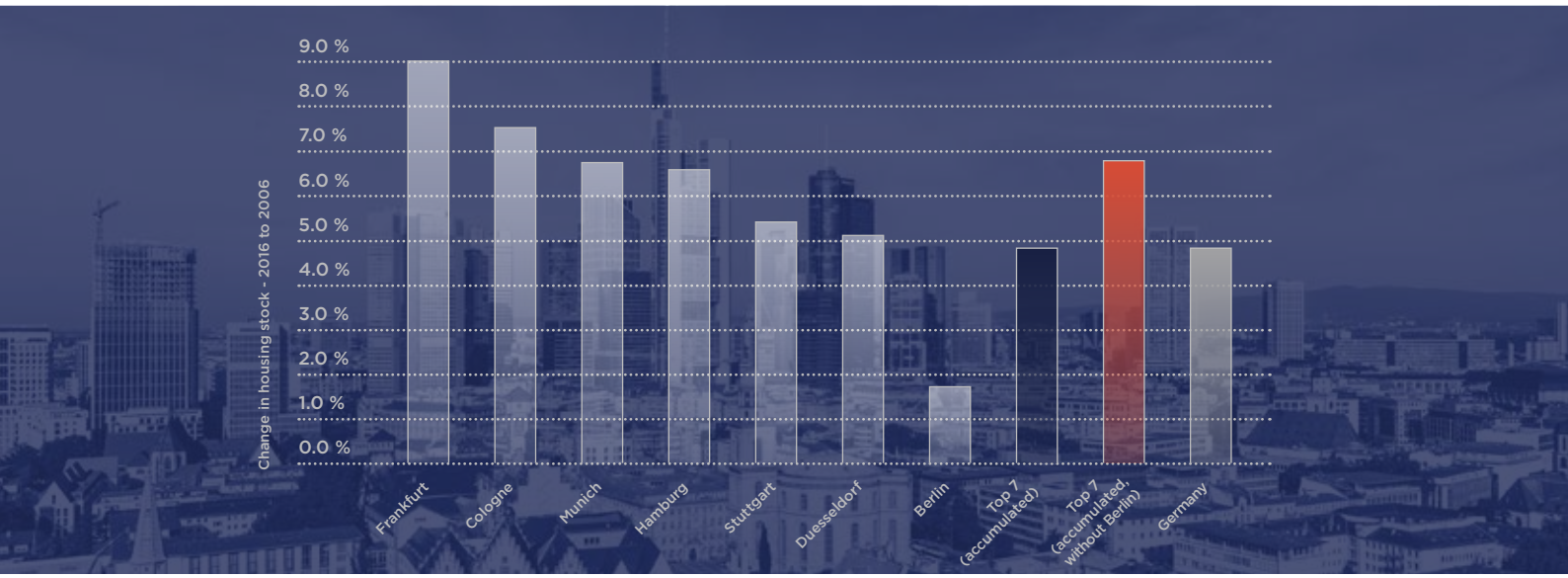

Figure 12: Development of the housing stock (apartments in residential and non-residential buildings) in Top 7 locations - individual view, cumulative (inclusive/exclusive Berlin), comparison Germany; change 2016 to 2006
Sources: Federal and State Statistical Offices; own calculation and illustration

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Berlin) are showing aboveaverage construction activity, excess demand is still assumed. The reasons for this need to be analyzed in greater depth. In particular, the supply data must be compared more closely with the demand data. For this, suitable measures and indicators are necessary.

4.4. Returns: Investor's point of view

From an investor's point of view, shortages and the resulting rent increases are relevant in two ways. On the one hand, the net cash flow for investors who have already invested increases regularly, i.e. for all those who have acquired their portfolios earlier at a more favorable price. On the other hand, there are valuation effects. The analysis of the last few years shows a virtually parallel course of rental growth and value development (Figure 13). Investors who have already invested early have recorded a correspondingly high performance. However, the valuation yields and multipliers appear to have remained largely constant.

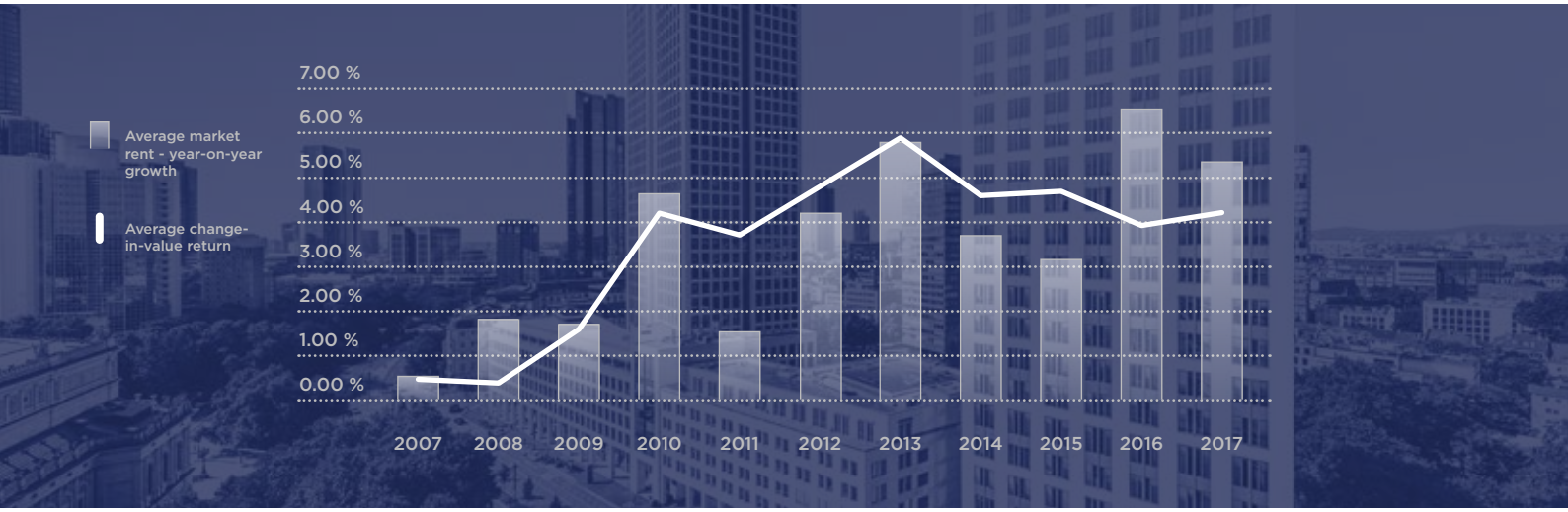

Figure 13: Development of market rent (growth year-on-year) and change-in-value return for residential properties in Top 7 locations - average of the Top 7 in each case
Source: F+B GmbH; own calculation and illustration

The total return results from the interaction of the change-in-value return and the cash flow return. It should be noted here that the basic parameter „property value" is readjusted each year. Rising property values in year N thus increase the reference value in the following year N+1. Cash flow returns therefore hardly change over time. They can even come under some pressure from higher valuations, provided that rental income does not rise in parallel. The positive development of total returns recorded in recent years (Figure 14) can primarily be explained by the change-in-value component. Most of the value increases in the Top 7 outperformed those of the smaller locations. Hamburg, Berlin and Munich, for example, achieved average value increases of more than 3 % per year in the period under review.

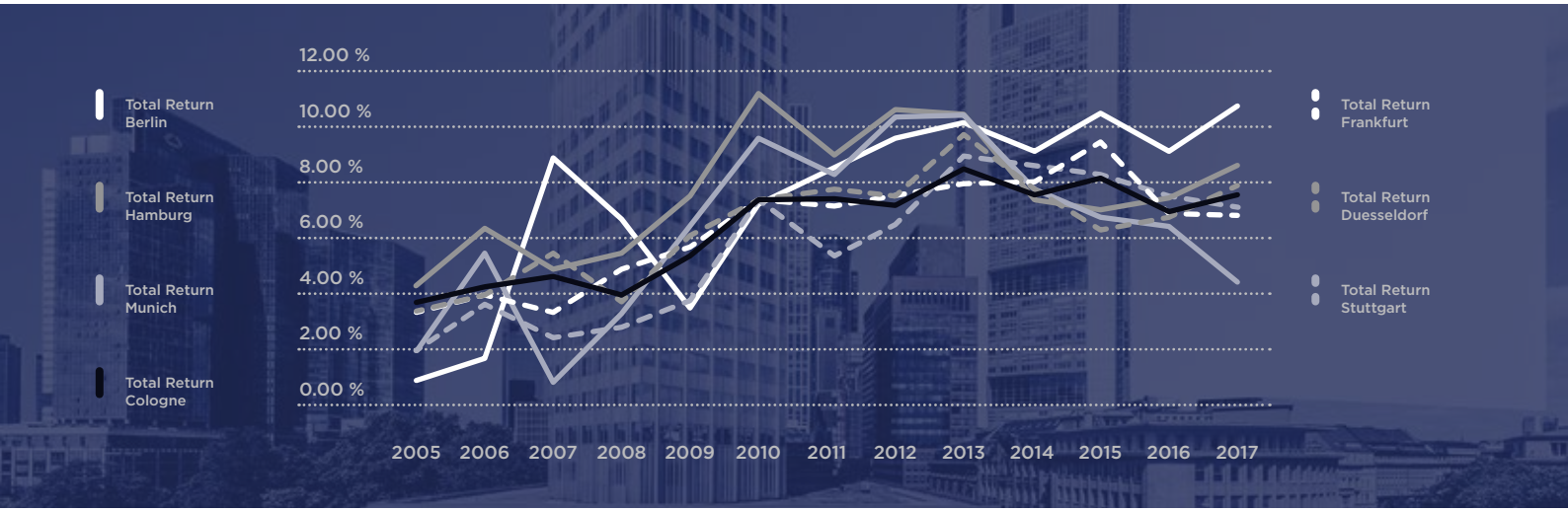

Figure 14: Development of total returns for residential real estate in Top 7 locations
Source: F+B GmbH; own illustration

5. Outlook for the Top 7: Where should the priorities lie?

5.1. Demand analysis: Supply vs. demand

An overall picture of the demand for apartments in the Top 7 results from the interaction of supply and demand. The focus here is on quantitative analysis. Possible undersupplies from purely qualitative points of view - such as size, standard, micro location - are thus eliminated. Can scarcities, rankings and priorities in the Top 7 be identified in this quantitative sense?

Population development vs. housing construction

The comparison of population development and changes in the housing stock is interesting (Figure 15). The two absolute values provide the ratio of „increase in housing per additional inhabitant". A first ranking shows the cities in ascending order based on this ratio. While Hamburg, with 0.52 new flats per new inhabitant or vice versa one newly created flat for about two additional inhabitants, is in the range of the average German household size of about two persons, construction activity in the other Top 7 cities appears below average. The figures for Cologne and Dusseldorf would require slightly larger-than-average households, but in Frankfurt and Stuttgart the household would already have to comprise three people if the newly built apartments are to provide for all additional households. In Munich, four new residents would statistically have to share each newly constructed apartment. Berlin is conspicuously lagging, with a newly added apartment for only about one in nine new residents in the period under review.

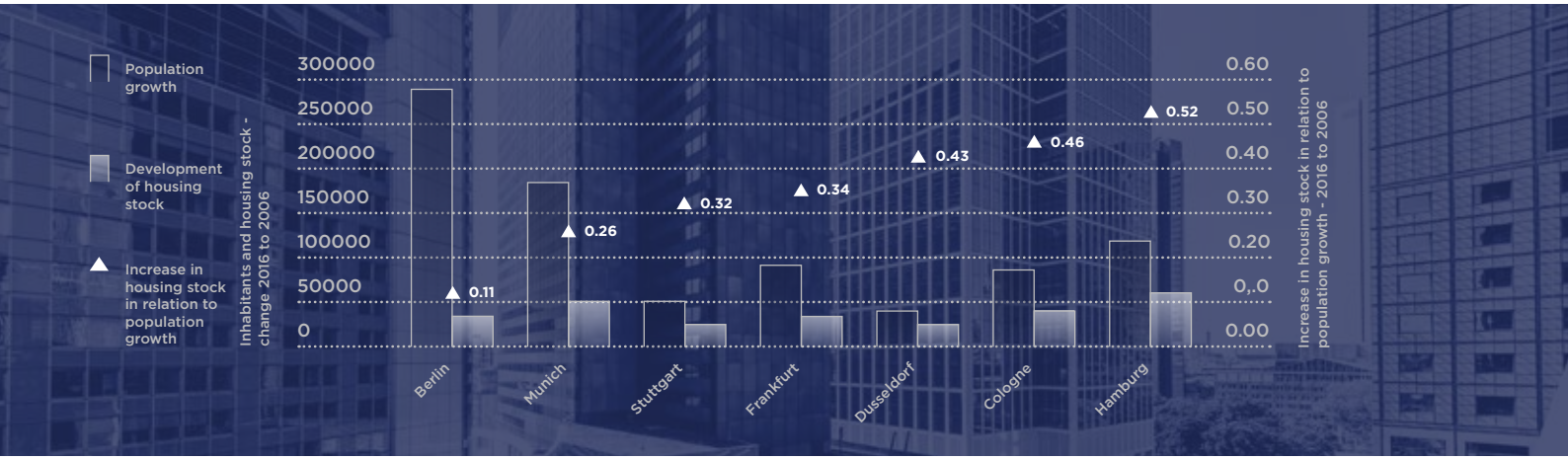

Figure 15: Development of population and housing stock in Top 7 locations - change 2016 to 2006
Sources: Federal and State Statistical Offices; own calculation and illustration

A matrix can be created from the individual data (Figure 16). In terms of the average household size in Germany, two clusters can be distinguished here. Only Hamburg is to the left of the dividing line, which suggests a sufficient supply of new housing in relation to population growth. Munich and Berlin are clearly off to the right-hand side of this reference value. In fact, these population developments are only made possible by a reduction in existing vacancies or by the growth of existing households, including accommodation that is not counted as residential units.

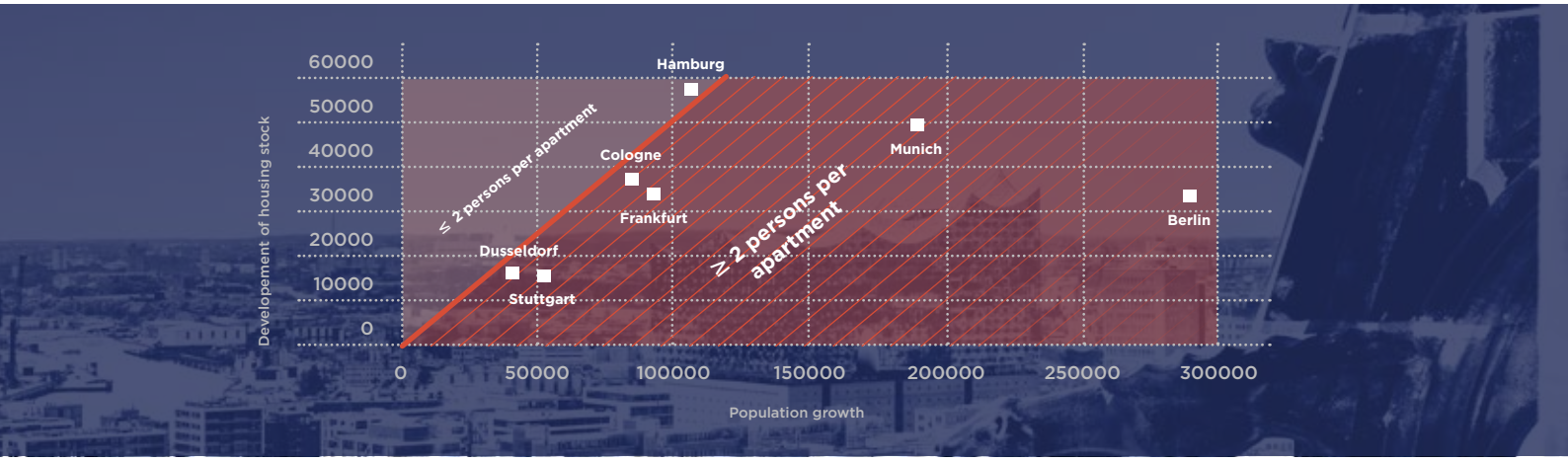

Figure 16: Development of population and housing stock in Top 7 locations - change 2016 to 2006 in matrix comparison to occupancy of two persons per apartment
Sources: Federal and State Statistical Offices; own calculation and illustration

Residential units per capita vs. residential space per capita

An analysis based on space is carried out using the residential space per inhabitant. Alternatively, the supply can be represented by the key figure „apartments per 100 inhabitants“ (Figure 17). In a ten-year compari-

son, there has been a decline in the ratio of apartments to inhabitants almost across the board. Only Hamburg was able to maintain its level of 52.2 apartments per 100 inhabitants. Munich was first among the Top 7 with 58.0 apartments per 100 inhabitants at the beginning, but in 2016 already has a significantly lower ratio of 53.8. Berlin and Frankfurt experienced similarly sharp declines in the period under review. Stuttgart was the worst performer in 2006 and 2016. Its supply rate fell from 51.2 to 49.6 apartments per 100 inhabitants.

There are differences in the development of residential space per capita. In 2006, Berlin still held the first place among the Top 7 with 40.1 m² per inhabitant, but Duesseldorf is currently ahead with a value of 40.9 m². Residential space per capita there has risen and is now even higher than Berlin's previous peak. The lowest-scoring location in 2006 according to this figure was Hamburg with only 37.0 m². Today it is Frankfurt, with also 37.0 m². Overall, there is no clear trend. In a ten-year comparison, cities such as Berlin, Munich, Frankfurt and Stuttgart show marginal decreases in residential space per capita, while Hamburg, Cologne and Duesseldorf experienced an increase. The overall German trend of more residential space per capita (Figure 2) therefore does not seem to apply to the largest cities. In addition, the residential space per capita is in some cases significantly below the figure of the entire country (particularly Frankfurt and Stuttgart, with a negative deviation of approx. eight m²). In general, however, such a discrepancy between large cities and smaller or rural locations is to be expected and can hardly be resolved.

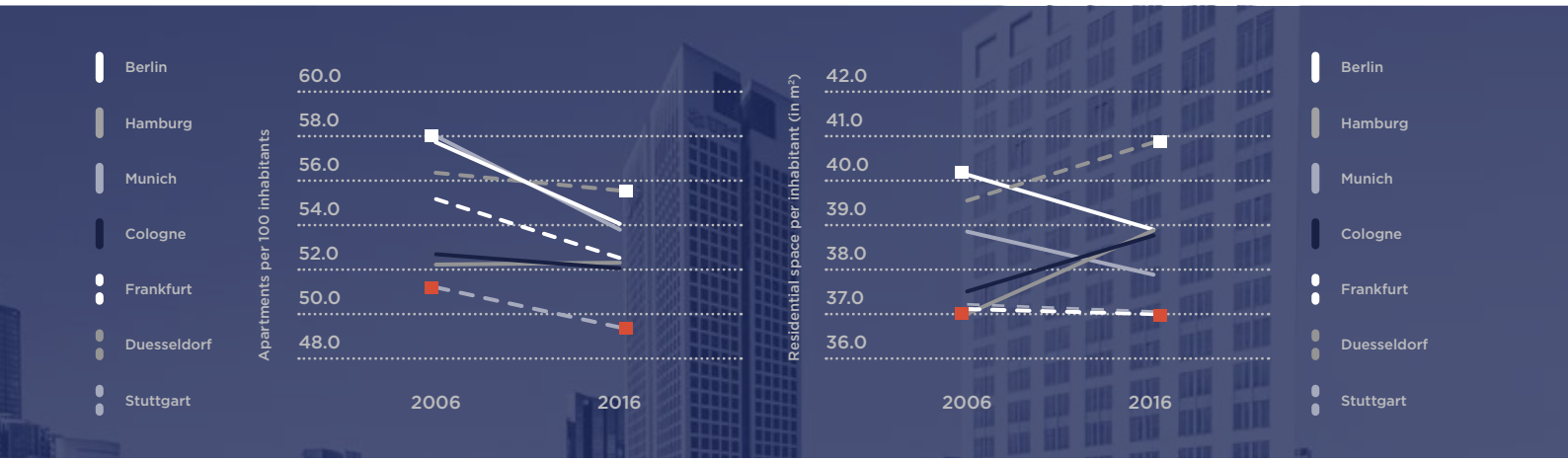

Figure 17: Development of apartments (housing stock in residential and non-residential buildings) per 100 inhabitants (left) and of residential space (apartments in residential buildings) in m² per inhabitant (right) in Top 7 - Tops (white) and Flops (red) marked; change 2016 to 2006
Sources: Federal and State Statistical Offices; own calculation and illustration

Household development vs. housing construction

The household figures can also be related to housing stock and residential space (Figure 18). The findings are not significantly different from those based on the number of inhabitants but include the size of the household typical of the respective location. In Duesseldorf, for example, only 0.19 new apartments or 20 m² of residential space were created per added household between 2011 and 2016. Stuttgart shows similarly low numbers. In the other Top 7 locations, too, the growth in residential space and housing stock per new household is limited. Even the peak value

for Cologne (0.33 apartments or 33.2 m² per household) still seems relatively low. Here, too, existing vacancies may of course have been used up for the time being, although these reserves were not too high already at the beginning of the analysis period.

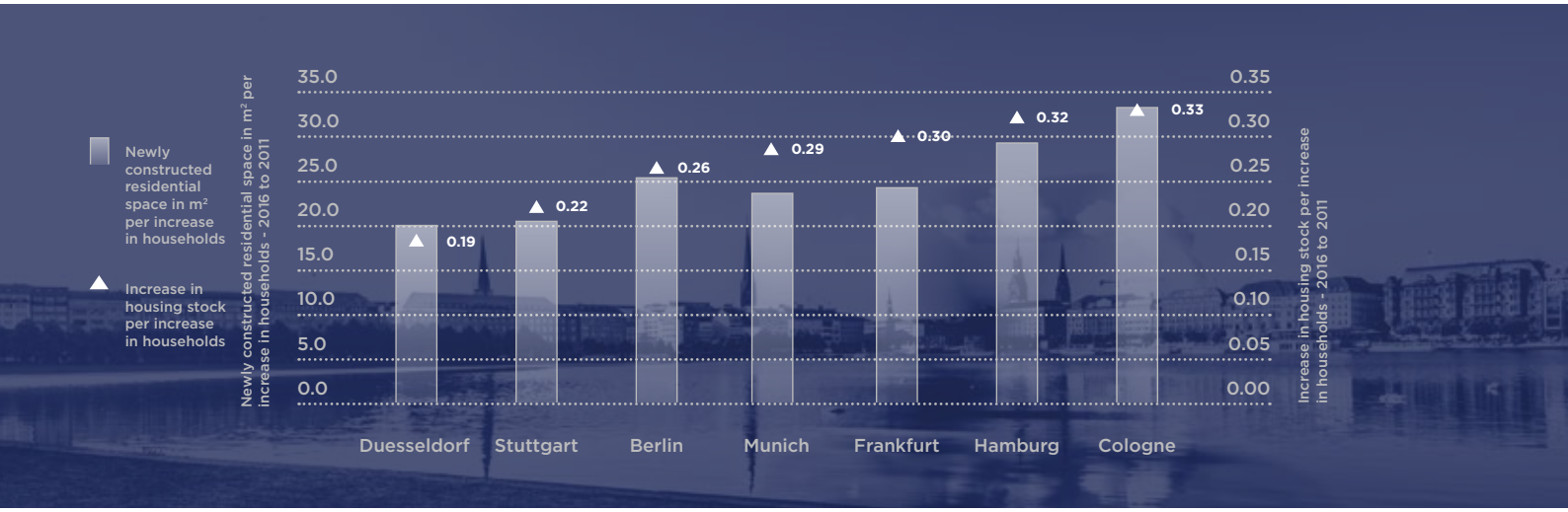

Figure 18: Residential space created (in residential buildings) in m² per new household and increase in housing stock (in residential and nonresidential buildings) per new household in Top 7 locations - change 2016 to 2011
Sources: Federal and State Statistical Offices, Municipal statistical offices; own calculation and illustration

Households vs. residential units

Ideally, the development of households and apartments should ensure that there are at least as many apartments as there are households so that the needs of a region can be met. However, the actual figures are lower. The cities surveyed here all have ratios between 92.6 (Frankfurt) and 99.3 (Cologne) apartments per 100 households, i.e., always below the limit that would signal a sufficient supply. To put it bluntly, all the Top 7 locations lack apartments for the households living there - in Frankfurt, more than seven out of every 100 households would lack their own living space. The difference can be explained by the fact that several households that are regarded as economically independent can live in one housing unit, e.g. as part of a shared apartment. Nevertheless, the ratios above allow speculations about possible demand surpluses. Household mergers may therefore also have happened due to a lack of alternative housing. Apart from the number of apartments, available sizes and furnishings (number of rooms, floor area, etc.) also need to be considered and contrasted with household types (singles, families). This would probably result in an even greater discrepancy between supply and demand.

Development of vacancies

Demand can also be met by using or reactivating unused housing. Figure 19 shows the vacancy rates of the Top 7 over time. Berlin, Frankfurt and Duesseldorf in particular had comparatively high vacancy rates in the mid-2000s. In 2006, the vacancy rate of 4.4 % means that around 83,000 apartments were available in Berlin. In all locations, vacancy rates have fallen continuously in recent years. This is astonishing against the background of a housing stock that has grown across all cities in the same period. However, the (increased) housing stock also influences the calculated rate as a reference value. The ratio decreases both when empty apartments are being rented and when new, already rented

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apartments expand the market. In general, current vacancy figures, which range from 1.5 % in Duesseldorf to barely perceptible 0.2 % in Munich, show a very high occupancy rate for the existing housing. However, these figures do not permit a final evaluation. A low vacancy rate does not rule out a functioning market that is in balance between supply and demand. Thus, a demand overhang cannot be shown with this indicator alone.

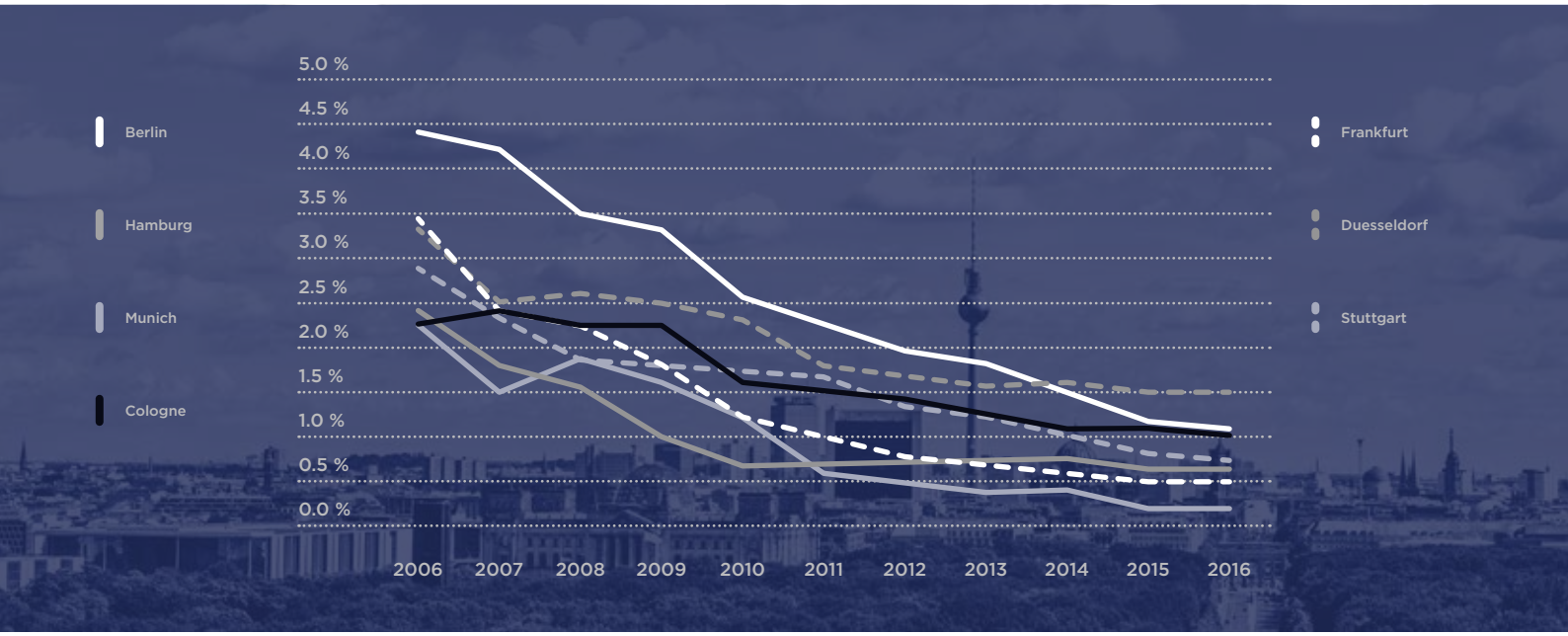

Figure 19: Development of the vacancy rate of apartments in Top 7 locations
Source: Statista (based on empirica); own illustration

Overall, the various key figures in all Top 7 markets show declining reserves and consequently, an increasing pressure resulting from growing demand. A high increase in the population of these cities has been met with a relatively moderate growth in housing stock during recent years, which has changed the ratios to the detriment of consumers. Population growth leads to an increase in the number of households, disproportionately so due to shrinking average household sizes. A reduction in existing vacancies was able to partially compensate for the low level of construction activity. However, there are currently hardly any further reserves available. Accordingly, construction activity would have to be increased (significantly) unless demand is expected to reverse its trend.

5.2. Meeting demand: Building permits vs. building completions

Construction activity can be statistically measured based on building permits and completions. A portion of the permits granted is not being used for building new houses. This means that certain losses in efficiency regarding the quantities realized must be examined. The interesting question here is in which quantity and with how much delay permits granted ultimately lead to completed projects. In this context, it can be assumed that during most market phases more apartments will be approved than built.

In answering the question of the extent to which permits granted are not used, it is not only the data for one year that needs to be compared. Rather, the analysis must consider typical market delays (time lags): Approved residential construction projects are rarely completed in the same calendar year; completion can also take place one, two or three years later. Especially during periods of rising economic activity, numerous projects are planned and approved, so that approval figures often far outstrip completion. During the end of an economic cycle, however, the exact opposite can happen: reduced planning for new projects, but still numerous completions of already-running construction.

Thus, a ratio between approvals and completions of less than one (completions predominate), seen over several years, represents a rather pessimistic market in which numerous projects started earlier are still being finalized. An example for this is the year 2006. In the years 2008 to 2011 and 2016, on the other hand, there were considerably more approvals than completions. This holds true for all time lags examined (0 to 3 years). Especially the concurrent and the one-year delayed series show high ratios of up to 1.5 times. As a sample calculation, during these years, 150,000 approved apartments in the Top 7 corresponded to only approx. 100,000 completed units.

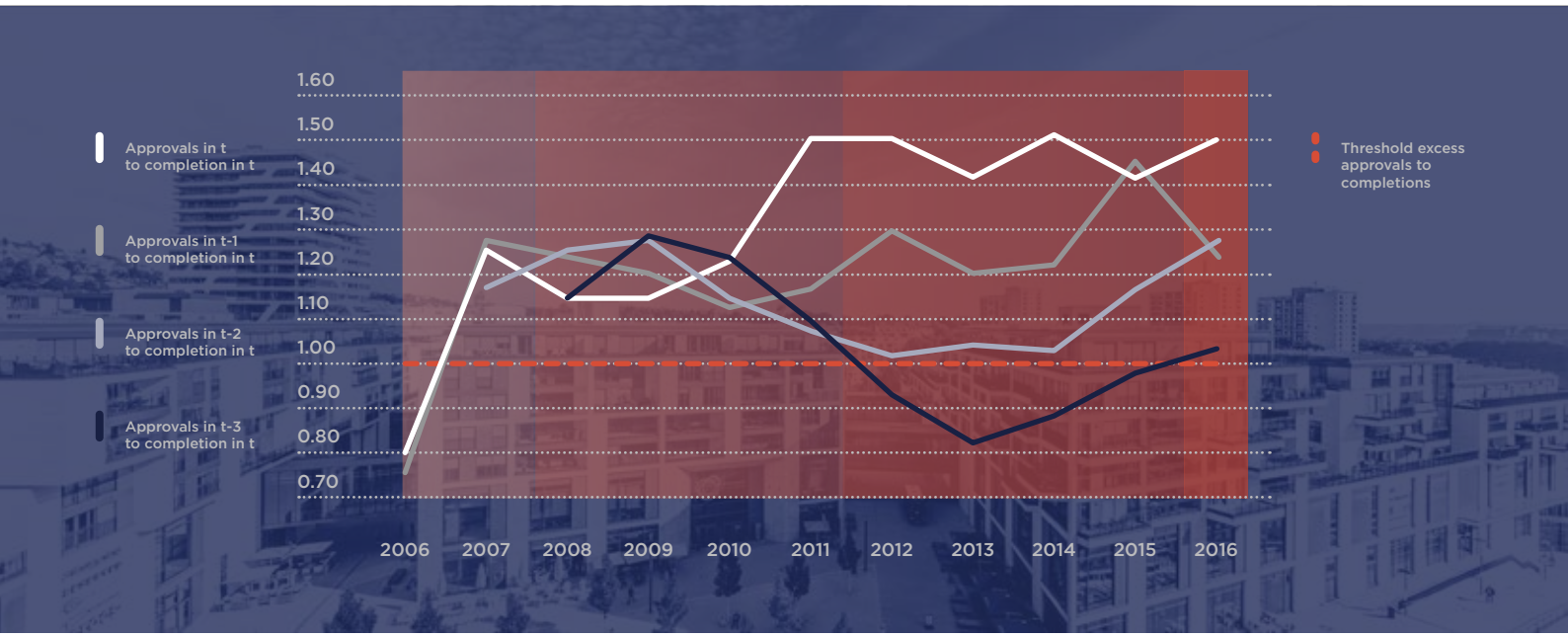

Figure 20: Ratio of building permits to completions (in each case apartments in residential and nonresidential buildings) in Top 7 locations (cumulated) - comparison of various time lags
Sources: State Statistical Offices; own calculation and illustration

There are major differences between the individual locations. For example, approvals and completions in the period from 2006 to 2016 are balanced only in Stuttgart, with an annual average of 2.8/1,000 inhabitants. In all other cities, a surplus of permits was recorded during this period, with particularly high averages in Berlin (3.3 to 1.8), Hamburg (3.9 to 2.9) and Frankfurt (5.7 to 4.5). In the Hessian metropolis, the comparatively high numbers of permits issued and units completed stand out despite this overhang. It is well above the level of larger cities such as Hamburg and Berlin.

Approved projects thus are only implemented in part, with the degree of implementation fluctuating. This can be caused by a variety of factors. For example, land is sold immediately after a building permit has been granted, but the new owner may change plans or hold onto the property in hopes of further appreciation. The current market dynamics (taking into account the entire relevant environment, including construction work) may also necessitate short-term adjustments to projects. This, in turn, leads to new planning and approval processes, to the keeping of reserves or even to the termination of a project. In addition, problems can also conceivably show up in the process of awarding and implementing contracts. Finally, construction costs are a factor for unfinished housing projects. The construction cost index (material and labor costs) reported by the Federal Statistical Office has risen by 13.6 index points since 2010 alone, about four index points more than the consumer price index has in the same period. The procurement pressure indicated by this price index is reflected in the form of scarce resources, for example in terms of available construction companies, personnel and materials. Economic reports from the German construction industry confirm this.

Numerous economic and organizational parameters can thus endanger projects and explain the gap between approvals and completions. Therefore, this gap can only be closed to a limited extent.

5.3. Scenarios: Population forecast vs. housing forecast

While project developments can be based on current market data and the short-term outlook, portfolio investments and strategies require at least medium-term forecasts. The following is an extrapolation of current trends up to the year 2025, using available forecasts and our own data series.

For example, MB Research provides a forecast of population trends until 2025 (published in Thomas Daily). The development of housing stock shall be extrapolated based on previous completion figures (mean value from 2013 to 2016) and generalized decreases in stock. This phase of the market already includes higher completion figures than in previous years, i.e. it includes shortages that have already been identified and the resulting market effects (rental prices, purchase prices, sales volumes). If construction activity cannot be increased significantly, the relations shown in Figure 21 could be the medium-term results for the Top 7.

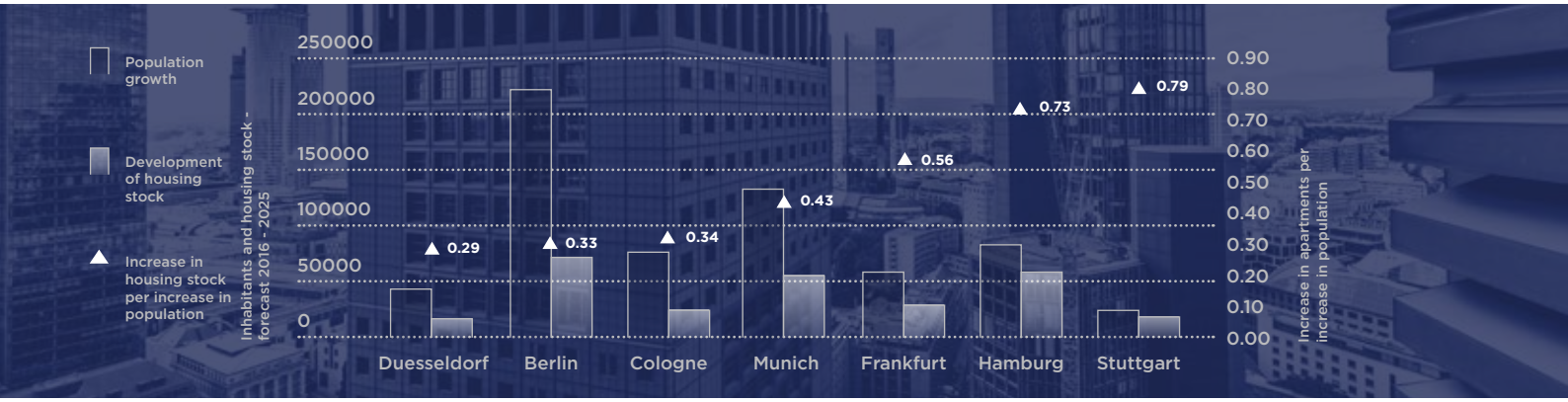

Figure 21: Development of population and housing stock in Top 7 locations - 2016 to 2025 extrapolation
Sources: Federal and State Statistical Offices, Thomas Daily (based on MB Research); own calculation and illustration

For the cities of Duesseldorf, Berlin and Cologne, a further shortage can be expected based on the extrapolation. In these cities, only one apartment would be built for about three new inhabitants. Particularly in Cologne, where the current ratio of 52.1 apartments per 100 inhabitants is already the second-lowest of the Top 7, this could mean a further deterioration in the supply of housing (forecast value 50.9). The forecast for Duesseldorf has to be interpreted against the background of the highest current vacancy rate among the Top 7 and the highest ratio of apartments per 100 inhabitants. Although according to the extrapolation, the ratio will fall back to 53.7 flats per 100 inhabitants in 2025, this will still be the highest figure among the Top 7. In contrast, Stuttgart is building 0.79 flats per new inhabitant and is thus increasing the ratio from the current 49.6 to 50.4 flats per 100 inhabitants. Hamburg and (to a marginal extent) Frankfurt will also be able to increase the supply rate to an extent; Munich would fall back somewhat. Figure 22 shows the development in these cities in terms of population, household and housing stock forecasts.

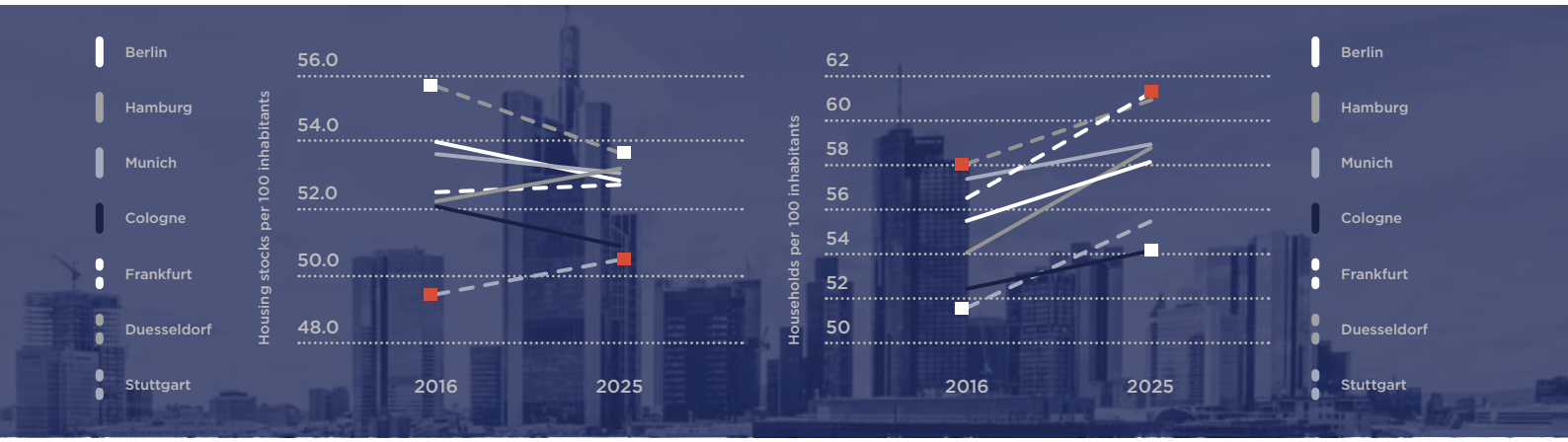

Figure 22: Housing (housing stock in residential and nonresidential buildings) per 100 inhabitants (left) and households per 100 inhabitants (right) extrapolated in the Top 7 - tops (white) and flops (red) marked
Sources: Federal and State Statistical Offices, Thomas Daily (based on MB Research), Municipal statistical offices; own calculation and illustration

The extrapolation of household figures from 2016 onwards is essentially based on the current household forecast calculation of the Federal Statistical Office (until 2035). For the purposes of this study, the growth rates of the predicted household figures from 2016 to 2025 of the city states (Berlin, Hamburg) as well as the West German territorial states (remaining Top 7) were taken as a basis. Percentage surcharges are based on the different growth rates from 2011 to 2016 of the respective city's household development compared to the corresponding federal state (or, for Hamburg and Berlin, to the totality of the city states).

The values for 2025 that were calculated in this way consistently show an increase in households per 100 inhabitants. This increase is particularly high in Frankfurt, where in 2025, 61.1 households per 100 inhabitants can be expected, after a ratio of 56.5 in 2016. Duesseldorf, too, has a value above 60. Cologne has the lowest ratio with 54.1 households per 100 inhabitants. All in all, the trend towards ever smaller household sizes is striking, and it is likely to drive demand for apartments further upwards. There is currently no sign of an upcoming reversal of this trend, but should it happen, it would correspondingly lead to different forecast values.

Thus, there is a certain amount of uncertainty about the continuation and extent of this trend, which would increase if forecasts were made for an even longer period. As far as construction work is concerned, capacity can be expected to be limited in the short to medium term, which means that it will probably not be possible to increase construction significantly; at best, capacity could be concentrated on the major cities. In the event of an unfavorable economic development or stronger market intervention, a reduction in housing project developments would nevertheless be conceivable.

5.4. Rankings: Which Top 7 markets are particularly interesting in the medium term?

The results highlighted in this study are summarized in Figure 23. In order to present a ranking, key figures are prioritized in the comparison of the Top 7. A ranking of „1" thus stands for the highest need for residential construction or the highest priority, at least in relation to the respective key figure. The rankings can also be summarized for certain groups of key figures and study areas. In these cases, only a simple mean value without specific weighting is calculated.

PRIORITY LIST OF RESIDENTIAL CONSTRUCTION - EVALUATION ON THE BASIS OF INDIVIDUAL SUPPLY AND DEMAND INDICATORS														
	Ber	Prio	Ham	Prio	Mun	Prio	Col	Prio	Fran	Prio	Dues	Prio	Stu	Prio
Population growth (development 2016 to 2006)	8.8 %	3	6.7 %	7	15.0 %	1	8.7 %	5	14.6 %	2	6.8 %	6	8.8 %	3
Population forecast (development 2025 to 2016)	6.2 %	5	4.4 %	6	8.8 %	1	7.0 %	4	7.9 %	2	7.8 %	3	2.9 %	7
Household developement (development 2016 to 2011)	9.4 %	6	11.1 %	5	13.6 %	2	8.8 %	7	17.0 %	1	11.5 %	4	11.8 %	3
Household forecast (development 2025 to 2016)	11.5 %	5	13.2 %	2	11.7 %	4	10.3 %	6	16.7 %	1	13.0 %	3	9.9 %	7
Market rent (development 2017 to 2007)	72.7 %	1	41.6 %	4	55.5 %	2	28.2 %	7	38.7 %	5	38.7 %	5	49.3 %	3
Ratio of unemployed to job openings (reporting month 08/2018)	6.0	7	3.8	5	2.9	3	4.5	6	1.7	2	3.4	4	1.6	1
Housing stock 2016 to 2006	1.7 %	1	6.7 %	4	6.8 %	5	7.5 %	6	9.0 %	7	5.1 %	2	5.4 %	3
Housing stock - forecast (2025 to 2016)	3.8 %	1	6.2 %	5	7.1 %	6	4.6 %	3	8.4 %	7	4.1 %	2	4.6 %	3
Building completions per 1,000 inhabitants (mean 2006-2016)	1.8	1	2.9	4	4.9	7	3.0	5	4.5	6	2.1	2	2.8	3
Building permits per 1,000 inhabitants (mean 2006-2016)	3.3	3	3.9	5	5.3	6	3.3	3	5.7	7	2.8	1	2.8	1
Mean of priorities		**3.3**		**4.7**		**3.7**		**5.2**		**4.0**		**3.2**		**3.4**

PRIORITY LIST OF RESIDENTIAL CONSTRUCTION - EVALUATION ON THE BASIS OF SUPPLY-DEMAND RELATIONS														
	Ber	Prio	Ham	Prio	Mun	Prio	Col	Prio	Fran	Prio	Dues	Prio	Stu	Prio
Vacancy rate (2016)	1.1 %	6	0.6 %	3	0.2 %	1	1.0 %	5	0.5 %	2	1.5 %	7	0.7 %	4
Housing stock per 100 inhabitants (2016)	54.0	6	52.2	3	53.8	5	52.1	2	52.4	4	55.5	7	49.6	1
Housing stock per 100 inhabitants - forecast 2025	52.8	4	53.1	6	53.0	5	50.9	2	52.6	3	53.7	7	50.4	1
Households per 100 inhabitants (2016)	55.4	4	54.1	5	57.1	2	52.4	6	56.5	3	57.9	1	51.8	7
Households per 100 inhabitants - forecast 2025	58.1	5	58.7	3	58.7	3	54.1	7	61.1	1	60.8	2	55.4	6
Housing stock per 100 households (2016)	97.6	6	96.4	5	94.2	2	99.3	7	92.6	1	95.9	4	95.7	3
Increase in housing stock per increase in population (2016 to 2006)	0.11	1	0.52	7	0.26	2	0.46	6	0.34	4	0.43	5	0.32	3
Increase in housing stock per increase in household (2016 to 2011)	0.26	3	0.32	6	0.29	4	0.33	7	0.30	5	0.19	1	0.22	2
Residential space created in m² per increase in population (2016 to 2006)	24.6	1	66.1	7	31.5	2	53.4	5	36.2	4	60.9	6	35.9	3
Residential space created in m² per increase in households (2016 to 2011)	25.4	5	29.5	6	24.4	3	33.2	7	24.6	4	20.3	1	20.7	2
Mean of priorities		**4.1**		**5.1**		**2.9**		**5.4**		**3.1**		**4.1**		**3.2**
OVERALL MEAN		**3.7**		**4.9**		**3.3**		**5.3**		**3.6**		**3.7**		**3.3**

Figure 23: Priority list (1=highest priority, 7=lowest priority) for housing construction comparing the Top 7 locations - various supply and demand indicators, supply/demand relations
Sources: Federal and State Statistical Offices, Federal Employment Agency, Thomas Daily (based on MB Research), Municipal Statistical Offices, Statista (on the basis of empirica); own calculation and illustration

Some of the rankings shall be examined in more detail as examples. For instance, Munich shows a high priority when looking at the population development from 2006 to 2016. Regarding this figure, demand in Hamburg would be the lowest. Another high priority for Munich can be derived from the development of rents, which is seen as an indicator of scarcity. In this respect, the Bavarian state capital is surpassed only by Berlin. In terms of rents, Cologne has the lowest priority among the Top 7. Regarding the development of housing stock in recent years, Berlin shows clear weaknesses. In view of this figure, construction would have to be carried out primarily here.

Based on the mean value of the supply and demand indicators (first table segment), however, residential construction in Duesseldorf would have to be prioritized (mean value: 3.2). This is mainly due to the relatively low increase in housing stock and the associated construction completions and permits. Stuttgart and Berlin also show a high demand in relation to these mean value rankings, whereas Hamburg and Cologne have the lowest priority among the Top 7.

The second table segment indicates partially different rankings. According to these mean values, Duesseldorf ranks behind Stuttgart, Frankfurt and Munich. In Stuttgart, the low housing stock per 100 inhabitants (current and forecast value) and the low growth in the number of apartments and residential space per added household (2011 to 2016) have an exacerbating effect on scarcity. In Frankfurt, the forecasted household size and the current housing stock per 100 households indicate a high housing demand. Hamburg and Cologne reaffirm their low priorities in relation to the Top 7 group. Cologne ranks last in four out of ten key figures. Only in terms of the number of apartments per inhabitant a greater need for action is shown (here, Cologne ranks second two times). The Berlin housing market looks more favorable when comparing the supplydemand ratios than when looking at individual indicators (upper part of the table). Especially the housing stock per 100 inhabitants and per 100 households leads to a better placement according to the mean value calculated for the second table segment.

The priorities „calculated“ based on the individual key figures are not necessarily recommendations for investment allocations across those markets. Rather, they serve as indicators for an on average tense or less tense overall housing market in the respective city. In a specific case, it goes without saying that additional or reduced demand can be found depending on the district, type of property, quality of construction or target group.

A detailed assessment must include qualitative factors in addition to the key figures presented here. One example is Stuttgart with its relatively low housing stock per 100 inhabitants - in contrast to its bottom priority when looking at the ratio of households per 100 inhabitants. Fewer available apartments in the state capital of Baden-Wurttemberg may therefore be attributed to the preference for larger households on average and need not necessarily represent a bottleneck. Corresponding characteristics of the current and future distribution would have to be examined more closely. Another special feature is the low increase in the housing stock per additional inhabitant in Berlin, which, however, would have to be compared with the comparatively higher vacancy rate at the beginning of the review period. Even today, Berlin still has the highest reserves of all the Top 7 cities.

The final prioritization of an investor or developer must include individual preferences and experience. Investment goals and strategies, for example, can be accounted for by the use of exclusion factors and weightings.

Policy makers and administrators must observe certain formal criteria in order to determine a tense housing market situation and corresponding possibilities for intervention from their point of view. This, too, cannot be measured in terms of just one value. An attempt was made to find suitable criteria during the 2015 amendment to the German tenancy law. However, the four criteria set out in Section 556d of the German Civil Code (BGB) - rent increase, rental burden, population growth and vacancy rates - are not conclusively defined and can therefore be interpreted depending on the interests involved.

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In general, it is thus possible to find and calculate indicators for the situation on the housing market. However, an exact quantification of housing demand is not possible, due to the numerous influences and their interaction. In particular, behavioral elements play a role, as consumers and suppliers adapt to new situations, information and assumptions. This can lead both to more flexibility and a relaxation on the market (e.g. through moving or commuting), and to the conscious or unconscious creation of roadblocks to adjustment processes (e.g. retention of too-large apartments or historical lease constellations, granularization of the original market down to street level, property or even individual apartment).
In this sense, the results of this study can be seen as a decision-making aid for the basic prioritization of target markets. The actual selection of specific properties or projects naturally requires further indepth analyses.

6. Conclusion

Although the housing shortage is playing a major role in public debate, at least the nationwide housing market and population data cannot supply corresponding evidence. This study by the Empira Group is therefore specifically devoted to Germany's Top 7 cities. These have developed quite differently in recent years. However, across the board, discrepancies can be identified between the mostly increasing demand for housing and the barely sufficient construction activity. Although construction activity in recent years has lagged behind the forecast demand, in relative terms the Top 7 are still seeing more building activity than the national average.
Residential construction is distributed quite differently among the cities surveyed. While the figures for Frankfurt and Munich, to all intents and purposes, look good related to their respective populations, Berlin in particular is falling behind in terms of approved and completed apartments. However, due to various problems such as administrative hurdles in the approval process, inadequate project planning, increased construction costs or speculative sales caused by the market situation, the completion figures for all locations sometimes lag considerably behind the number of approved residential buildings.
The shortage in the Top 7 markets is the result of fundamentally high demand pressure. This in turn is the result of above-average population growth and in part also of declining household sizes, a combination which leads to a sharp rise in household numbers. Upstream factors can be found in the positive economic and labor market situation, but also in the lower attractiveness of longer commutes to places of work and education. Commuters living in rural or suburban areas are increasingly disadvantaged compared to urban dwellers by the increased costs of individual transport. A better infrastructure and public transport could relieve this situation at least partially.

If there is no reversal or at least slowdown in population development, construction activity is unlikely to suffice in the medium term. Key factors here are lower property reserves, capacity limits in the construction industry, complex planning and approval procedures and various regulations ranging from environmental law to tenancy law and construction standards. None of these issues are currently the subject of fundamental improvements that politicians, companies, research institutes or other parties involved have promised or even jointly discussed. Instead, there is a danger of further market interventions and increasingly demanding projects (on the scarce

remaining land or in complex refurbishments or extensions of existing properties), possibly leading to further shortages in large cities.
A need for action, but at the same time also an aboveaverage opportunity for project developers, is above all evident in the cities of Stuttgart, Munich and Frankfurt. Berlin is in the midlevel of the Top 7 when looking at the interplay of supply and demand. Hamburg and Cologne still are best supplied with housing among the Top 7.
Overall, the question of housing supply is currently primarily being discussed in terms of money, particularly the rent price. Corresponding interventions in the pricing structure are relatively easy to decide and can selectively achieve financial improvements, especially for the group of new tenants (possibly previously selected from a larger group of applicants). The positive effects, however, are of a rather short-term nature. In the long term, only a quantitative approach - based on housing units and living space - can relieve the pressure on the housing markets in the metropolises. This can be achieved through growth, i.e. new construction, but also - at least supportively - through accompanying measures such as a different distribution of available residential space (redistribution, relocations) and a better infrastructure (connecting the surrounding areas).
Claims about regional and local housing supply can only be made in light of the interaction of several suitable indicators. Research at the Empira Group will therefore continue focussing on market interrelationships in order to determine influencing factors and identify trends and cycles for successful investments at an early stage.

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