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The Effect of Immigration on the German Housing Market

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The Effect of Immigration on the German Housing Market

Abstract

This study provides evidence of the causal impact of immigration on housing prices and rents using an extensive dataset from Germany that covers 382 administrative districts over the period 2004−2020. Employing a panel-data approach and a manually constructed Bartik instrument, we show that international migration has a significantly positive short-term effect on flat prices and rents. House prices are not significantly affected. We estimate that an increase in international migration of 1% of the initial district population causes a hike in flat prices of up to 3% as well as a hike in flat rents of about 1%. The increase in flat prices is more than twice as high as this at the lower end of the market, whereas the flat rental market demonstrates a more linear response. We also discover that immigration's impact on flat prices and rents does not significantly differ across rural and urban areas within the country.

JEL classification: J61; R23; R31

Keywords: Immigration; Housing prices; Rents; Instrumental variable; IV quantile regression; German housing market

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1. Introduction

Immigration is now a highly charged political issue, and anti-immigrant objectives are a key element of nativist and nationalist movements (Pavlov & Sommerville, 2020). According to 2022 data from the United Nations, there are 281 million immigrants, which is approximately 3.6% of the global population.[1] In 2020, almost 55 million of the 445 million European Union (EU)-27 residents (ca. 12%) were foreigners. Germany, with more than 11 million immigrants, is host to the largest number of foreigners[2] among the EU-27 Member States (Destatis)[3]. Although Germany is an important player in EU migration law and policy, it is not a classic immigration country. In fact, until the end of the 20th century, the general political consensus was that Germany is not an immigration country and, consequently, there was no coordinated government action to help integrate migrants into the native society. Over the last 20 years, this has changed; indeed, an explicit Immigration Law came into effect in 2005.

Between 2004 and 2020, the number of foreigners in Germany increased from 6.5 million (8.5% of the total population) to more than 11 million (14% of the total population), an increase of 69%. Immigration was not the only thing that went up; so, did housing prices. The median price of a single-family house increased by 54% between 2004 and 2020, and the rate of increase in prices per square metre (price/sqm) for flats was 69% during this period, with a median price of €2,200/sqm in 2020. Underlying these aggregate developments in immigration and property prices is substantial variation across the country's districts.

Our study provides empirical evidence that immigration leads to higher house prices, flat prices, and flat rents, at least over the short term. We use an extensive dataset that covers 382 administrative districts in Germany over the period 2004 to 2020. Our data allow us to measure annual changes in house prices, flat prices, and flat rents and the spatial concentration of immigrants at the district (Kreise) level. Studying disaggregated areas rather than state-, metropolitan-, or city-level aggregate data is crucial for identifying the local economic impact of migration flows. We conduct instrumental variable panel-data analyses in which the annual change in house/flat prices or flat rents in different districts is regressed on the annual inflow of immigrants into that same district, along with various control variables. The simultaneous relationship between immigration flows and property price changes has the potential to create an endogeneity problem. On the one hand, low housing prices may attract immigration, so that one would expect a negative correlation between the two variables. On the other hand,

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[1] UN DESA (2022), Policy Brief No. 133: Migration Trends and Families, available at: https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-no-133-migration-trends-and-families/

[2] Under the German 'Constitution' (Art. 116 Abs. 1 of the Grundgesetz), a foreigner is someone who does not have German citizenship. 'Foreigners' and 'immigrants' are used interchangeably and refer to people who do not have German citizenship. Asylum-seekers are also counted as immigrants and, prior to 2008, official statistics did not differentiate between the two groups. However, between 2004 and 2020, the average share of asylum-seekers among immigrants was only 10% and they make up less than 1% of the total population. Therefore, their impact on the housing market is likely limited.

[3] Destatis is the Federal Statistical Office of Germany responsible for collecting, processing, presenting, and analysing statistical information regarding the economy, society, and the environment. https://www.destatis.de/DE/Home/_inhalt.html

immigration should increase house/flat prices or rents, leading to a positive correlation between the two variables. To address the endogeneity problem and to derive a causal conclusion we follow the extant literature and create a Bartik instrument for estimating the distribution of the recent immigrant population that is based on historical settlement patterns of immigrants according to their countries of origin. We take a careful look at the validity of this instrument in the current context, and we provide a number of robustness checks of our empirical specification.

Our empirical findings suggest that international migration has a significantly positive short-term effect on flat prices and rents, based on data from Germany. An increase in migration inflow equal to 1% of a district's initial population causes a hike in flat prices of about 2.5–3% as well as a hike in flat rents of about 1%, whereas it has no significant effect on housing prices. Finding that immigration has a positive impact on rents and flat prices is consistent with the idea that immigrants do not displace natives. Supporting this conclusion, we find no significant evidence for native out-flight. We also conducted a test to examine the phenomenon of immigrant crowding and find some evidence for it. Although statistically significant, the immigrant crowding effect is not particularly large in economic terms. Thus, the increase in housing prices due to immigration occurs despite the fact that immigrants occupy slightly less space than the same number of natives. Considering the price distribution of the housing market, we find that the largest price increases occur at the lower end of the market for flats, namely, at the 25th percentile of the price/rent distribution, which is intuitive as migrants tend to be poorer than the native population. Indeed, our estimations show that immigrants tend to move towards districts where property prices and rents are growing more slowly or towards areas with more affordable housing stock.

Considerable research effort in many developed countries, especially within the past 20 years or so, has been devoted to understanding the impact of immigration on housing prices and rents. Research using within-metropolitan-area variation for identification reveals that immigrants raise aggregate metropolitan area house prices or rents (e.g., Moallemi et al., 2021; Moallemi & Melser, 2020; Akbari & Aydede, 2012; Stillman & Maré, 2012; Gonzalez & Ortega, 2013; Degen & Fischer, 2017; Saiz, 2003, 2007), but lower them in destination neighbourhoods or districts. The negative relationship at the neighbourhood and district level is interpreted as evidence that native residents' desire to segregate themselves from immigrants dominates the pure housing demand effect of the immigrants at the local authority and/or neighbourhood level (see, e.g., Saiz & Wachter, 2011; Sá, 2015; Braakmann, 2019; Accetturo et al., 2014). In contrast to this interpretation, but in line with Saiz (2003, 2007), our results for Germany suggest that a greater number of immigrants settling in a district tends to raise local housing prices, particularly at the lower end of flat prices and rents. This different finding in regard to the impact of immigration in German districts appears to be driven by the absence of native out-flight. A caveat is that we cannot exclude the possibility that specific neighbourhoods within districts are subject to price decreases.

Population growth and decline due to migration affect native populations and have essential social, economic, and policy implications. Each individual's relocation decision contributes to the broader migration patterns that shape regions and cities. The results obtained for Germany can provide essential insight into the regional economic impact of immigration in other European migrant-receiving countries. In this context, this paper makes at least four contributions to the literature on immigration and housing prices.

First, to date, there is no comprehensive analysis of the causal impact of immigration on housing markets in Germany, a country that hosts the largest number of migrants among the EU-27 Member States. In other words, this topic has not yet been studied adequately nor have its consequences for the local housing markets in Germany been sufficiently discussed.

Second, given political debate over the German housing market, this topic is increasingly important. Federal, state, and municipal governments try to alleviate rent and price hikes via various measures such as, for example, rent 'breaks' and/or limiting the transformation of rental flats into owner-occupied property).[4] The success of these measures is as yet unclear.[5] Based on our district-level data, our comprehensive discussion of immigration's role in the German housing market will provide important insights for policymakers.

Third, we add to the limited literature on the causal link between immigration and housing prices. After controlling for economic drivers (disparities in the unemployment rate, working-age population, and GDP/person) and the historical settlement patterns of immigrants according to their country of origin, we find that immigration influxes raise flat prices and rents. Therefore, we argue that the causal link is from international migration to housing prices, not that housing prices are the reason for migration.

Fourth, only a limited number of studies focus on how immigration affects the lower and higher ends of the house price or rent distribution in the USA (Saiz, 2003) and England and Wales (Braakmann, 2019). To explore further the heterogeneity in the identified relationship along the distributions of housing prices, we use IV quantile regressions and find that immigrants increase flat prices and rents at the low end of the market. Although this finding is similar to the result reported by Saiz (2003), it is the exact opposite of what Braakman's (2019) study discovered, which reports a negative immigration effect, particularly at the lower end of the property price distribution.

The remainder of the paper is structured as follows. Section 2 reviews the existing research on the impact of immigration on house price changes in several countries. Section 3 briefly discusses immigration policy and housing market dynamics in Germany. Section 4 introduces the methodology. Section 5 presents the results, and section 6 concludes the paper.

[4] https://www.n-tv.de/politik/Umwandlung-von-Mietwohnungen-begrenzen-article22376026.html; accessed 21 September 2022.

[5] See, e.g., https://www.bmj.de/SharedDocs/Downloads/DE/Ministerium/ForschungUndWissenschaft/MPB_Gutachten_DIW.pdf?__blob=publicationFile&v=4 and https://www.tagesschau.de/inland/mietpreisbremse-faq-kritik-101.html; accessed 21 September 2022.

2. Literature Review

To date, considerable research has been devoted towards understanding the impact of immigration on house prices and rents in many developed countries: for example, *Australia* (Moallemi et al., 2021; Moallemi & Melser, 2020), *Canada* (Akbari & Aydede, 2012; Pavlov & Somerville, 2020), *Italy* (Accetturo et al., 2014), *New Zealand* (Coleman & Landon-Lane, 2007; Stillman & Maré, 2012), *Spain* (Gonzalez & Ortega, 2013), *Switzerland* (Degen & Fischer, 2017), the *United Kingdom* (Braakmann, 2019; Sá, 2015), and the *United States of America* (Saiz, 2003, 2007; Saiz & Wachter, 2011). The main body of research on immigration and housing markets uses the metropolitan area as the unit of analysis, typically through a panel of metro areas or, on occasion, through time series in a single housing market (Pavlov & Somerville, 2020), and finds that immigrants have a positive effect on house prices or rents (e.g., for *Australia*, Moallemi et al., 2021; Moallemi & Melser, 2020; for *Canada*, Akbari & Aydede, 2012; for *Italy*, Accetturo et al., 2014; for New Zealand, Stillman & Maré, 2012; for Spain, Gonzalez & Ortega, 2013; for Switzerland, Degen & Fischer, 2017; for the USA, Saiz, 2003, 2007).

In contrast to these mostly positive aggregate effects, studies that use within-metropolitan-area variation for identification find negative relationships between immigrant numbers and house prices. For instance, Saiz and Wachter (2011) use a geographic diffusion model to represent a neighbourhood's growth of immigrant density and find that growing immigrant density appears to cause native out-flight and decreasing prices in these neighbourhoods. Using panel data covering local authorities for the years 2003–2010 in the UK, Sá (2015) finds that an increase in the stock of immigrants equal to 1% of the local initial population leads to a 1.7% reduction in house prices. This significant drop in house prices is attributed primarily to native out-mobility, particularly that of high-income individuals. Braakmann (2019) also uses a panel of local authorities in the UK and finds that immigration decreases house prices for units below a region's median but has no effect on those above the median. The author links this negative impact to native out-migration in areas home to housing below the median price and a greater number of persons per unit due to immigrant crowding. Accetturo et al. (2014) report a negative impact of immigration on average house prices chiefly when focusing on small local areas, such as neighbourhoods within metropolitan areas. Focusing on census tracts in Vancouver, Canada, over a 20-year period, Moos and Skaburskis (2010) find a positive correlation between immigrant volume and price increases when differentiating between inner and more suburban areas.

Several reasons are put forth for explaining the negative effects of immigration on housing prices/rents. First, native out-flight can occur due to a desire to avoid living near immigrants or having to deal with changes to neighbourhood amenities resulting from the immigrant inflow. Second, immigration may generate more crime or affect the quality of locally provided public goods (e.g., schools), which may experience overcrowding. Third, immigration may affect both the quality and quantity of the housing stock. According to Gonzalez and Ortega (2013), an increase in housing supply (i.e., the number of available properties) that is larger than the increase in demand may result in lower housing prices in immigrant-receiving areas.

A fourth possible explanation for the negative impact of migration flows on housing prices is that immigration leads to a drop in demand for owned properties, as immigrants might tend to move into rented accommodations (Braakmann, 2019).

So far, few studies consider how immigrants' different income profiles affect the lower and/or higher ends of the house price distribution. For example, Saiz (2003) studies the Miami housing market after the Mariel Boatlift led to an influx of Cuban immigrants. His findings indicate a short-run increase in rents of 8–11% relative to four comparison cities, particularly at the low end of the market. At the same time, house prices appeared to drop—which he explains by an outflow of natives—and there was a hike in the number of persons per bedroom. Pavlov and Somerville (2020) study wealthy immigrants, rather than immigrants more likely to be perceived as of a lower socioeconomic class. Their results indicate that immigrant flows raise neighbourhood house prices.

Without analysing the characteristics or income/wealth levels of immigrants, Braakmann (2019) considers another mechanism through which immigration can affect the housing market, namely, differences in usage of housing space and differences in tenure. He finds a negative effect on property prices, especially at the lower end of the property price distribution up to the median, whereas prices above the median appear to be unaffected. Although this result appears puzzling at a first glance, the author provides three main reasons for this negative effect. First, an increase in immigration leads to an increase in the share of households living in more crowded conditions, that is, a change in the number of people living in each available room. Second, there is a strong shift away from owner-occupiers to households living in (privately) rented properties. Third, an increase in immigration leads to more households living in smaller properties and fewer households living in very large properties, which can be seen as a sign that property owners have converted houses into apartments. Consequently, the prices for owned properties do not increase; moreover, the number of property transactions drops.

Similar to Braakmann (2019), we investigate the impact of immigration on the lower and higher ends of the house price distribution without analysing the characteristics or income/wealth levels of immigrants. However, in contrast to Braakman's study, we find that immigrants have a positive effect on property prices, particularly at the lower end of the flat price/rent distribution up to the median, whereas prices above the median appear to be unaffected.

Although Germany now hosts the highest number of immigrants in the EU-27, there is limited empirical evidence on the effect of international migration on house prices in the country. Existing research primarily examines the impact of East-West migration due to German reunification, refugee influx, and internal migration on the housing market. For example, Kürschner (2016) exploits a natural experiment provided by the German reunification to study the impact of the mass immigration of East Germans on housing rents in West German metropolitan areas. The study finds strong evidence for a positive and sizeable effect of immigration on rental prices of residential dwellings. Employing an IV approach based on the distances between origin and destination regions across the country as well as origin-specific push-factors of migration to instrument the regional settlement pattern of migrants across their

West German destinations, the study reveals that rental prices of minimum and average category dwellings increase by approximately 8% and 4% due to a 1% population increase caused by immigration.

Using detailed data on county-level refugee populations and their composition, Kürschner & Kvasnicka (2018) examine how refugee immigration affects flat rents. The study exploits exogenous variation in the timing of immigration, provided by the 2015 mass inflow of refugees to Germany, by employing an IV approach and finds strong evidence for a sizeable adverse effect of migration inflows on rental prices. The study also shows that the adverse price effects were attenuated, at least in the heyday of the crisis in late 2015, if a larger share of refugees was housed in decentralised accommodation rather than in centralised facilities. Jaschke et al. (2022) also study refugee migration to Germany and explore the effects of local threat on cultural and economic assimilation of refugees by exploiting plausibly exogenous variation in their allocation across German regions between 2013 and 2016. The researchers find that refugees converge culturally and economically as they spend more time in Germany; the cultural convergence is faster among refugees assigned to areas where locals display higher hostility against minorities. Yet, despite the higher cultural convergence, refugees are not more likely to integrate economically in these regions.

Boddin et al. (2023) study the household portfolio rebalancing channel of transmission of the European Central Bank's quantitative easing and evaluates its impact on housing outcomes in Germany in 2015. The paper finds that the rebalancing of the portfolios more towards second homes is especially pronounced among higher-income households that have a stronger motive to purchase and rent out properties due to tax incentives. Focusing on the apartment segment of the residential market, the authors conclude that regions with a larger number of refugees housed in independent accommodation attract more buy-to-let investors. In these regions, apartment prices saw a greater increase compared to rents, and the number of properties listed for sale decreased more than rental listings, suggesting a potential increase in rental supply in response to quantitative easing.

Stawarz et al. (2021) employ time-series data on annual intercounty migration among German citizens for the period 2004–2017 to examine the association between increasing housing costs (measured as asking rental prices) and changes in internal migration flows. The study concludes that regions with rising housing costs experience a decline in inflows and, in larger cities, rising housing costs are also associated with an increase in outflows.

Our study differs from existing empirical studies that examine the link between migration and housing market outcomes in Germany. This is mainly because we investigate the changes in regional housing prices/rents caused by skilled labour immigration flows, rather refugee flows or internal migration. Furthermore, we explore the heterogeneity of the identified immigration-price relationship along the distribution of housing prices by using IV quantile regressions for the lower quartile, the median, upper quartile, and 95th percentile of the property price/rent distributions.

3. Germany's Immigration Policy and Housing Market Dynamics

Germany is not a classic immigration country.[6] For instance, a notable net migration outflow occurred during the 19th century, especially to the US. However, after WWII, there was a massive inflow of refugees from the former eastern parts of Germany, which were lost to Russia and Poland, to the current Germany. In combination with the war-related destruction of buildings in all major cities, this caused a housing crisis, which was overcome in the 1950s by a massive government- and private-sector-driven building boom. During the 1960s, following the 'economic miracle', Germany suffered from a lack of workers and so-called guest workers, mainly originating from rural areas in Turkey, were recruited for the German labour market. Despite this government-led stimulation of immigration, it remained the general political consensus that Germany is not an immigration country and there was no coordinated government action to help integrate migrants into the German society prior to the end of the 20th century.

The current Immigration Law came into effect in 2005 and led to the establishment of a specialised federal office dealing with migrants, the Federal Office for Migration and Refugees (BAMF).[7] At present, integration policy is based on the principle of rights and obligations. For instance, in terms of rights, immigrants are supposed to receive equal opportunities and access to all aspects of social, economic, and cultural life in Germany. At the same time, they are obliged to learn the (basics of the) German language and must conduct themselves in line with the German constitution (Grundgesetz). Our analysis commences in 2004, so it mainly takes place after the Immigration Law was enacted, a period during which, as passage of this law evidences, it became politically recognised that Germany had, indeed, actually become an immigration country.

During our sample period, the number of foreigners in Germany rose constantly, from 6.5 million (8.5% of the total population) in 2004 to more than 11 million in 2020, an increase of 69%.[8] Figure 1 illustrates the development of immigration for the period 2004–2020 using the share of foreigners in the total German population. It shows that the share of foreigners has started to rise steeply, from around 9% in 2010 to 14% in 2020.

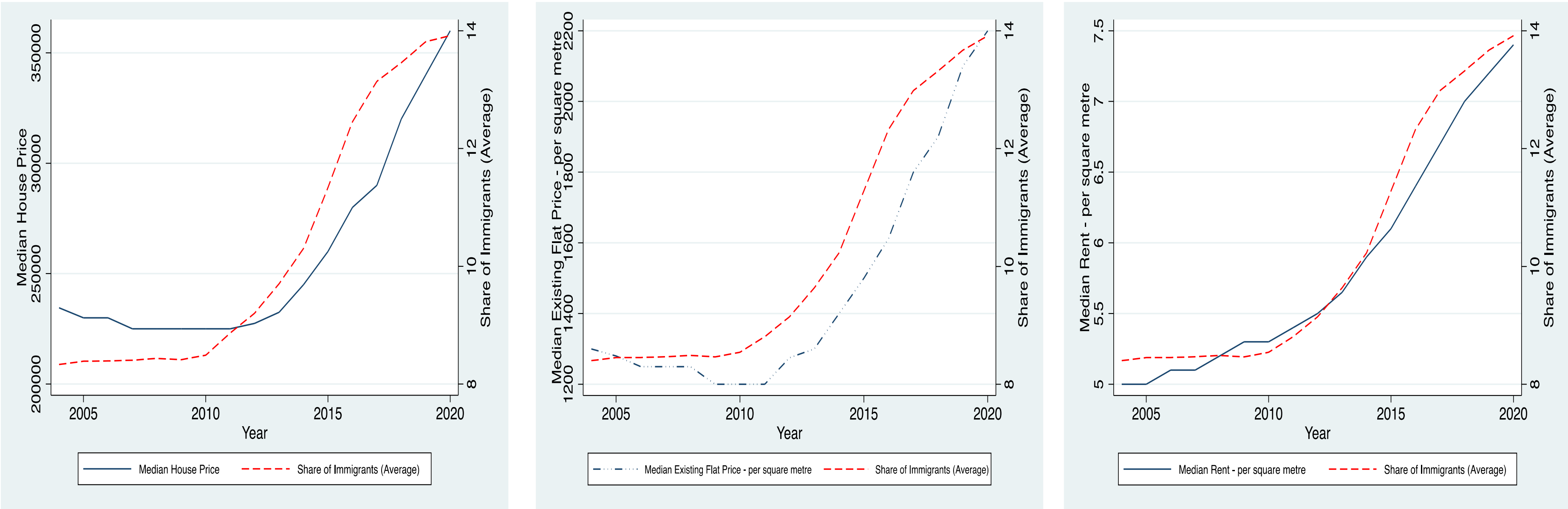
Underlying this aggregate development is substantial geographic variation. Figure 2 (Panel B) illustrates the variation in immigrant concentration across German districts. A particularly high share of immigrants is shown for some parts of Bavaria, Lower Saxony, North Rhine-Westfalia, and Rhineland-Palatinate, as well as for the city-states of Berlin and Bremen. Table A1 of the Appendix provides details on individual districts: the two cities with the highest shares of foreigners are Offenbach (41%) and Frankfurt (30%). Not only do we find substantial regional variation in the share of immigrants in the population, but there is also notable regional

[6] This section draws on https://www.bpb.de/themen/migration-integration/laenderprofile/deutschland/341068/geschichte-der-migration-nach-und-aus-deutschland/; accessed 20 July 2022.
[7] Erol and Unal (2022) provide further discussion of Germany's immigration policy.
[8] Note that these numbers are based on our sample data.

variation in immigration dynamics. For instance, in our sample period, the largest increases (decreases) in the share of foreigners are registered for Schweinfurt in 2016 and Berlin in 2018 (Munich in 2007 and Hamburg in 2005), equivalent to an increase (decrease) of about 10% and 7% (roughly 7% and 6.5%), respectively.

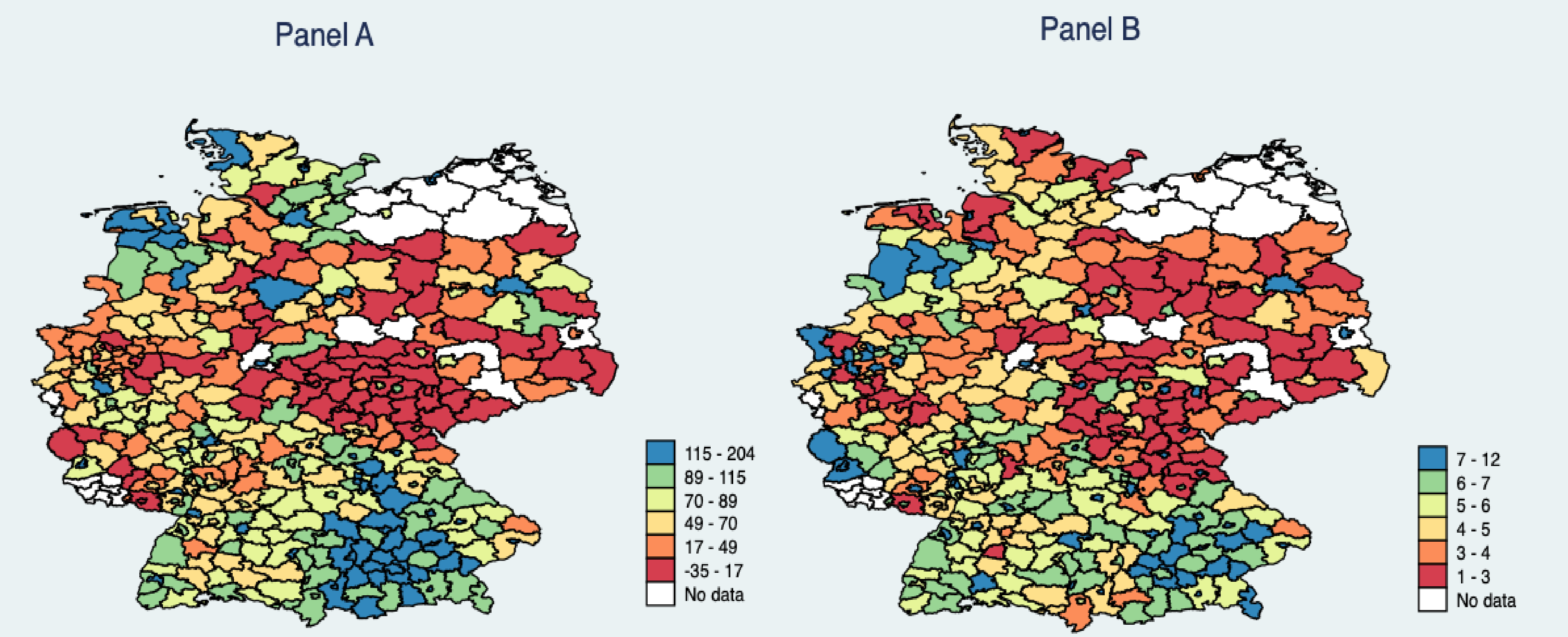
Figure 2 (Panel A) suggests that there are noteworthy differences in house price dynamics across regions, for example, in parts of Bavaria, Lower Saxony, Schleswig-Holstein, and Berlin. Table A2 of the Appendix provides further details at the district level. The largest increase in house prices (flat prices) occurred in Kyffhäuserkreis in 2016 and in Sömmerda in 2015 (Cham in 2017 and Hannover in 2005): house prices increased by more than 28% (26%). The largest reduction, equivalent to a decrease of more than 6.5% (23%), in house prices (flat prices) occurred in Altötting in 2006 and Regen in 2010 (Stendal 2008 and Erfurt 2005). Similarly, rental prices in Landshut in 2009 and in Bamberg in 2012 increased more than 14%, whereas the largest decrease occurred in Emsland in 2005 and in Zollernalbkreis in 2009, where house prices fell by more than 14%.

Figure 1: Immigration and Housing Prices/Rents in Germany, 2004–2020



Note: The figures, from left to right, show the median house sale price, median price per square metre for flats, and median rent per square metre for existing flats versus the average share of immigrants in total population during 2004–2020.

Figure 2: Cumulative Change in Flat Prices (Panel A) vs. Concentration of Immigrants as a Proportion of Total Population (Panel B) by Administrative Districts in Germany Over Time



Note: Panel A illustrates the cumulative change in flat prices per sqm during 2004 and 2020 across administrative districts in Germany. Panel B displays the percentage point change in the concentration of immigrants, calculated as the ratio of immigrants to the total population, during the same period and across administrative districts in Germany.

In fact, development of the foreigner-to-total-population ratio is not solely driven by the numerator. During the last two decades, the total resident population in Germany has increased. However, decomposing this trend shows that this increase is solely due to immigration, as the number of deaths of the native-born population constantly dominates the number of births. From almost 72 million in 2004, the native-born population dropped to less than 69 million in 2020.

Figure 1 illustrates that Germany not only experienced a hike in immigration during the last two decades, but also a notable rise in housing prices and rents. Median market prices for single-family houses increased by 54%, from €234,500 in 2004 to €360,000 in 2020. At the same time, the total rate of price/sqm growth for flats has been 69% and the median price in 2020 was €2,200 per sqm.[9] Similarly, the median rent per sqm increased by 46% during the same period. On average, house prices increased annually by 2.8%, flat prices by 3%, and rents by 2.3% (see Table 1 further down).

4. Methodology

Following the literature, Equation (1) estimates the impact of immigration on house prices/flat prices/rents:[10]

$$\Delta ln\left(HPR_{i,t}\right) = \beta\left(\frac{\Delta Immigrants_{i,t-1}}{Population_{i,t-2}}\right) + \alpha X_i + \delta W_{i,t-1} + \rho\Delta Z_{i,t-2} + \emptyset_i + \Lambda_t + \varepsilon_{i,t} \qquad (1)$$

where $\Delta\ln(HPR_{i,t})$ is the change in the natural logarithm of the median house price/flat price/rental price in each district i between years $t-1$ and t. The independent variable of interest $\left(\frac{\Delta Immigrants_{i,t-1}}{Population_{i,t-2}}\right)$ is the annual change in the stock of immigrants[11] in district i during a particular year divided by the district's initial population. β has an intuitive interpretation here as the percentage change in the dependent variable corresponding to an annual increase in the stock of immigrants equal to 1% of the district's local population. As highlighted by Sanchis-Guarner (2018), standardizing immigration flows by initial population stock is a way of dealing with the fact that regions of different sizes have different population and house price dynamics (Card, 2001; Peri & Sparber, 2011; Wozniak & Murray, 2012), and it further eliminates any unobservable factors that might affect both the numerator (immigration) and the denominator (original local population). Given the nature of housing markets, the main specification uses the immigration inflow lagged one period with respect to changes in house prices.

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[9] In our dataset, we have two types of housing: single-family house and flat. Total number of flats increased slightly from 38.6 million in 2004 to 41.4 million in 2020, an increase of 7.2%. The share of houses, on the other hand, increased 31% in 2020 from 28% in 2014 (see Figure A1 of the Appendix).

[10] This model is the standard specification in the literature; see, for instance, Degen and Fischer (2017), Erol and Unal (2023a), Erol and Unal (2023b), Gonzalez and Ortega (2013), Moallemi and Melser (2020), Sá (2015), Saiz (2007), and Sanchis-Guarner (2018).

[11] The definition of immigrants in this study is based on country of birth. Asylum-seekers are also counted as immigrants, but we did not examine them separately because the district-level data for asylum-seekers start only in 2008. Moreover, their average share is only 10% among immigrants and around 1% in the entire population of the country during the period under consideration.

In Equation (1), X_i stands for the log of local land area—the time-invariant district attribute. $W_{i,t-1}$ stands for one-year lagged socioeconomic neighbourhood characteristics: the local unemployment rate and working-age population ratio of the district. We include the variables in lags, as this allows for adjustment lags and tends to mitigate their endogeneity with respect to immigration (Sá, 2015; Saiz, 2007; Saiz & Wachter, 2011). $\Delta Z_{i,t-2}$ stands for the change in the log of GDP per person in each district between years $t-3$ and $t-2$—time-varying area characteristics that are an essential determinant of housing prices/rents. Here, we use a lag of the relevant variable with respect to the immigration flow variable, so that the essential determinants of housing prices/rents capture changes during $t-2$, which corresponds to one period before the inflows $t-1$ and two periods before the change in housing prices t (Saiz, 2007; Sanchis-Guarner, 2018). Finally, Λ_t are year dummies that capture national trends in inflation and other economic variables, and $\emptyset_i$ is the state-level area fixed effects to mitigate any existing unobserved factors at the state level that might be correlated with changes in house prices and changes in migrant stocks.

Estimating the causal effect of immigration on housing prices is difficult when there is no well-defined exogenous shock. There is the possibility that house prices and immigration are spatially correlated as a result of common fixed influences. To overcome this problem, we follow Coleman and Landon-Lane (2007), Sá (2015), Saiz (2007), and Saiz and Wachter (2011) and employ the dependent variable in first differences. This variable transformation removes area-specific, time-invariant factors that impact immigration flows and house/flat/rental prices. In addition, differencing helps create stationary data and avoids estimation results that suffer from spurious correlations. Because the model is specified in first differences, time-invariant factors that are unique to each local authority and that potentially affect the level of housing prices drop out. [12] To capture possible differences in the dynamics of state-level housing regulations, we introduce state fixed effects. Furthermore, time fixed effects are also included to control for underlying observable and unobservable aggregate-level differences between periods (Sá, 2015; Sanchis-Guarner, 2018). As a consequence of including these fixed effects in combination with specifying the model in first differences, our variable of interest has very little identifying variation left, allowing any sampling error in this variable to have a disproportionately large influence. As a result, even minor sampling errors are amplified when estimating the equation using OLS, causing an underestimation of the true influence of migration on housing prices. In the literature, this potential issue with OLS estimation is called 'attenuation bias' (Aydemir & Borjas, 2011).

The second difficulty concerns the length of time it may take for migration to affect house prices. Following Saiz (2007), we estimate the change in house price from t–1 to t as a function of one-year lagged migration inflow at t–1 divided by total resident population at t–2. By using lags of the other control variables, we accommodate all sorts of frictions that prevent house prices from instantaneously adjusting to changes in fundamentals.

The third problem that can occur when estimating the effect of immigration on housing prices is potential endogeneity, which may arise due to the simultaneity between migration flows and house price changes. Because migrants are not randomly distributed across geographical areas,

[12] Therefore, district level fixed effects are not included (Saiz, 2007).

the direction of causality is unclear, that is, there might be a self-selection problem. The direction of the bias is *a priori* unknown as immigrants may move to regions where housing is more affordable (downward bias) or to more prosperous areas, for example, in search of better employment opportunities, with the concomitant higher property/rental prices (Sá, 2015).

To address potential endogeneity as well as measurement error issues in the main explanatory variable of interest, we create an instrument for estimating the distribution of the recent immigrant population that is based on the historical settlement patterns of immigrants according to their country of origin. Bartel (1989) proposed this instrument and claims that immigrants in the US are more likely to live in areas where there is already a strong immigrant community. Thus, the instrument exploits the fact that immigrants tend to locate in areas where there are already immigrants from their home country (ethnic network instrument). Put differently, our instrument is based on the assumption that an immigrant network is important in an immigrant's decision about where to locate as such a network can facilitate job search and integration into a new cultural environment (Saiz, 2007).

Equations (2a) and (2b) show the construction of the instrument in detail. Our goal is to estimate the predicted level of immigration into a specific district i during a particular time period t. We initially determine the quantity of immigrants relocating from country c to district i during the baseline period t^0. The resulting number is divided by the aggregate number of immigrants arriving in Germany from the same country within the same period (Equation 2b). This calculation yields the share of immigrants from country c in year t^0 who opted to reside in a particular district i. This share is then multiplied by the overall number of immigrants from country c entering Germany in the year following the one we want to study ($imm_{c,GER,t}$; Equation 2a). We now have obtained the predicted number of immigrants from country c to district i, in time t. This prediction signifies the number of immigrants who would have chosen to settle in district i if the distribution pattern across various districts for country c had remained identical in the later time period t compared to the earlier one t^0. The final step of this methodology involves aggregating the values for all countries, which results in the prediction of the total number of migrants moving to a specific district within a defined time period ($\widehat{imm_{i,t}}$).

$$\widehat{imm_{i,t}} = \sum_c \widehat{imm}_{c,i,t} = \sum_c \phi_{c,i,t^0} * imm_{c,GER,t} \quad (2a)$$

where

$$\phi_{c,i,t^0} = \frac{imm_{c,i,t^0}}{imm_{c,GER,t^0}} \quad (2b)$$

For the instrument to be valid, it must be correlated with the share of immigrants in the resident population, but *un*correlated with the local shocks that affect house price changes, subject to the controls, as well as to fixed state and time effects.

Note that the unobserved factors determining the location of immigrants in a district relative to another district in the base years must be uncorrelated with the immigrants' respective economic prospects during the analysis period (Sanchis-Guarner, 2018). In our case, the main base year used for 'past' location patterns is available from 1998, which goes back reasonably far for an analysis period starting in 2004. Furthermore, we make the standard assumption in the literature (e.g., Sá, 2015), namely, that the annual changes in the national stock of immigrants are exogenous to the economic conditions of immigrant districts.

5. Data Analysis

5.1 Data Description and Empirical Findings

We use data from two main sources: the Regional Real Estate Information System (RIWIS)[13] and the Federal Statistical Agency of Germany (Destatis). The transaction price of a given house is measured as an absolute value in euro; flat prices, rents, and site for residential use are all measured in average price (euro) per sqm and obtained from RIWIS; number of immigrants, population, district area, unemployment rate, working-age population ratio, and GDP data at the district level are obtained from Destatis. House/flat price and rent are constructed using both unit-specific valuation and transaction data from building and loan associations, research institutions, realtor associations, as well as the chambers of industry and commerce (see Boddin et al., 2023). By combining these two sources, the dataset employed for the regression analysis covers the period from 2004 to 2020 and includes 382 German administrative districts.[14] Although it is common in the literature to rely on discrete Census data, typically available only at a 5- or 10-year frequency, our dataset allows us to measure housing market dynamics and the spatial concentration of immigrants annually. Table 1 presents descriptive statistics for the variables.

Table 1: Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
$\Delta \log house\ prices_t$	6,112	0.028	0.050	-0.223	0.297
$\Delta \log flat\ prices_t$	6,112	0.030	0.061	-0.247	0.268
$\Delta \log flat\ rents_t$	6,112	0.023	0.028	-0.163	0.148
$\Delta(Immigrants_{t-1}/Population_{t-2})$	6,112	0.003	0.006	-0.073	0.098
$Unemployment\ rate_{t-1}$	6,069	6.986	3.712	1.200	25.40
$Log\ area$	382	13.223	1.080	10.483	14.939
$Working-age\ population\ ratio_{t-1}$	6,099	65.600	2.193	56.213	75.895
$\Delta\ log\ GDP_{t-2}$	5,951	0.025	0.039	-0.353	0.440

[13] RIWIS is a commercial property price analyst, collecting and analysing data on regional property markets for over 30 years to create indices for various residential and commercial market sectors throughout Germany. The data provided by RIWIS are a widely accepted source of information and are used by a number of reputable institutions, including the Bundesbank (Kholodilin et al., 2018).

[14] The independent variable of interest and working age population ratio were not available for the following 19 districts: Harz, Landkreis Kassel, Landkreis Rostock, Merzig-Wadern, Ludwigslust-Parchim, Mecklenburgische Seenplatte, Mittelsachsen, Neunkirchen, Nordsachsen, Nordwestmecklenburg, Saar-Pfalz-Kreis, Saarbrücken (Regionalverband), Salzlandkreis, Saarlouis, Sankt Wendel, Spree-Neiße, Stadtregion Aachen, Vorpommern-Greifswald, and Vorpommern-Rügen. These districts accounted for roughly 5% of the total population in 2020.

5.2. Results of Regression Analysis

5.2.1 Considering OLS Estimation

Table 2 presents the results of the OLS specification in Equation (1) using data for 382 German administrative districts. The dependent variable is the change in the natural logarithm of the median sales price for houses/flats or median rents for flats, and the main variable of interest is immigration inflow relative to the total resident population in the previous year. In all specifications, the standard errors are clustered at the district level.

Models 1, 3, and 6 in Table 2 (for the three dependent variables: house price, flat price, and flat rent, respectively) display the estimation results when we include only our main independent variable of interest—an increase in immigration inflow equal to 1% of a district's initial population—along with state-level fixed effects and year dummies. In Models 2, 4, and 7, we include additional local controls: the district's total land area, unemployment rate, working-age population ratio, GDP per person, state fixed effects, and time effects. Finally, the lagged values of flat rents (in Model 5) and lagged values of flat prices (in Model 8) are included in the empirical specification.

We find that immigration is a significant explanatory variable for changes in housing prices/rents, with estimated coefficients ranging from 0.32 (Model 2) to 0.65 (Model 5) to 0.59 (Model 8) for the house price, flat price, and flat rent models, respectively. Note that these coefficients cannot be interpreted as the causal impact of international migration on property prices/rents, as the location selection decisions of migrants are not random.

Table 2: Effect of Immigration on House/Flat Prices and Flat Rents—OLS Estimation Results

	House Price		Flat Price			Flat Rent		
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Δ Immigrant stock at *t*–1/Population at *t*–2	0.460*** (0.124)	0.316** (0.129)	0.847*** (0.145)	0.642*** (0.137)	0.654*** (0.166)	0.535*** (0.081)	0.555*** (0.080)	0.589*** (0.094)
Unemployment rate at *t*–1		-0.001*** (0.000)		-0.002*** (0.000)	-0.002*** (0.000)		-0.001*** (0.000)	-0.001*** (0.000)
Log of area		-0.003*** (0.000)		-0.007*** (0.001)	-0.007*** (0.001)		-0.003*** (0.000)	-0.003*** (0.000)
Working-age population ratio at *t*–1		0.000*** (0.000)		0.002*** (0.000)	0.002*** (0.000)		0.001*** (0.000)	0.001*** (0.000)
Δ Ln GDP Per person at *t*–2		-0.018 (0.016)		0.021 (0.019)	0.028 (0.019)		-0.006 (0.009)	-0.000 (0.009)
Δ Log rent at *t*–1					0.142*** (0.030)			
Δ Log flat price at *t*–1								0.050*** (0.007)
Observations	6,112	5,926	6,112	5,926	5,580	6,112	5,926	5,580
R-squared	0.546	0.560	0.534	0.551	0.565	0.575	0.584	0.606
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors in parentheses are clustered at the district level; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; Δ indicates first differences. Across all specifications, our dependent variable is the log of the median house prices/existing flat prices/existing flat rents in each district i between years $t-1$ and t. The variable of interest is change in the annual stock of immigrants in year $t-1$ divided by the initial population in year $t-2$ in a local district. Log of area stand for initial local area attributes involved. Unemployment rate and working-age population ratio stand for one-year lagged socioeconomic neighbourhood characteristics of the district, respectively. Ln GDP per person stands as time-varying area characteristics that are likely to affect the housing demand in each district between years $t-3$ and $t-2$. Model [1], [3] and [6] display the results obtained when we only include the main independent variable. Model [2], [4] and [7] include the set of controls. Model [5] and [8] considers the possible interdependence between flat prices and flat rents by including one-year lagged values of change in flat rents and change in flat prices, respectively.

5.2.2 Considering the Model Based on Instrumental Variable (IV) Estimation

The results of the two-stage least squares (2SLS) regression analysis of Equation (1) are presented in Table 3. The findings show that international migration is a significant explanatory variable for changes in house and flat prices, with estimated coefficients ranging from 1.63 (Model 1) to 2.69 (Model 3), whereas immigration has no significant effect on the growth rate of flat rents (Model 6). As presented in Model 2 for house prices, the estimated coefficient for the immigration variable is 1.13 and statistically insignificant. The estimated values for flat prices and flat rents are statistically significant and equal to 2.39 (Model 4) and 0.86 (Model 7), respectively. The results suggest that an increase in immigration inflow equal to 1% of a district's initial population causes a hike in flat prices of almost 2.4%, as well as a hike in flat rents of 0.9%.

Across the various specifications presented in Table 3, each district's total land area, unemployment rate, and working-age population ratio correlate robustly with housing price and rent growth. In contrast, the evidence for the GDP change per person is insignificant. Note that neither the exclusion of controls nor the inclusion of these variables alters the main results.

While the general patterns of the responses are similar across different specifications, our results show that IV estimates are higher than those obtained by the corresponding OLS estimations reported in Table 2. This suggests that conditional on the local controls and the state-level and year-fixed effects, (i) immigrants tend to move towards districts where housing prices and rents grow more slowly, or which are characterised by more affordable property stock and/or (ii) there is substantial measurement error in the immigration variable. We argue that the estimations with instruments better capture the relevant behaviour, as, in all cases, our instrument can be considered strong.

Table 3: Effect of Immigration on Housing Prices and Rents—IV Model Estimation Results

	House Price		**Flat Price**			**Flat Rent**		
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Δ Immigrant stock at *t*–1/Population at *t*–2	1.625**	1.130	2.689***	2.388***	3.164**	0.515	0.863**	1.180*
	(0.685)	(0.944)	(0.648)	(0.840)	(1.451)	(0.327)	(0.421)	(0.684)
Unemployment rate at *t*–1		-0.001***		-0.002***	-0.002***		-0.001***	-0.001***
		(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Log of area		-0.002***		-0.006***	-0.005***		-0.003***	-0.002***
		(0.001)		(0.001)	(0.001)		(0.000)	(0.001)
Working-age population ratio at *t*–1		0.000***		0.002***	0.002***		0.001***	0.001***
		(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Δ Ln GDP per person at *t*–2		-0.017		0.023	0.027		-0.006	-0.000
		(0.016)		(0.019)	(0.020)		(0.009)	(0.010)
Δ Log rent at *t*–1					0.120***			
					(0.032)			
Δ Log flat price at *t*–1								0.047***
								(0.00)
Observations	6,109	5,923	6,109	5,923	5,580	6,109	5,923	5,580
R-squared	0.540	0.557	0.522	0.541	0.548	0.575	0.583	0.603
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LM test statistic for under-identification	41.72	31.70	41.72	31.70	19.20	41.72	35.25	24.97
p-value of under-identification LM statistic	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Kleibergen-Paap F-statistic	16+	13.97+	16+	13.97+	12.32+	16+	15.83+	14.61+

Note: Standard errors in parentheses are clustered at the district level; ***p < 0.01, **p < 0.05, *p < 0.1; Δ indicates first differences; + stands for a value larger than the critical value recommended by Stock and Yogo (2005). In all specifications, our dependent variable is the natural logarithm of the median house prices/existing flat prices/existing flat rents in each district i between years $t-1$ and t. The variable of interest is the change in the annual stock of immigrants in year $t-1$, divided by the initial population in year $t-2$ in a local district. 'Log of area' represents initial local area attributes. 'Unemployment rate' and 'Working-age population ratio' are one-year lagged socioeconomic neighbourhood characteristics of the district. 'Ln GDP' per person represents time-varying area characteristics that are likely to affect the housing demand in each district between years $t-3$ and $t-2$. Models [1], [3], and [6] show results when including only the main independent variable. Models [2], [4], and [7] incorporate additional local controls. Models [5] and [8] consider the possible interdependence between flat prices and flat rents by including one-year lagged values of change in flat rents and change in flat prices, respectively.

5.2.3 Considering the Possible Interdependence Between Flat Prices and Flat Rents

To understand the interaction between flat prices and flat rents, we include lagged values of flat rents in the regression on flat prices and, vice versa, we add one-year lagged values of change in flat rents and change in flat prices to Models 5 and 8 of Table 3, respectively. The estimation results show that after controlling for previous year's rent growth (Δ log rent at *t*–1), an increase in immigration inflow equal to 1% of a district's initial population leads to an annual increase of 3.2% in flat prices (Model 5). Moreover, an increase in immigration inflow equal to 1% of a district's initial population leads to an annual increase of 1.2% in flat rents after controlling for previous year's price growth (Δ log flat price at *t*–1).

To some extent, this finding is consistent (although not fully comparable due to different variables of interest)[15] with the work of Saiz (2007), who found that an annual inflow of immigrants equal to 1% of the city's original population resulted in a 2.9% (US-level instrument) to 3.4% (origin country instrument) annual increase in house prices. The annual change in the log of rents was about 1% using either the US-level or the origin country instrument. Hence, in line with Saiz (2007), our estimates for flat prices are larger and less precise than for flat rents.

5.2.4 Considering Native Out-Flight and Immigrant Crowding

Our results provide evidence that international migration has a significantly positive effect on flat prices and rents over the sample period. It is interesting to ask whether this increase in housing prices takes place in a situation of notable native-out flight, the reason being that a large resident population outflow would offset the hike in demand due to the migration inflow. When there is displacement, cross-region regressions would underestimate the effect of immigrants on local house prices. Following Peri and Sparber (2011), Sá (2015), and Sanchis-Guarner (2018), we estimate the effect of immigration inflows on native location decisions using Equation (4).

$$\frac{\Delta Natives_{it-1}}{Pop_{it-2}} = \alpha + \pi \frac{\Delta Immigrants_{it-1}}{Pop_{it-2}} + \emptyset_i + \Lambda_t + \varepsilon_{it}, \tag{4}$$

where the variables on the right-hand side denote the same elements as in Equation (1). The sign and size of π capture the relationship between immigration inflows and native location. If natives move out of (into) the regions where the immigrants locate, we should find $\pi < 0$ ($\pi > 0$).[16] If there is no relationship between immigration and native location, we can be quite confident that, conditional on housing supply, coefficient β in Equation (1) captures only the effect of (increased demand from) immigration on prices or rents.

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[15] Saiz (2007) employs MSA-level data, where the annual change in the logarithm of rents/prices is the dependent variable. Rather than using the annual change in the stock of immigrants divided by the district's initial population, the author uses the lagged value of the number of new immigrants divided by population in the previous year as the main independent variable of interest.

[16] The native# displacement would be complete if $\pi = -1$, or less than proportional if $-1 < \pi < 0$.

Table A3 presents the results based on OLS and 2SLS regressions for the test of native displacement and shows that the estimated coefficient π is positive, which is similar to what Wozniak and Murray (2012) found. However, the coefficient is insignificant in the case of OLS estimation and only significant at the 10% level in the case of IV estimation. Hence, unlike previous research, for example, Sa (2015) and Saiz and Wachter (2011), we find no evidence of a negative reaction of the native population to immigration and only weak evidence of the opposite effect.

In a further step, we examine the existence of immigrant crowding in Germany, which describes a situation in which more immigrants than natives crowd into the same space. We analyse this issue by regressing the regional average square metre per person on the share of immigrants. Table A4 in the Appendix displays a negative sign for the immigration indicator, indicating that migrants tend to crowd together. If the change in the share of immigrants in the population increases by one percentage point, then the change in the space per person increases by half a square metre. This should potentially ease pressure on housing prices by mitigating housing scarcity. However, despite this crowding effect, we observe the price effects described above, indicating that the changes in the housing market caused by immigration are such that crowding alone is not sufficient to absorb the influx of migrants.

Consequently, in line with Saiz (2003) and Braakmann (2019), we find a significant degree of crowding by immigrants. This suggests that estimates of the impact of immigration on house prices would be even higher if migrants did not occupy less space than natives.

5.2.5 Considering Nonlinear Effects of Immigration on House/Flat Prices and Flat Rents

As an extension, we go beyond the conditional mean regression using IV quantile regressions, which allows us to explore the possibility that our main explanatory variable of interest has heterogeneous effects of on our dependent variable. While still controlling for potential endogeneity of immigration with respect to house prices, the effects of our instrumented immigration variable may vary over its quartiles. Hence, we investigate the effect of immigration on the lower and higher ends of the house/flat price and flat rent distributions, albeit without being able to disaggregate the wealth levels of immigrants. Table 4 displays the estimation results of IV quantile regressions for the lower quartile, the median, upper quartile, and 95th percentile of property price/rent distribution in each district and year. Immigration has insignificant effects on house prices in each quartile, whereas there is a significant positive migration effect on flat prices below and up to the median price (or 25th and 50th percentiles). There is also some limited evidence for a rental price increase at the 25th percentile. Thus, it can be argued that while lower quartile flat price increases by 5.3%, the median price increases by 2.7% following an increase in international migration equal to 1% of the initial total population. Similarly, immigration inflows have a significant positive effect on the lower quartile flat rents, with an annual increase of 1.1% in flat rents.

These findings are somewhat consistent (although not fully comparable due to different variables of interest and different outcomes) with Saiz (2003) and Braakman (2019), who also found stronger effects for housing at the lower end of the price and/or rent distribution. Thus, our estimation results of IV quantile regressions suggest that immigrants' demand for flats (rather than houses) at the lower end of the market is larger than or not affected by any negative response from native residents.

Pavlov and Somerville (2020) study more affluent and higher-socioeconomic-status immigrants, whose demand for housing at the extensive margin is larger than a possible negative response from native residents. Our dataset contains no information on immigrants' socioeconomic status. However, evidence from household surveys indicates (see, e.g., Büchel & Frick, 2001) that the average market and nonmarket incomes of foreigners are substantially lower than those of the autochthonous German population. Therefore, we may assume that, on average, the presence of immigrants affects the lower end of flat prices and rents.

Table 4: IV Quantile Regressions

	House Price				Flat Price				Flat Rent			
Variables	25th Percentile	50th Percentile	75th Percentile	95th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
Δ Immigrant stock at *t*–1/Population at *t*–2	0.857	0.446	0.179	1.521	5.326***	2.721***	0.504	-0.379	1.094**	0.420	-0.878	-0.388
	(1.119)	(0.943)	(0.951)	(16.944)	(1.377)	(1.256)	(1.077)	(15.558)	(0.506)	(0.656)	(0.657)	(13.989)
Unemployment rate at *t*–1	-0.002***	-0.001	-0.000	0.002	-0.003***	-0.002***	-0.001	0.001	-0.001***	-0.000	0.001	0.001
	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.000)	(0.000)	(0.001)	(0.002)
Log of area	-0.004***	-0.001	-0.000	0.004	-0.003***	-0.004***	-0.004***	-0.001	-0.001*	-0.001	-0.002***	-0.005
	(0.001)	(0.001)	(0.001)	(0.025)	(0.001)	(0.002)	(0.001)	(0.017)	(0.001)	(0.001)	(0.001)	(0.021)
Working-age population ratio at *t*–1	0.001**	0.001**	0.001**	0.002	0.002***	0.003***	0.002***	0.003	0.000	0.001***	0.001***	0.002
	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.002)
Δ Ln GDP per person at *t*–2	-0.025	-0.009	-0.015	-0.038	0.012	0.033	0.058***	0.090	0.008	-0.002	-0.006	0.010
	(0.028)	(0.017)	(0.019)	(0.038)	(0.034)	(0.022)	(0.021)	(0.088)	(0.013)	(0.011)	(0.012)	(0.035)
Observations	5,923	5,923	5,923	5,923	5,923	5,923	5,923	5,923	5,923	5,923	5,923	5,923
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap F-statistic	25.8^{+}	68.7^{+}	89.7^{+}	31.7^{+}	25.8^{+}	68.7^{+}	89.7^{+}	31.7^{+}	25.8^{+}	68.7^{+}	89.7^{+}	31.7^{+}

Note: Standard errors in parentheses are bootstrapped with 200 replications; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; Δ indicates first differences; $^{+}$ stands for a value larger than the critical value recommended by Stock and Yogo (2005).

In all specifications, our dependent variable is the natural logarithm of the median house prices/existing flat prices/existing flat rents in each district i between years $t-1$ and t. The variable of interest is the change in the annual stock of immigrants in year $t-1$, divided by the initial population in year $t-2$ in a local district. 'Log of area' represents initial local area attributes. 'Unemployment rate' and 'Working-age population ratio' are one-year lagged socioeconomic neighbourhood characteristics of the district. 'Ln GDP' per person represents time-varying area characteristics that are likely to affect the housing demand in each district between years $t-3$ and $t-2$.

5.2.6 Considering Land Price Corrections for Flat Prices

Urban economics theory suggests that housing elasticity is mainly dependent on local factors, rather than on the availability of undeveloped land and regulatory restrictions at the country level (Capozza & Helsley, 1989; Green et al., 2005). Following these theoretical considerations, empirical findings indicate that housing supply elasticities can vary significantly across regions (Caldera & Johansson, 2013; Goodman & Thibodeau, 2008; Saiz, 2010). However, our analysis focuses on the short term, as the unavailability of relevant data at the district level, such as housing stock, construction material and labour cost, and credit availability, means that we are unable to estimate local housing elasticities.

But we can find out whether our results remain robust when considering at least some aspects associated with housing supply. The German Association of Builders claims that land in Germany is scarce and expensive.[17] On average, the price of land increased more than 60% over the period 2009 to 2020. There are large variations between small districts and large cities, of course, as land prices rose by 40% in the former and by 255% in the latter. This difference is an obvious result of the fact that land in big cities is usually both scarce and in high demand. Since land supply (or land cost) is crucial for the size of the housing supply elasticity, we may indirectly control for local supply elasticities by eliminating land costs. Thus, we adjust flat prices by accepting that the average flat price in a district is the sum of construction costs and land values. Subtracting land prices from (total) flat prices, allows examining how varying construction costs, especially construction labour costs, are affected by immigration flows:[18]

$$\Delta ln\left(Calibrated\ Flat\ Price_{i,t}\right) = \Delta ln\left(HPR_{i,t}\right) - \sigma_i * \Delta\ln(land\ prices)_{i,t}, \quad (3)$$

where σ_i is the city-specific parameter defined as land cost share in flat prices in 2004, the year our sample starts. Combined with the detailed information about land price growth in each district, the district-specific intercept $\sigma_i * \Delta\ln(land\ prices)_{i,t}$ can be identified and integrated into the model. We then calculate the calibrated (corrected) flat price by using Equation (3) and then plugging this variable as the dependent variable into our 2SLS model based on Equations (1) and (2).

Table 5 provides estimation results for flat prices when applying this type of land price correction. For main IV Models 1, 2, and 3, an increase in immigration inflow equal to 1% of a district's initial population leads to an annual increase of 2.1% (Model 1) to 3.4% (Model 3) in construction costs or calibrated flat prices. With increases of 3.9% and 2.4%, respectively, the positive effect of immigration is particularly strong for the 25th and 50th percentiles of the construction cost distribution. In contrast, immigration inflow has no effect on the 75th and 95th percentiles of the calibrated flat price distribution. Thus, the analysis that takes a few housing-

[17] https://www.bauindustrie.de/zahlen-fakten/auf-den-punkt-gebracht/bauland-knapp-und-teuer; accessed: 20 July 2022).

[18] Note that the relevant analysis will be carried out only for flat prices due to the unavailability of land prices for houses and rental property.

supply-relevant considerations into account suggests that our results may hold for longer periods of time, too.

5.2.7 Considering Possible Differences Across Urban and Rural Districts

We next turn to investigating whether immigration flows have different effects in urban compared to rural districts. Our analysis is based on data provided by the German Federal Office for Building and Regional Planning (BBSR), which classifies 401 districts (Kreise) according to their settlement structure (siedlungsstrukturelle Kreistypen, KTYP4).[19] At the district level, BBSR provides a view of settlement structures across Germany that is more detailed than the typical binary rural/urban distinction. The four main types of settlement structure are: (1) large city (67 observations, kreisfreie Großstadt), (2) urban district (131 observations, städtischer Kreis), (3) mixed urban/rural district (100 observations, ländlicher Kreis mit Verdichtungsansätzen), and (4) rural district (103 observations, dünn besiedelter ländlicher Kreis).

Table 6 displays the IV estimation results for the effect of immigration on flat prices and rents across urban and rural districts in Germany. Model 2 shows that flat prices grow significantly slower in rural than in urban districts, and that an increase in immigration inflow equal to 1% of a district's initial population leads to an annual increase in flat prices of 2%. However, there are no differences in the interactions with the immigration variable, which implies that the impact of immigration on flat prices and rents is not significantly different between rural and urban districts.

[19] See https://www.bbsr.bund.de/BBSR/DE/forschung/raumbeobachtung/downloads/download-referenzen.html; accessed: 20 July 2022.

Table 5: Land Price Correction for Main Models and IV Quantile Models

	Flat Price Main Models			**Flat Price Quantile Models**			
Variables	Model 1	Model 2	Model 3	25th Percentile	50th Percentile	75th Percentile	95th Percentile
Δ Immigrant stock at *t*–1/Population at *t*–2	2.106***	2.420***	3.395***	3.941***	2.426**	0.413	-1.229
	(0.632)	(0.837)	(1.373)	(1.314)	(1.192)	(0.847)	(11.049)
Unemployment rate at *t*–1		-0.001***	-0.001***	-0.002***	-0.001	-0.000	0.002
		(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
Working-age population ratio at *t*–1		0.000***	0.000***	0.002***	0.002***	0.002***	0.001
		(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.002)
Δ Ln GDP per person at *t*–2		0.021	0.023	0.019	0.035	0.057***	0.109**
		(0.019)	(0.020)	(0.033)	(0.022)	(0.021)	(0.044)
Δ Log rent at *t*–1			0.121***				
			(0.033)				
Observations	6,109	5,923	5,580	5,923	5,923	5,923	5,923
R-squared	0.494	0.497	0.501				
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LM test statistic for under-identification	41.72	35.95	25.92				
p-value of under-identification LM statistic	0.000	0.000	0.000				
Kleibergen-Paap F-statistic	16+	13.94+	12.30+	41.7+	62.4+	52.7+	23.5+

Note: Standard errors in parentheses are clustered at the district level for flat price main models; and are bootstrapped for the flat price quantile models; ***p < 0.01, **p < 0.05, *p < 0.1; Δ indicates first differences; + stands for a value larger than the critical value recommended by Stock and Yogo (2005). In all specifications, our dependent variable is the natural logarithm of the median house prices/existing flat prices/existing flat rents in each district i between years $t-1$ and t. The variable of interest is the change in the annual stock of immigrants in year $t-1$, divided by the initial population in year $t-2$ in a local district. 'Log of area' represents initial local area attributes. 'Unemployment rate' and 'Working-age population ratio' are one-year lagged socioeconomic neighbourhood characteristics of the district. 'Ln GDP' per person represents time-varying area characteristics that are likely to affect the housing demand in each district between years $t-3$ and $t-2$. Model [1] shows results when including only the main independent variable. Model [2] incorporates additional local controls. Model [3] considers the possible interdependence between flat prices and flat rents by including one-year lagged values of change in flat rents and change in flat prices, respectively.

Table 6: Effect of Immigration on Flat Prices and Rents Across Urban and Rural Districts—IV Model Estimation Results

Variables	**Flat Price**		**Flat Rent**	
	Model 1	Model 2	Model 3	Model 4
Δ Immigrant stock at *t*–1/Population at *t*–2	7.917	1.959***	0.165	0.357
	(5.572)	(0.772)	(2.230)	(0.419)
Unemployment rate at *t*–1	-0.001***	-0.002***	-0.000	-0.000**
	(0.001)	(0.000)	(0.000)	(0.000)
Log of area	-0.002	-0.005***	-0.002**	-0.002***
	(0.132)	(0.001)	(0.001)	(0.000)
Working-age population ratio at *t*–1	0.001	0.001***	0.001***	0.001***
	(0.028)	(0.000)	(0.000)	(0.000)
Δ Ln GDP per person at *t*–2	0.024	0.026	-0.004	-0.004
	(0.020)	(0.018)	(0.009)	(0.009)
Urban district dummy	0.028*		0.000	
	(0.014)		(0.006)	
Urban district x [Δ Immigrant stock at *t*–1/Population at *t*–2]	-5.407		0.167	
	(4.211)		(1.653)	
Rural district dummy		-0.007***		-0.001
		(0.002)		(0.001)
Rural district x [Δ Immigrant stock at *t*–1/Population at *t*–2]		-0.658		0.167
		(0.504)		(0.270)
Observations	5,923	5,923	5,923	5,923
R-squared	0.467	0.549	0.591	0.592
Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Kleibergen-Paap F-statistic	4.849	12.38+	4.849	12.38+
LM test statistic for under-identification	3.991	37.46	3.991	37.46
p-value of under-identification LM statistic	0.045	0.000	0.045	0.000

Note: Standard errors in parentheses are clustered at the district level; ***p < 0.01, **p < 0.05, *p < 0.1; Δ indicates first differences; + stands for a value larger than the critical value recommended by Stock and Yogo (2005). In all specifications, our dependent variable is the natural logarithm of the median house prices/existing flat prices/existing flat rents in each district i between years $t-1$ and t. The variable of interest is the change in the annual stock of immigrants in year $t-1$, divided by the initial population in year $t-2$ in a local district. 'Log of area' represents initial local area attributes. 'Unemployment rate' and 'Working-age population ratio' are one-year lagged socioeconomic neighbourhood characteristics of the district. 'Ln GDP' per person represents time-varying area characteristics that are likely to affect the housing demand in each district between years $t-3$ and $t-2$. The rural (urban) district dummy takes the value 0 (1) if the district is classified as rural (urban). 'Rural(urban) district x [Δ Immigrant stock at t–1/Population at t–2]' is an interaction dummy variable.

5.2.8 Considering Other Specification Changes

In this subsection, we report a number of additional robustness checks. For brevity reasons, we do not report the underlying regressions here, but all omitted results are available on request.

First, we have interchangeably included changes in GDP per employee and average wage as alternative specifications of time-varying area characteristics; the results are similar to those in Table 3.

Second, when we include state-year fixed effects in our models, which adds 208 additional regressors, we find that the sign of the immigration variable remains unchanged in all models. However, due to the increase in standard errors resulting from the decrease in estimation efficiency, the impact of immigration on rents is no longer significant.

Third, to analyse the influence of outliers, we remove the top and bottom 1% of observations on housing prices. Based on this trimmed sample, we conclude that results remain generally unchanged and that our conclusions are not driven by outliers. However, as in the case of including state-year fixed effects, the results on flat rents are now less significant.

Fourth, although we excluded asylum seekers from the analysis due to data constraints and methodological considerations, we nevertheless checked what happens when including the change in the ratio of asylum seekers in t–1 to the population in t–2 as an additional regressor. We believe that this is a conservative test, as we assume that the asylum seeker variable is fully exogenous. It turns out that the asylum seeker variable is insignificant and the estimated effects for the immigration variable hardly change. The only notable changes are higher coefficient estimates for the immigration variable and a notable increase in its standard errors, which is due to the higher number of estimated coefficients and some multicollinearity between the immigration variable and the asylum seeker variable.

Finally, we considered the possibility that the relationships in large cities may differ from those in other districts. We therefore examine the consequences of focusing the analysis on seven large cities from different regions, including Berlin, Cologne, Düsseldorf, Frankfurt/Main, Hamburg, Munich, and Stuttgart. We find that prices and rents rise relatively faster in these cities than in other regions. A higher share of immigrants seems to mitigate the flat price increases in the big cities, but the effect is only significant at the 10% level.

5.2.9. Robustness of the Bartik Instrument

We construct a Bartik instrument as defined in Equation (2), capturing past spatial concentration of immigrants multiplied by the country-level immigration flows. Two statistical tests are employed to examine the validity of this instrument. To address the under-identification problem, we use the Kleibergen-Paap rk LM test with the null hypothesis that the instrument is irrelevant. The test results, located in the bottom rows of the respective tables, reject the null hypothesis of under-identification at the 1% significance level. Additionally, we conduct the Kleibergen-Paap F-test to detect potential issues with weak instruments. In all cases, the Kleibergen-Paap F-statistic exceeds the critical value of 10 recommended by Stock and Yogo (2005), allowing us to reject the null hypothesis of a weak instrument. We document the first-stage regression in Table A5 of the Appendix.

The validity of the identification assumptions underlying the Bartik instrument, which is commonly employed in the immigration literature, has been extensively discussed by Goldsmith-Pinkham et al. (2020). To assess the validity of the exclusion restriction, they recommend analysing the correlation between the historical shares used to construct these instruments and other initial characteristics. In this respect, we employ the four available explanatory variables, which we also use in our regressions of interest. Here, they are employed as initial characteristics from 1998, our oldest available value, to explain the historical shares of migrants for the main countries of origin in our dataset. The results, presented in Table 7, show that these initial characteristics are generally insignificant. Even when considered together, they explain only a small part of the cross-sectional variation in the historical shares. According to Goldsmith-Pinkham et al. (2020), these results mitigate the concern that immigrants from a particular country of origin cause a violation of the exclusion restriction.[20]

Table 7. Relationship between Origin Country Shares and Characteristics

VARIABLES	Turkey	Denmark	Greece	Iraq	Iran	Poland	Bosnia
Log of Area	0.058	0.003	-0.003	-0.000	0.007	0.005	0.025
	(0.116)	(0.002)	(0.004)	(0.000)	(0.011)	(0.005)	(0.038)
Δ Ln GDP per person at t–2	0.040	0.001	0.001*	0.000	0.005	0.002	0.012
	(0.025)	(0.001)	(0.001)	(0.000)	(0.003)	(0.001)	(0.008)
Unemployment rate at t–1	0.044	0.001	-0.000	0.000	0.005	0.002	0.013
	(0.037)	(0.001)	(0.001)	(0.000)	(0.004)	(0.002)	(0.012)
Working-age population ratio at t–1	0.135	0.001	0.008**	0.001	0.011	0.006	0.048
	(0.111)	(0.002)	(0.003)	(0.000)	(0.011)	(0.005)	(0.036)
Observations	382	382	382	382	382	382	382
R-squared	0.12	0.05	0.11	0.12	0.07	0.13	0.13

Notes: Each column reports the results of a single regression of the 1998 (base year) region of origin share on 1998 local area characteristics. Standard errors are clustered at the district level and presented in brackets. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

6. Conclusion

Our study investigates the short-term impact of immigration on regional house prices, flat prices, and flat rents. We employ instrumental variable (IV) panel-data analyses using a comprehensive dataset that covers 382 administrative districts across Germany over the period 2004 to 2020. During this period, the number of foreigners in Germany rose steadily, at an average rate of 3.4% per year. Moreover, Germany experienced an annual growth rate of 2.8%

[20] Another way to check for robustness would be to run a parallel pre-trend analysis, as suggested by Goldsmith-Pinkham et al. (2020, p. 2620, fig. 3). However, due to the unavailability of our dependent variable before 2004, we cannot examine pre-trends.

and 3% in house and flat prices, respectively, surpassing the 2.3% growth rate of flat rents. To address potential endogeneity, we create an instrument for estimating the distribution of the recent immigrant population that is based on historical settlement patterns of immigrants according to their country of origin (Bartel, 1989).

Theoretically, the interaction between immigration and local housing markets is ambiguous. The stock-flow model of the housing sector distinguishes between short-term and long-term effects. In the short term, when the stock of housing is fixed, house prices increase due to the inflow of immigrants. In the long term, however, the supply of housing expands. If housing markets are not regulated, housing prices are expected to react positively to an inflow of immigrants in the short run, whereas the long-run effect would depend on how responsive housing supply is to changes in market conditions.

Our empirical results provide evidence that international migration has a significantly positive short-run effect on flat prices and rents. This positive effect is consistent with our insignificant test results for native out-flight. The IV estimations show that immigration is a significant explanatory variable for changes in flat prices and flat rents, – i.e., the median flat price (rent) increases by up to 3% (1%) following an increase in international migration equal to 1% of the initial total population, whereas it has no significant effect on single-family house prices.

Using IV quantile regressions for the lower quartile, the median, upper quartile, and 95th percentile of property price/rent distribution in each district and year, we continue to find no effect of immigration on house prices, but we do find a significantly positive migration effect on flat prices below and up to the median price. Following an increase in international migration equal to 1% of the initial total population, lower quartile flat price rises by more than 5%, whereas the median price increase is about half that. Lower quartile flat rents react similarly to such a change in demographics. Thus, the increase in flat prices is more than twice as high when considering the lower end of the market, whereas the rental market for flats reacts more linearly. Including land price as an important indicator for the development of long-term housing supply suggests that our estimates may have relevance beyond the short term.

Our study is similar to that of Braakmann (2019), which also examines how immigrants affect the lower and higher ends of the house price distribution in England and Wales without knowing their characteristics or income/wealth levels. Braakmann (2019) links the negative impact of immigration on housing prices to the following factors: (1) native out-migration in areas home to housing below the median price, (2) a greater number of persons per unit due to immigrant crowding (an increase in the share of households living in more crowded conditions), which can be seen as a sign that property owners have converted houses into apartments, and (3) a drop in demand for owned properties as immigrants might tend to move into (privately) rented accommodations. However, in contrast to Braakman's study, we find that immigrants have a sizeable positive effect on property prices, particularly at the lower end of the flat price/rent distribution up to the median, whereas prices above the median appear to be unaffected. Moreover, these housing price effects occur even though we observe evidence of immigrant crowding in Germany.

This positive effect can be explained by three main reasons. First, the largest price increase occurs at the lower end of the market for flats (at the 25th percentile of the price and rent distribution), which is intuitive as, in Germany, immigrants tend to be poorer than the native population (Büchel & Frick, 2001). As Brücker (2018) points out, the qualification structure of migrants is different to that of the resident population. While there is a higher share of people with a university degree, there is also a higher share of migrants without vocational qualifications. Quantitatively, migrants without vocational qualifications outnumber those with university degrees. Indeed, our estimates show that immigrants tend to move towards districts where property prices and rents are growing more slowly or towards areas with more affordable housing stock, so we may assume that, on average, the presence of immigrants affects the lower end of flat prices and rents.

Second, unlike the UK, there appears to be no local out-migration in Germany, which could potentially lower prices in migrant-receiving areas.

Third, unlike the UK case as provided by Braakmann (2019), immigrants might not tend to shift away from owner-occupied dwellings to privately rented flats because rental accommodation is a highly preferred tenure by Germans/natives. Our dataset does not include the characteristics or income/wealth levels of immigrants, but, in principle, there might be two options regarding the housing tenure choices of immigrants. First, if immigrants are wealthy enough or have financial access to mortgage markets, then they may prefer owning a flat rather than renting one. As noted above, there is a group of migrants with a university degree. However, at approximately 70%, the share of migrants who do not so is even larger. The rental housing market in Germany is very competitive. A large share of the population lives in a rented or a sublet accommodation (in 2018, according to Destatis (2021), almost 54% of the population lives in rented accommodation). While there is an excess supply of housing in some rural areas, the rental housing market in urban areas, especially in larger cities, tends to be characterised by excess demand (Auspurg et al., 2017; Fitzenberger and Fuchs, 2017). This development is fuelled by changes in the supply of social housing. Between 2010 and 2020, the number of publicly-provided flats, rented out at below market prices, fell by almost 50% (2010: 2.1 million; 2020: 1.1 million). In these circumstances, landlords and real estate agents in many urban areas play a strong gatekeeper role in deciding who can rent an apartment and they tend to favour locals over foreigners (Eilers et al., 2021). But if immigrants cannot find accommodation in the rental market, they may turn to home ownership. Therefore, immigrants may increase the demand for owner-occupied housing, especially for more affordable flats below the median price. Second, if immigrants are not affluent enough to purchase flats and prefer renting, this could attract buy-to-let investors (non-bank investors) to the region. In other words, a large immigrant population residing in independent accommodations may create a tight rental market, particularly in multifamily apartments. Buy-to-let investments can drive up housing valuations while simultaneously increasing the supply of rental units. For instance, using data from Germany, Boddin et al. (2023) report that regions experiencing rental market tightness —proxied by the share of refugees residing in independent accommodations (as in Bednarek et al., 2021) — witnessed a more substantial increase in house prices compared to rents.[21] Our results align with Boddin et al.'s (2023) finding, indicating a notably stronger positive effect of immigration flows on flat prices (3% increase) compared to flat rents (1% increase). Given the evidence of (slight) immigrant crowding, we observe a positive impact at the lower end of the flat price segment. This observation is supported by Saiz (2003), who also find a positive effect of immigrant crowding on housing rents at the lower end of the market in the short run. Thus, the observed price effect can be interpreted as an underestimation of the migration-induced adjustments in the German housing market.

Our analysis leads to the conclusion that if Germany continues to experience net in-migration in the longer term, and there is little reason to expect otherwise, the government should increase its efforts to provide affordable flats, as the demand for this type of housing will rise by more than an analysis based on the current population structure would suggest. As we see it, increasing the supply of affordable flats could meet two important objectives. First, doing so would help secure the economic livelihoods of many migrants as well as those of less affluent natives. Second, it could reduce social tensions between migrants and low-income natives, as increasing the supply of affordable housing will reduce the pecuniary spillovers from migration to the lower end of the domestic housing market. The resulting decrease in competition for housing between less-affluent natives and in-migrants may go some distance towards undercutting support for xenophobic political parties. Reflecting these considerations, since 2022, the German Federal government aims to have 400,000 new flats constructed each year, of which 100,000 are supposed to be for social housing purposes.[22] However, the data available in mid-2023 suggest that this target will be clearly missed.[23]

[21] Boddin et al. (2023) also show that the ratio of rental listings declines less in more exposed regions than sale listings, arguably implying a relative increase in the supply on the rental market.
[22] https://www.bundesregierung.de/breg-en/search/affordable-housing-2134122 (accessed on 25 August 2023).
[23] https://www.tagesschau.de/wirtschaft/unternehmen/wohnungsbauboom-unterbrochen-deutschland-101.html (accessed on 25 August 2023).

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Appendix:

Table A1: Local Districts with the Largest Share of Immigrants in the Total Local Population and Working-Age Population in 2020

Share of Immigrants—Top 15			
	in **total population**		in **working-age population**
Offenbach (Main)	40.5	Offenbach (Main)	63.3
Frankfurt (Main)	30.3	Ludwigshafen	45.1
Ludwigshafen	29.0	Kassel	44.8
München	28.9	München	44.5
Pforzheim	27.9	Frankfurt (Main)	44
Heilbronn	27.8	Pforzheim	43.2
Kassel	27.0	Heilbronn	43
Nürnberg	26.0	Nürnberg	40.5
Mannheim	25.9	Düsseldorf	40.2
Stuttgart	25.4	Mannheim	38.8
Düsseldorf	25.3	Gelsenkirchen	37.8
Augsburg	24.3	Groß-Gerau	37.5
Groß-Gerau	24.2	Duisburg	37.4
Duisburg	23.7	Stuttgart	37.1
Gelsenkirchen	23.5	Augsburg	36.7
Share of immigrants—Bottom 15			
Börde	3.5	Meißen	5.9
Wartburgkreis	3.5	Wartburgkreis	5.7
Meißen	3.4	Börde	5.7
Stendal	3.3	Stendal	5.4
Sömmerda	3.1	Mansfeld-Südharz	5.2
Kyffhäuserkreis	3.0	Saalfeld-Rudolstadt	5.2
Mansfeld-Südharz	3.0	Sömmerda	5.2
Saalfeld-Rudolstadt	3.0	Kyffhäuserkreis	5.1
Saale-Holzland-Kreis	3.0	Leipzig (Landkreis)	5.0
Leipzig (Landkreis)	2.9	Sächsische Schweiz-Osterzgebirge	5.0
Sächsische Schweiz-Osterzgebirge	2.9	Saale-Holzland-Kreis	4.9
Bautzen	2.6	Greiz	4.5
Greiz	2.6	Bautzen	4.5
Elbe-Elster	2.6	Elbe-Elster	4.3
Erzgebirgskreis	2.2	Erzgebirgskreis	3.9
Mean	11.9		18.7
St. Dev.	5.8		9.0
Min	2.2		3.9
Max	40.5		63.3

Table A2: Local Districts with the Highest Average House Prices, Existing Flat Prices, and Rents in 2020

	House Prices (Euro)		Flat (Existing), Average Price (Euro/sqm)		Flat (Existing), Average Rent (Euro/sqm)
Top 15					
München	1,600,000	München	7,900	München	17.7
München (Landkreis)	1,400,000	München (Landkreis)	6,300	München (Landkreis)	15.2
Starnberg	1,400,000	Nordfriesland	6,100	Stuttgart	14.5
Ebersberg	1,200,000	Starnberg	6,100	Frankfurt (Main)	14.3
Bad Tölz-Wolf	1,100,000	Miesbach	6,000	Starnberg	13.8
Fürstenfeldbruck	1,100,000	Dachau	5,700	Fürstenfeldbruck	13.3
Miesbach	1,100,000	Frankfurt (Main)	5,650	Dachau	13
Stuttgart	990,000	Fürstenfeldbruck	5,500	Ebersberg	12.7
Frankfurt (Main)	970,000	Ebersberg	5,400	Freiburg (Breisgau)	12.5
Garmisch-Partenkirchen	960,000	Freising	5,200	Hamburg	12.3
Dachau	940,000	Garmisch-Partenkirchen	5,200	Heidelberg	12.2
Wiesbaden	910,000	Hamburg	5,100	Ingolstadt	12
Heidelberg	900,000	Stuttgart	4,800	Köln	11.8
Main-Taunus-Kreis	880,000	Bad Tölz-Wolfratshausen	4,700	Miesbach	11.8
Düsseldorf	870,000	Erding	4,600	Freising	11.7
Bottom 15					
Erzgebirgskreis	190,000	Kyffhäuserkreis	900	Wunsiedel (Fichtelgebirge)	5.2
Anhalt-Bitterfeld	190,000	Sonneberg	900	Altenburger Land	5.1
Stendal	190,000	Saale-Orla-Kreis	900	Altmarkkreis Salzwedel	5.1
Sonneberg	190,000	Sömmerda	875	Kyffhäuserkreis	5.1
Saale-Orla-Kreis	190,000	Elbe-Elster	870	Mansfeld-Südharz	5.1
Mansfeld-Südharz	185,000	Mansfeld-Südharz	850	Salzlandkreis	5.1
Kyffhäuserkreis	185,000	Saalfeld-Rudolstadt	850	Tirschenreuth	5.1
Oberspreewald-Lausitz	180,000	Greiz	850	Görlitz	5
Suhl	180,000	Altenburger Land	825	Spree-Neiße	5
Greiz	180,000	Erzgebirgskreis	800	Stendal	5
Elbe-Elster	175,000	Burgenlandkreis	800	Erzgebirgskreis	4.9
Uckermark	175,000	Görlitz	785	Greiz	4.9
Lüchow-Dannenberg	170,000	Zwickau	780	Holzminden	4.8
Görlitz	170,000	Vogtlandkreis	770	Vogtlandkreis	4.8
Prignitz	160,000	Holzminden	650	Lüchow-Dannenberg	4.3
Median	360,000		2,200		7.3
St. Dev.	200,322.3		1,101.9		2.0
Min	160,000		650		4.3
Max	1,600,000		7,900		17.7

Table A3: Immigrant Inflows and Native Population

	$\Delta Natives_{it-1}/Pop_{it-2}$			
	OLS		2SLS	
Variable				
$\Delta Immigrants_{it-1}/Population_{it-2}$	0.063	0.032	0.179*	0.211***
	(0.041)	(0.032)	(0.087)	(0.070)
Unemployment rate at *t*–1		-0.001***		-0.001***
		(0.000)		(0.000)
Log of area		-0.002***		-0.002***
		(0.000)		(0.000)
Working-age population ratio at *t*–1		0.001***		0.001***
		(0.000)		(0.000)
Δ Ln GDP per person at *t*–2		-0.004*		-0.004*
		(0.002)		(0.002)
Observations	6,112	5,926	6,109	5,923
R-squared	0.247	0.400	0.239	0.386
Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Kleibergen-Paap F-statistic			14.92^{+}	13.97^{+}

Note: Standard errors in parentheses are clustered at the district level; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$; $^{+}$ stands for a value larger than the critical value recommended by Stock and Yogo (2005).

Table A4. Immigrant Crowding

	$\Delta(Regional\ Average\ Square\ Metre\ per\ Person)_{it}$
$\Delta immigrants_{i,t-1}/Population_{i,t-2}$	-0.51** (0.19)
Observations	6,112
R-squared	0.28
Year FE	Yes
State FE	Yes

Note: Estimator: OLS. Standard error in parenthesis is clustered at the district level; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table A5: First Stage Regression Results

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Δ Immigrant stock at *t*–1/Population at *t*–2	0.446***	0.427***	0.446***	0.427***	0.370***	0.446***	0.434***	0.385***
	(0.038)	(0.034)	(0.038)	(0.034)	(0.020)	(0.038)	(0.034)	(0.022)
Unemployment rate at *t*–1		0.000**		0.000**	0.000**		-0.000**	-0.000
		(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Log of area		-0.000***		-0.000***	-0.000***		-0.001***	-0.001***
		(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Working-age population ratio at *t*–1		0.000		0.000	0.000***		0.000***	0.000***
		(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Δ Ln GDP per person at *t*–2		-0.000		-0.000	-0.000		0.000	0.000
		(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
Δ Log rent at *t*–1					0.009***			0.006***
					(0.002)			(0.001)
Δ Log flat price at *t*–1								
Observations	6,109	5,923	6,109	5,923	5,580	6,109	5,923	5,580
R-squared	0.620	0.642	0.620	0.642	0.692	0.620	0.636	0.685
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors in parentheses are clustered at the district level; ***p < 0.01, **p < 0.05, *p < 0.1; Δ indicates first differences.