The Effect of Foreign Investors on Local Housing Markets: Evidence from the UK[‡]

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Abstract

I use newly-released administrative data on properties owned by overseas companies to study the effect of foreign investment on the housing market in England and Wales. To estimate the causal effect, I construct an instrument for foreign investment based on economic shocks abroad. Foreign investment is found to have a positive effect on house price growth. This effect is present at different percentiles of the distribution of house prices and is stronger in local authorities where housing supply is less elastic. Foreign investment is also found to reduce the rate of home ownership. There is no evidence of an effect on the housing stock or the share of vacant homes.

Key words: foreign investors, house prices

JEL Classification: R21, F21

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1 Introduction

House prices in the UK have increased significantly since the late 1990s. Figure 1 reports average house prices in England and Wales using data from the Land Registry house price index database. Average house prices almost tripled during the period shown, from just over £70,000 in 1999 to about £215,000 in 2014. Apart from a reduction in 2009, at the height of the global financial crisis, house prices increased every year during this period. What factors may be behind this upward trend in house prices?

On the supply side, lack of available land for construction and regulatory constraints — such as planning delays and restrictions — may be contributing to house price appreciation. In 2004, the UK government commissioned a review on housing supply (Barker 2004). This review concluded that a much higher rate of house building would be necessary to reduce the trend rate of house price growth to a level comparable with the EU average. A related review on land use planning (Barker 2006) argued for a need to make the planning application process more efficient and to incentivise the use of vacant previously developed land. A recent study by Hilber and Vermeulen (2015) looks at how supply constraints affect the transmission of income shocks to house prices. They find that an increase in earnings raises house prices by more in areas with tighter regulatory constraints (measured by the refusal rate of major residential projects).

On the demand side, Sá (2015) uses an IV approach to examine the causal effect of immigration on house prices. The findings suggest that an inflow of immigrants into a local area generates native outmigration and has a negative effect on local house prices. Badarinza and Ramadorai (2016) look at the effect of foreign investment on house prices in London. They construct a proxy for foreign investment based on two ideas: first, foreign investors are more likely to invest in the UK property market when their home countries face negative economic conditions; second, foreign investors exhibit "home bias abroad", i.e., they tend to choose areas in the UK where people from their home country live. The focus of their paper is different from Sá (2015) because foreign buyers are not necessarily residents in the UK, but may be purchasing properties purely for investment purposes. The authors find a significant "safe haven" effect, with increases in foreign risk being associated with higher house prices in parts of London with a high share of foreign-origin residents. A related strand of literature uses macro data to examine the effect of foreign capital inflows on the housing

market. Aizenman and Jinjarak (2009) use panel regressions to study the association between the current account and real estate prices across countries. They conclude that there is a positive association between current account deficits and appreciation of real estate prices. Sá, Towbin and Wieladek (2014) estimate a panel VAR for OECD countries and look at the effect of capital-inflow shocks on the housing market. They find that capital-inflow shocks have a significant and positive effect on real house prices, real credit to the private sector, and real residential investment.

In this paper, I look at the effect of foreign investment on the housing market in England and Wales. Unlike Badarinza and Ramadorai (2016), I do not use economic shocks abroad as a proxy for foreign investment, but measure foreign investment directly using a new dataset released by the Land Registry. This dataset contains information on all property transactions in England and Wales registered to overseas companies. My sample is broader than the one in Badarinza and Ramadorai (2016) and includes all local authorities in England and Wales and not just in London. Also, while Badarinza and Ramadorai (2016) focus on the average effect on house prices, I also look at heterogeneous effects across the distribution of house prices and across local authorities with different levels of supply constraints. In addition, I look at other outcome variables, such as the housing stock, vacant homes and home ownership.

The newly-released Land Registry dataset is used to calculate the share of total residential transactions registered to overseas companies in each year and local authority for the period from 1999 to 2014. This share is calculated in volume and in value (using information on transaction prices). To see how these shares correlate with house prices, Figure 1 plots the evolution of house prices and foreign transactions calculated as averages across all local authorities in England and Wales. All three series display an upward trend. The value share is more volatile than the volume share, probably due to measurement error in reported transaction prices. This issue is discussed in more detail in the data section.

Behind these averages, there is significant regional variation, as illustrated in Figures 2 and 3 and in Table 1. Average house prices in the South East, particularly in London, are significantly higher than in other regions, reaching a value of almost £1.3 million in Kensington and Chelsea in 2014. Foreign investment also tends to be concentrated in the South East — Westminster and Kensington and Chelsea have by far the largest shares of transactions registered to overseas companies. Some of the major cities in the North — such as Liverpool, Leeds and Manchester —

also attract large shares of foreign investment. Interestingly, the city of Salford (part of Greater Manchester) had a significant share of foreign investment in 2014. After looking at the addresses of properties in Salford sold to overseas investors in that year, it appears that many of them are in an apartment block partly funded by Chinese investors[1].

This paper makes use of this regional variation and identifies the effect of foreign investment on house prices from spatial correlations between the share of foreign transactions and changes in house prices across local authorities. A potential problem in interpreting these correlations as causal effects is that the direction of causality between foreign investment and house prices is not clear, because foreign investors are not randomly allocated across geographic areas. To overcome this issue, I borrow from Badarinza and Ramadorai (2016) and use measures of economic shocks abroad and the idea of "home bias" to construct an instrument for foreign investment.

To preview the results, I find that foreign investment has a positive and significant effect on house prices. An increase of one percentage point in the volume share of residential transactions registered to overseas companies leads to an increase of about 2.1 percent in house prices. To have a better idea of the magnitude of this effect, I use the model to construct the counterfactual evolution of house prices when the share of foreign investment is set to zero. I find that average house prices in England and Wales in 2014 would have been about 19% lower in the absence of foreign investment (at approximately $£174,000$, compared with an actual average of about $£215,000$). Looking at the effect at different points of the distribution of house prices, I find that foreign investment does not just raise prices of expensive homes, but has a positive effect at different percentiles of the distribution. To examine how supply restrictions affect the propagation of foreign investment shocks to house prices, I use the data in Hilber and Vermeulen (2015) to calculate the house price-earnings elasticity for each local authority in England. I then divide local authorities into different quartiles of this elasticity and estimate the model separately for each quartile. As expected, I find that foreign investment increases prices by more in local authorities with a larger house price-earnings elasticity, which are the ones with a less elastic housing supply.

I also examine the effect of foreign investment on other outcome variables. Looking at the effect on the housing stock, I do not find evidence that an increase in foreign investment leads

[1] A report by the BBC on Chinese investment in major cities in the North, particularly Salford, can be found at: http://www.bbc.co.uk/news/business-36086012

to an increase in housing construction, contrary to the suggestions of some estate agents in prime London areas[2]. I also do not find evidence in favour of "buy-to-leave" — the hypothesis that foreign buyers purchase properties purely for capital appreciation and do not occupy them or rent them out. However, I do find evidence that foreign investment reduces home ownership rates, suggesting that some residents may be priced out of the market in areas where foreign investors are more active and have to rent rather than own their homes.

The findings in this paper are useful to inform the policy debate on the impact of foreign investment on the housing market. This topic has attracted the attention of the Mayor of London (Sadiq Kahn), who has recently launched an inquiry into the consequences of foreign property ownership in the capital. Other countries have also been debating this issue and have introduced policies to control foreign investment in the housing market in an attempt to reduce house price appreciation. For example, Australia has a legislative framework which encourages foreign investment in new residential projects, but imposes tighter controls on the purchase of existing dwellings (Gauder, Houssard and Orsmond (2014)); Switzerland has quotas on the number of residential properties that can be sold to foreigners; and the Canadian city of Vancouver has recently introduced a 15% property tax on foreign home buyers.

The rest of the paper is organised as follows. The next section describes the key data sources, particularly the new Land Registry Overseas Companies Dataset (OCD). Section 3 discusses the empirical methodology used to estimate the effect of foreign investment on house prices and presents the results. Section 4 discusses some robustness checks. Section 5 looks at the effect of foreign investment on the housing stock, vacant homes and home ownership. Section 6 concludes.

2 Data

2.1 Investment by overseas companies

Data on all land, commercial and residential properties in England and Wales registered to overseas companies are obtained from the Land Registry Overseas Companies Dataset (OCD), published in March 2016. The dataset contains around 100,000 title records and collects information on tenure

[2] For example, research by Savills (2014) suggests that foreign investors play a major role in stimulating the supply of new housing in London.

(freehold or leasehold), address, price paid (where available), name and country of incorporation of the legal owner and date of registration. While the data go as far back as the mid-1960s, the majority of records were registered from 1999 onwards. The public version of the dataset contains data up to October 2015. The dataset includes overseas companies only and does not cover properties owned by private individuals, UK companies or charities.

Prior to the release of this dataset, similar data were published on the website of the Private Eye magazine, together with an informative map showing all land and properties in England and Wales registered to overseas companies[3]. The Private Eye obtained these data from the Land Registry under a Freedom of Information request. Their dataset covers the period from 1999 to 2014 and contains more complete information on price paid than the Land Registry dataset. I use this dataset to fill in missing information on prices in the Land Registry OCD. Therefore, the data used for the empirical analysis cover the period from 1999 to 2014.

To assess the relative importance of foreign investment in a given local authority and year, it is important to scale foreign transactions by the total number of transactions. To do this, I use information on all property sales in England and Wales from the Land Registry Price Paid Data (PPD). This dataset only covers residential properties sold at full market value. Until October 2013, only sales to private individuals were included. Since then, the dataset also includes buy-to-let sales and sales to companies. To ensure consistency across time, I focus on transfers of residential property to private individuals for all years.

I use two measures of foreign investment by local authority and year. The first measure is the volume share of foreign transactions and is calculated by dividing the number of residential properties registered to overseas companies (from the Land Registry OCD) by the total number of residential transfers to private individuals (from the Land Registry PPD). The second measure is the value share of foreign transactions and is obtained by dividing the total value of all residential properties registered to overseas companies by the total value of all residential properties bought by private individuals. The appendix contains more details on the construction of the volume and value shares.

There are some potential measurement problems with these shares of foreign investment. One problem is that the Land Registry OCD only includes purchases by overseas companies, but not

[3] http://www.private-eye.co.uk/registry

by non-resident private individuals. This implies that the shares of foreign transactions may underestimate the true importance of foreign investment in the local housing market. In practice, however, most foreign investment is likely to be directed through a company, because tax rates on rental income are generally lower for non-resident companies than for individuals[4].

Another issue is that the Land Registry OCD only contains information on the country of incorporation, but does not reveal the country of ultimate ownership of the companies that invest in UK property. Table 2 lists the countries of incorporation with the largest shares of investment in UK property in 2014 (in volume). About 34% of purchases of property in England and Wales by overseas companies in 2014 were done by companies incorporated in the British Virgin Islands. The channel islands of Guernsey and Jersey also had large shares, as well as the Isle of Man. All these territories have low tax rates. It is possible that some UK investors may register a company overseas in order to pay less taxes. If this is the case, the volume and value shares would overestimate the true importance of foreign investment in the local housing market because the numerator would include some properties bought by UK investors via a company registered overseas. To get a sense of the extent of this problem, the robustness section reports results excluding properties registered to companies incorporated in Guernsey, Jersey and the Isle of Man. Given their geographic proximity, these are the most likely countries of incorporation of UK companies seeking to reduce their tax liabilities.

An additional issue with the calculation of the foreign shares is that the transaction prices reported in the Private Eye dataset are likely to suffer from measurement error. Some of the information on prices is reported by visitors to the Private Eye website, who can click on a link on the map to report additional information about a record. Occasionally, price paid figures contain errors and may not refer to an individual property, but to all properties registered to the same company. Because of this issue with the price data, it is useful to consider the results for the value share alongside those for the volume share, which is calculated solely from administrative data and does not suffer from measurement problems. In the empirical analysis, I use an IV approach to deal with endogeneity in the shares of foreign investment, which should help address measurement error in the value share.

[4]Foreign companies pay corporation tax on rental income at 20%, whereas tax rates for non-resident and resident individuals vary between 20% and 45%, depending on income.

2.2 House prices and other controls

Data on house prices are obtained from the Land Registry house price index dataset. The index is based on repeated sales and measured at monthly frequency (it is converted to annual by taking averages). Using repeated sales to measure house price changes has the advantage of holding constant the quality of the housing stock.

In the regression analysis, I control for local economic conditions by including lags of the unemployment rate and the benefits rate (the proportion of the population receiving any state benefits). All data sources and definitions are listed in Table A1 in the appendix. Table 3 reports descriptive statistics for the key variables.

3 Foreign buyers and house prices

3.1 Specification

The following model is used to estimate the effect of foreign investment on house prices:

$$\Delta \ln(P_{it}) = \beta \frac{FT_{it}}{TT_{it}} + \gamma X_{it-1} + \phi_t + \rho_i + \varepsilon_{it} \tag{1}$$

where $\Delta \ln(P_{it})$ is the change in the log of the house price index in local authority i between years $t-1$ and t. The main independent variable is the share of foreign transactions to total transactions ($\frac{FT_{it}}{TT_{it}}$). As described in the data section, this is obtained by dividing the volume or value of residential properties registered to overseas companies by the total volume or value of residential transfers to private individuals. The coefficient β can be interpreted as the percentage change in house prices corresponding to an annual increase of one percentage point in the share of foreign transactions.

X_{it-1} is a set of controls and includes a lagged dependent variable and one year lags of the local unemployment rate and the share of the local population claiming state benefits. The unemployment rate and the benefits rate capture local macroeconomic conditions, which may affect housing demand. The model includes a lagged dependent variable to allow for inertia in house price growth. Case and Shiller (1989) find evidence that an increase in house prices in one year tends

to be followed by an increase in the subsequent year. Other studies examining the determinants of house price growth — for example, Favara and Imbs (2015) and Jordà, Schularick and Taylor (2015) — also include a lagged dependent variable in the model.

Year dummies (ϕ_t) capture national trends in inflation and other economic variables. Since the model is written in first-differences, time-invariant factors that are specific to each local authority and that affect the level of house prices have been differenced out. However, local authority fixed effects (ρ_i) are still included to capture different trends in house prices at the local level. The model is estimated in first differences to account for heterogeneous trends across local authorities and because house prices are measured as an index, whose level has no economic interpretation. Following the recommendation in Bertrand, Duflo and Mullainathan (2004) and Angrist and Pischke (2009), standard errors are heteroskedasticity-robust and are clustered by local authority to account for correlation within groups.

The effect of foreign investment on house prices is identified from spatial correlations between the share of foreign transactions and changes in house prices across local authorities. Identification relies on variation in the share of foreign buyers across local authorities and time.

There are two potential problems in interpreting these correlations as causal effects. First, foreign investment and house prices may be spatially correlated because of common fixed influences, for example, the climate or local amenities. This would lead to a correlation between the two variables, even in the absence of any genuine effects of foreign investment. The second problem is that the direction of causality between foreign investment and house prices is not clear because foreign investors are not randomly allocated across geographic areas.

To address the first problem, the model is estimated with the dependent variable in first-differences. This eliminates time-invariant, area-specific factors that affect foreign investment and house prices. To address the second problem, I construct an instrument for the value and volume shares of foreign investment. The instrument is based on the analysis in Badarinza and Ramadorai (2016), who look at the effect of foreign investment on house prices in London. The authors do not look directly at measures of foreign investment, since this information was not available until the recent release of the Land Registry OCD. Instead, they construct a proxy for foreign investment based on two ideas: first, foreign investors are more likely to invest in the UK property market when their home countries face negative economic conditions; second, foreign investors exhibit "home bias

abroad", i.e., they tend to choose areas in the UK where people from their home country live.

"Home bias abroad" may arise if foreign investors find it easier to rent property to residents from their home country, because there are no language or cultural barriers. Also, in areas where some nationalities are more highly represented, local estate agents specialise in dealing with investors from those countries, reducing transaction costs for foreign investors who buy property in those areas[5]. The notion of "home bias abroad" is closely related to an instrument that is typically used in the literature on immigration, which relies on the historical settlement pattern of immigrants by country of origin to predict the current geographic distribution of the immigrant population — see, for example, Cortes (2008) and Sá (2015). This instrument is based on the notion that immigrant networks are an important determinant of the locational choices of new immigrants, because they facilitate the job search process and assimilation into a new culture (Munshi 2003).

I follow Badarinza and Ramadorai (2016) and construct the following instrument for the share of foreign investment in local authority i in year t:

$$\sum_{c} f_i^c z_{t-1}^c$$

where f_i^c is the share of residents in local authority i that were born in foreign country c from the 2001 Census and z_{t-1}^c is a measure of economic conditions in country c in year $t-1$, specifically the economic risk index from the International Country Risk Guide (ICRG). The index is constructed by awarding risk points for 5 components: GDP per capita, real annual GDP growth, annual inflation rate, budget balance as a percentage of GDP and current account as a percentage of GDP. Countries with lower risk are awarded a higher value for the index. The index is available for 140 countries for the period 1984 to 2015. Because population data from the Census is available for only 60 countries and regions, it is necessary to combine the economic risk indices to match the regions in the Census. I do this by calculating weighted indices using population shares from the IMF World Economic Outlook as weights. In the robustness section, I estimate the model using an alternative measure of economic conditions abroad to construct the instrument.

The validity of this instrument relies on two identification assumptions. First, I assume that the geographic distribution of the foreign-born population in 2001 is uncorrelated with recent changes

[5] In prime central London locations, there are several property consultancy firms that specialise in helping Russian and Chinese investors buy property in those areas.

in the economic performance of different UK local authorities. In that case, f_i^c is correlated with changes in house prices only through its relation with current foreign investment in those areas. The second identifying assumption is the exogeneity of economic conditions abroad to economic conditions of UK local authorities. This is a plausible assumption because economic conditions abroad should be largely determined by country-specific political and institutional factors and year fixed effects should capture global macroeconomic shocks.

3.2 Results

Table 4 reports the results of estimating model (1) by OLS and IV. The OLS results suggest a positive correlation between the share of foreign investment in volume and in value and house price growth. The coefficients are very similar with and without controlling for changes in the local unemployment rate and the benefits rate.

The IV coefficients are significantly larger, pointing to considerable attenuation bias in the OLS estimates, likely due to measurement error in the shares of foreign investment. The IV results imply that, on impact, house prices increase by about 2% when the volume share of total transactions registered to overseas companies increases by one percentage point. For the value share, the increase in house prices is about 1.4%. The instrument is highly significant in the first stage and has the expected sign: when economic conditions abroad improve — corresponding to an increase in the index of economic conditions abroad (weighted by local foreign population) — foreign buyers invest less in the UK housing market. The F-statistic on the excluded instruments is around 8. This is below the benchmark value of 10 suggested by Stock, Wright and Yogo (2002), but is above the 20% maximal bias threshold (6.66) in Stock and Yogo (2005). The table also reports the Anderson-Rubin Wald test of the significance of the foreign shares in the structural equation, which is robust to the presence of weak instruments. The test indicates that the foreign shares have a significant effect on house price growth.

To better understand the magnitude of these results, I use the IV coefficients to predict the evolution of average house prices when the volume share of overseas transactions is set to zero. Figure 4 reports the evolution of actual average house prices across local authorities in England and Wales (solid line), as well as the evolution of average house prices predicted by the model with the volume share of overseas transactions observed in the data (long dashed line) and with a

volume share of overseas transactions equal to zero (short dashed line). Predicted house prices are close to observed house prices, indicating that the model does well in explaining the evolution of house prices. Without any foreign investment in the housing market, average house prices would be lower. For example, in 2014, average house prices without foreign investment would be about 19% lower (at approximately £174,000, compared with an actual average of about £215,000).

To get a sense for how the response of house prices changes over time, I follow the method introduced in Jordà (2005) and estimate impulse responses at different points in time using local projections. This method estimates impulse responses directly, without the need to specify the unknown multivariate dynamic process, as would be the case with a vector autoregression (VAR). Local projections are obtained by estimating sequential regressions of the endogenous variable shifted forward:

$$\ln(P_{it+h}) - \ln(P_{it+h-1}) = \beta^h \frac{FT_{it}}{TT_{it}} + \gamma X_{it-1} + \phi_t + \rho_i + \varepsilon_{it} \tag{2}$$

The vector of estimates $\{\beta^h\}_{h=0,1,...}$measures the effect of foreign investment on house prices at horizon h. To account for endogeneity in the share of foreign investment, I estimate the regressions using the instrument based on economic shocks abroad. This approach is described in Jordà, Schularick and Taylor (2015) as local projection instrumental variables (LP-IV) and has also been used in Favara and Imbs (2015) to study the effect of shocks to credit supply on house price growth. Figure 5 reports the impulse responses over a period of four years. The effect of an increase in foreign investment on house price growth is quite persistent and only becomes insignificant four years after the shock.

3.3 Effect along the distribution of house prices

Foreign buyers are more active at the top end of the housing market. For example, in 2012, 13% of all residential property transactions in England and Wales above £1 million were registered to overseas companies, compared with only 2% of properties under £1 million. Therefore, it is possible that most of the impact of foreign investment on house prices is felt at the top end of the market.

To test this hypothesis, I estimate the following model to study the effect of foreign investment at different percentiles of the distribution of house prices:

$$\ln(P_{pit}) = \beta_p \frac{FT_{it}}{TT_{it}} + \gamma_p X_{it-1} + \phi_{pt} + \rho_{pi} + \varepsilon_{pit} \tag{3}$$

The dependent variable is the log of the pth percentile of house prices in local authority i in year t. As before, the vector X_{it-1} includes a lagged dependent variable and two controls for local macroeconomic conditions — one-year lags of the local unemployment rate and of the share of the local population claiming state benefits. The coefficient β_p captures the effect of overseas investment on each percentile of the distribution of house prices. This model is similar to the one adopted in Dustmann, Frattini and Preston (2013) to study the effect of immigration along the distribution of wages.

Table 5 reports the results of estimating the model for selected percentiles of the distribution of house prices with the share of foreign transactions measured in volume and in value. Panel A reports OLS results and panel B reports IV results using the instrument based on economic shocks abroad. Results are reported with and without controlling for the lagged unemployment rate and benefits rate. The OLS coefficients suggest a slightly larger effect of foreign investment at the top end of the distribution of house prices. However, the IV coefficients point to a similar positive effect of foreign investment on house prices at all points of the distribution. For example, an increase in the volume share of residential properties registered to overseas companies of one percentage point increases house prices at the 95th percentile by about 2.3% and increases house prices at the 5th percentile by about 2.1%.

To obtain a more detailed picture, I estimate the model using a finer grid of house price percentiles. Figure 6 reports the IV coefficients in percentile intervals of five percentage points. These coefficients correspond to the results in columns (2) and (4) of Table 5. The figure suggests that foreign investment does not increase prices only for expensive homes, but has a positive effect at all points of the house price distribution.

3.4 Supply constraints and the effect of foreign investment on house prices

The response of house prices to foreign investment should depend on supply conditions. In local authorities where housing supply is more constrained by regulation or geography, house prices should increase by more in response to an increase in foreign investment. To test this hypothesis, I

use the estimates of the house price-earnings elasticity for local authorities in England constructed by Hilber and Vermeulen (2015). The house price-earnings elasticity is a proxy for the elasticity of housing supply — in areas where supply is less elastic, a positive shock to demand (for example, an increase in earnings) would lead to a larger increase in house prices. Therefore, a higher house price-earnings elasticity reflects a less elastic supply of housing.

Hilber and Vermeulen (2015) estimate the house price-earnings elasticity by running a regression of the log of house prices on earnings and interactions of earnings with the share of planning applications for major residential projects that are refused permission, the share of land already developed and the elevation range. The refusal rate measures regulatory constraints to house building, while the share of land already developed and the elevation range measure land scarcity. To address endogeneity in the refusal rate, the authors use the share of votes for the Labour Party in the 1983 general election as an instrument. This is motivated by the fact that Labour voters tend to be less protective of housing values than Conservative voters. As an additional instrument, they use the change in the delay rate of major planning applications after a reform introduced by the Labour government in 2002, which set a target to speed up the planning process. To address endogeneity in the share of land already developed, the authors instrument it with population density in 1911. The model is estimated using annual data for the period from 1974 to 2008.

I use the estimated coefficients in Hilber and Vermeulen (2015) and their data to construct estimates of the house price-earnings elasticity for each local authority in England[6]. Figure 7 reports these elasticities and shows that local authorities in the South East are considerably more elastic, especially in Greater London. Local authorities in the North and East of England have much lower house price-earnings elasticities, reflecting lower regulatory restrictions and more space available for construction. I then separate local authorities in England into four quartiles, according to the house price-earnings elasticity, and estimate model (1) separately for each of these quartiles. The results, reported in Table 6, suggest that foreign investment only has a positive effect on house prices for local authorities with a higher house price-earnings elasticity (i.e., a lower elasticity of housing supply). The effect of foreign investment is insignificant for local authorities in the bottom two quartiles.

This analysis is related to some recent studies using US data which look at how the elasticity

[6] More details on the construction of the elasticities can be found in the appendix.

of housing supply affects the propagation of shocks to house prices. These studies make use of the elasticities of housing supply by metropolitan area constructed by Saiz (2010), which take into account geographic and regulatory constraints to house building. Favara and Imbs (2015) analyse whether branching deregulations across US states have a differential effect in counties with different elasticities of housing supply. They find that the response of house prices is more muted in counties where supply is more elastic, whereas the response of the housing stock is more muted in counties where supply is less elastic. Adelino, Schoar and Severino (2012) look at a different shock to credit supply — changes to the conforming loan limit, which determines the maximum size of a mortgage that can be purchased or securitised by Fannie Mae or Freddie Mac. They find that cheaper credit increases house prices by more in regions where housing supply is less elastic. Mian and Sufi (2009) compare house price growth between 1997 and 2007 in US metropolitan areas with high and low supply elasticities. They find a strong increase in house price growth in inelastic areas until 2005, followed by a large collapse in 2006 and beyond. By contrast, house price growth in elastic areas remains low and flat during this period. All these findings are consistent with the results in Table 6.

4 Extensions and Robustness Checks

4.1 Alternative Samples

Many local authorities with large shares of foreign investment are located in London, as shown in Figure 3 and Table 1. To test whether the effect of foreign investment on house prices is different in London and other parts of England and Wales, I estimate model (1) for the 32 London local authorities. The results, reported in the first two columns of Table 7, suggest that foreign investment has a positive effect on house prices in London. However, the effect is smaller than the average effect across all local authorities reported in Table 4. An increase of one percentage point in the volume share of foreign investment increases house prices in London by 0.6%, compared with 2.1% across all local authorities in England and Wales. For the value share, the effect in London is 0.5%, compared with 1.4% across all local authorities.

Another fact illustrated by Figure 3 is that many local authorities have a very small share of foreign investment. To test how this affects the results, I estimate model (1) for local authorities

with a volume share of foreign transactions above 0.5%. This leaves only 26 out of 172 local authorities. The results, reported in the last two columns of Table 7, point again to a positive effect of foreign investment on house price growth. Comparing with the results for all local authorities in Table 4, the IV coefficients are somewhat smaller for local authorities with a high share of foreign transactions.

A possible limitation with the definition of foreign transactions used in this paper is that the Land Registry OCD includes all properties bought by overseas companies, but does not provide information on the country of ultimate ownership. It is possible that some UK investors register companies overseas to benefit from lower taxes and use those companies to invest in property at home. To assess how this may affect the results, I recalculate the foreign shares excluding properties registered to companies incorporated in Guernsey, Jersey and the Isle of Man. Because of their geographic proximity, these are the most likely countries of incorporation of UK companies seeking to reduce their tax liabilities. Table 8 reports the results of estimating model (1) for this sample. The coefficients are similar to the ones reported in Table 4, suggesting that the results are not being driven by transactions registered to companies in these territories.

4.2 Alternative Instrument

The IV results reported so far are based on an instrument that captures economic conditions abroad, measured by the economic risk index of the ICRG. To check robustness of the results to the choice of instrument, I construct an alternative instrument based on the index of economic policy uncertainty of Baker, Bloom and Davis (2016). The index is constructed by searching key words in newspaper articles and is available for 15 countries (in addition to the UK). High values of the index denote a higher degree of economic policy uncertainty. Using these data, I construct the following instrument for the volume and value shares of foreign investment in local authority i in year t:

$$\sum_c f_i^c z_{t-1}^c$$

where f_i^c is the share of residents from foreign country c living in local authority i in the 2001 Census (as before) and z_{t-1}^c is the one-year lagged value of the index of economic policy uncertainty

for country c from Baker, Bloom and Davis (2016).

The IV estimates of the coefficients in model (1) with this alternative instrument are reported in Table 9. Compared with the results in Table 4, the coefficients with this alternative instrument are smaller. For the model with the full set of controls, the coefficients imply that, on impact, house prices increase by about 1.4% when the volume share of total transactions registered to overseas companies increases by one percentage point. For the value share, the increase in house prices is about 0.7%, which is half the size of the effect reported in Table 4. The instrument is highly significant in the first stage and has the expected sign: an increase in economic policy uncertainty abroad increases foreign investment in the UK housing market. The F-statistic on the excluded instruments is somewhat lower for the volume share than the one reported in Table 4. However, for the value share, the new instrument is stronger, with an F-statistic above the benchmark value of 10 suggested by Stock, Wright and Yogo (2002). The Anderson-Rubin test confirms that foreign investment has a significant effect on house price growth.

5 Foreign buyers and other housing market outcomes

5.1 Housing stock

To test whether foreign investment encourages the construction of new housing, I estimate model (1) with the change in the log stock of dwellings as the dependent variable (instead of the change in the log of the house price index). Annual data on the dwelling stock are obtained from the Department for Communities and Local Government (DCLG). Data are only available for local authorities in England from 2001. The results of estimating the model by OLS and IV are reported in Table 10 and suggest there is no significant effect of foreign investment on the change in the housing stock. It appears that foreign investment does not significantly increase housing construction, resulting instead in a significant increase in prices. I have also estimated the model separately for local authorities with a high and low house price-earnings elasticity (split at the median). I find that this insignificant effect is present in both groups of local authorities (the results are reported in Table A2 in the Appendix).

5.2 Vacant Homes

One of the concerns expressed by commentators and policy makers when discussing the effect of foreign investment on the housing market is that homes bought by foreign investors are likely to be left empty, with a negative effect on local communities. This is sometimes described as "buy-to-leave" (Financial Times (2016)).

Annual data on vacant dwellings are available from the DCLG for English local authorities from 2004 onwards. These data are obtained from council tax returns. Dwellings reported to the local authority as vacant may be eligible for a council tax exemption or discount. Vacant dwellings are classified into long-term or short-term vacant, depending on whether they have been unoccupied or substantially unfurnished for more or less than six months. To study the effect of foreign investment on vacant dwellings, I use these data to estimate model (1) with the change in the log number of short-term and long-term vacant dwellings as the dependent variable. The results — reported in Table A3 in the Appendix — point to an insignificant effect of foreign investment on vacant dwellings. The OLS coefficients point to a positive correlation between the volume share of foreign transactions and the number of short-term vacant dwellings, but this relation becomes insignificant in the IV regressions.

Council tax data on vacant dwellings have two potential limitations. First, local authorities have discretion over the level of council tax discount they apply to vacant dwellings and may decide not to apply any discount. In local authorities that do not award any discount, there is less incentive for home owners to report their properties as vacant, which could lead to underreporting of vacant homes. Another issue is that foreign investors may not be aware that they are eligible for a council tax exemption or may view the exemption as too small to warrant reporting the home as vacant, which may be particularly true at the high-end of the market.

To overcome these limitations, I use an alternative source of data on vacant homes. The 2011 Census reports the number of household spaces with no usual residents. These are household spaces that are vacant or used as second addresses, but may still be used by short-term residents and visitors. Table 11 lists the 10 local authorities in England and Wales with the largest share of household spaces with no usual residents. Many of these local authorities (for example, in Wales, Cornwall and the Isle of Wight) are holiday destinations. However, the large share of homes with

no usual residents in the City of London, Westminster and Kensington and Chelsea is probably a result of foreign investors buying in prime areas for long-term capital appreciation.

To examine the effect of foreign investment on vacant homes using this alternative data source, I regress the share of household spaces with no usual residents in each local authority on the share of foreign transactions (in volume and in value):

$$vacant_i = \beta \frac{FT_i}{TT_i} + \varepsilon_{it} \tag{4}$$

The model is estimated by OLS and IV (using the alternative instrument based on economic policy uncertainty abroad) for the cross-section of local authorities in England and Wales[7]. The results are reported in the first two columns of Table 12. The OLS results suggest a positive and significant correlation between foreign investment and vacant homes. However, the IV coefficients are insignificant. These results, together with the findings based on data from the DCLG, indicate that there is no clear evidence that foreign investment in the housing market increases the number of vacant homes.

5.3 Home Ownership

The results on the effect of foreign investment on house prices suggest that an increase in foreign investment leads to a significant increase in prices at all points of the house price distribution. A potential consequence of this is that residents may not be able to afford to buy a home in areas where foreign investors are more active and may be forced to rent their homes instead.

To test this hypothesis, I collect data from the 2011 Census on the share of households in owner-occupied accommodation for local authorities in England and Wales. I then estimate model (4) with this share as the dependent variable. The results, reported in the last two columns of Table 12, suggest that an increase in foreign investment in the housing market leads to a reduction in the share of households who own their homes. The IV coefficients imply that an increase of one percentage point in the volume share of foreign transactions reduces the share of households who own their homes by 5.6 percentage points. For the value share, the effect is also negative and significant at 3 percentage points. There is evidence that residents are priced out of the market in

[7] The usual instrument (based on the economic risk index) produces weak first-stage results for this cross-sectional sample.

areas where foreign investors are more active.

6 Conclusions

This paper identifies the causal effect of foreign investment on the housing market in England and Wales. It uses a dataset recently released by the Land Registry on property transactions registered to overseas companies. The paper uncovers a number of interesting results. Foreign investment is found to have a positive effect on house prices at different percentiles of the house price distribution. This suggests that foreign investment in the housing market does not only drive up prices of expensive homes, but has a "trickle down" effect to less expensive properties. I also highlight an important interaction between housing demand shocks and housing supply — increases in foreign investment only appear to drive up prices in areas where housing supply is particularly constrained, either because there is less land available for construction or because of regulatory constraints.

Looking beyond the impact on prices, I find no evidence that foreign investment has encouraged construction of new housing. I also do not find evidence that more homes are left vacant in local areas where foreign buyers are more active. However, I do find evidence that the rate of home ownership declines as a result of foreign investment. These results should help inform the debate on the impact of foreign investment on the housing market.

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A Appendix. Construction of foreign shares

To construct the shares of foreign investment, I divide the number (or value) of residential properties registered to overseas companies (from the Land Registry OCD) by the total number (or value) of residential transfers to private individuals (from the Land Registry PPD) in a given year and local authority. Because the Land Registry PPD only contains residential properties, I classify transactions in the Land Registry OCD into residential and commercial and retain only transactions of residential properties.

This classification is done in three stages. First, I use certain key words in the address field to classify properties. For example, if the address field contains the words "flat" or "apartment", the property is classified as residential; if the address field contains the words "land", "garage", "industrial estate", "store", "farm", etc., the property is classified as non-residential. In a second stage, I merge properties that remain unclassified after the first stage with data from the Ordnance Survey AddressBase dataset, which contains information on whether an address is commercial or residential. The merge is done by property number or name, street and postcode. Finally, any remaining unclassified properties are searched manually in the Royal Mail Address Finder software or on Google maps and classified as residential or commercial. At the end of this process, $98,271$ records were classified out of a total of $99,345$ transactions in the Land Registry OCD. About 50% of the classified records are residential properties.

B Appendix. Calculation of house price-earnings elasticities

The calculation of house price-earnings elasticities is based on equation (8) in Hilber and Vermeulen (2015):

$$\begin{aligned}\log(house\ price_{j,t}) &= \beta_0 + \beta_1 \log(earnings_{j,t}) + \beta_2 \log(earnings_{j,t}) \times \overline{\text{refusal rate}}_j \\ &\quad + \beta_3 \log(earnings_{j,t}) \times \%developed_j + \beta_4 \log(earnings_{j,t}) \\ &\quad \times elevation_j + \sum_{i=1}^{34} \beta_{4+i} D_t + \sum_{i=1}^{352} \beta_{38+i} D_j + \varepsilon_{j,t}\end{aligned}$$

where j denotes local planning authority (LPA) and t denotes year. The dependent variable

is the log of the mix-adjusted house price index and the main regressor is the log of male weekly earnings. The model is estimated on 34 years of data (1974-2008). Regulatory constraints are captured by the refusal rate of planning applications for major projects (consisting of 10 or more dwellings), averaged over the period from 1979 to 2008. Land scarcity is captured by the share of land already developed in 1990 and the elevation range. The model includes year fixed effects (D_t) and LPA fixed effects (D_j). The refusal rate is instrumented with the share of votes for the Labour Party in the 1983 general election and the change in the delay rate of major planning applications following a reform introduced by the Labour government in 2002, which set a target to speed up the planning process. The share of land already developed is instrumented with population density in 1911.

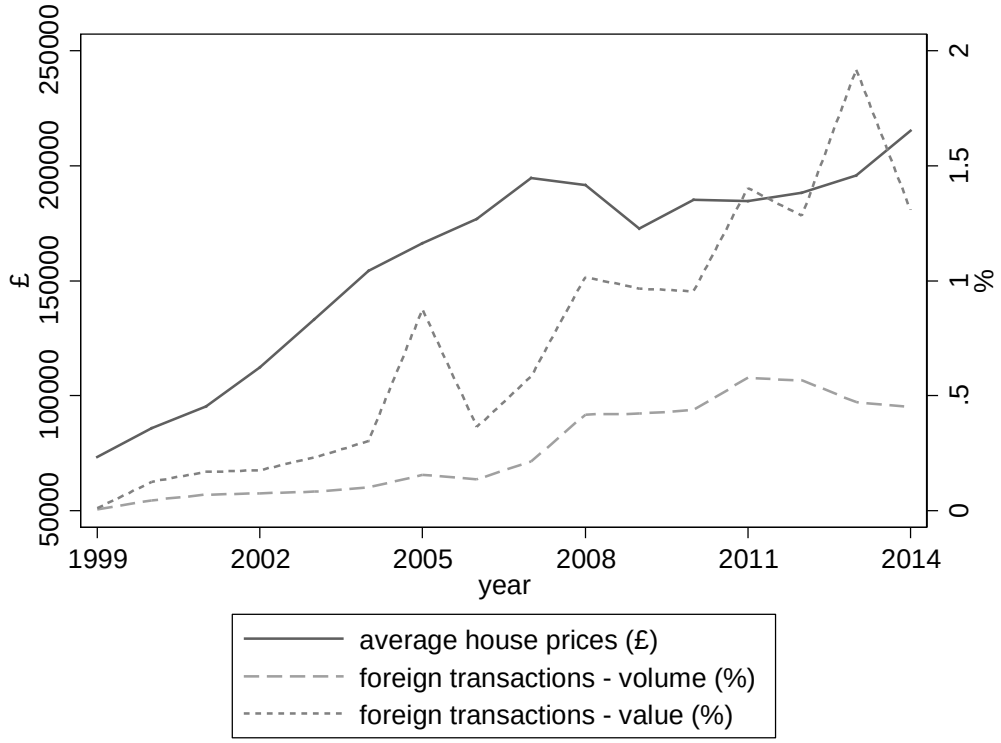
The authors standardise the three measures of supply constraints by subtracting the mean and dividing by the standard deviation. With this standardisation, the coefficient β_1 can be interpreted as the house price-earnings elasticity for an LPA with average levels of the supply constraints.

I use the coefficients and data in Hilber and Vermeulen (2015) to calculate the house-price earnings elasticity in each LPA as follows:

$$\widehat{elasticity}_j = \widehat{\beta}_1 + \widehat{\beta}_2 \overline{\text{refusal rate}}_j + \widehat{\beta}_3 \%developed_j + \widehat{\beta}_4 elevation_j$$

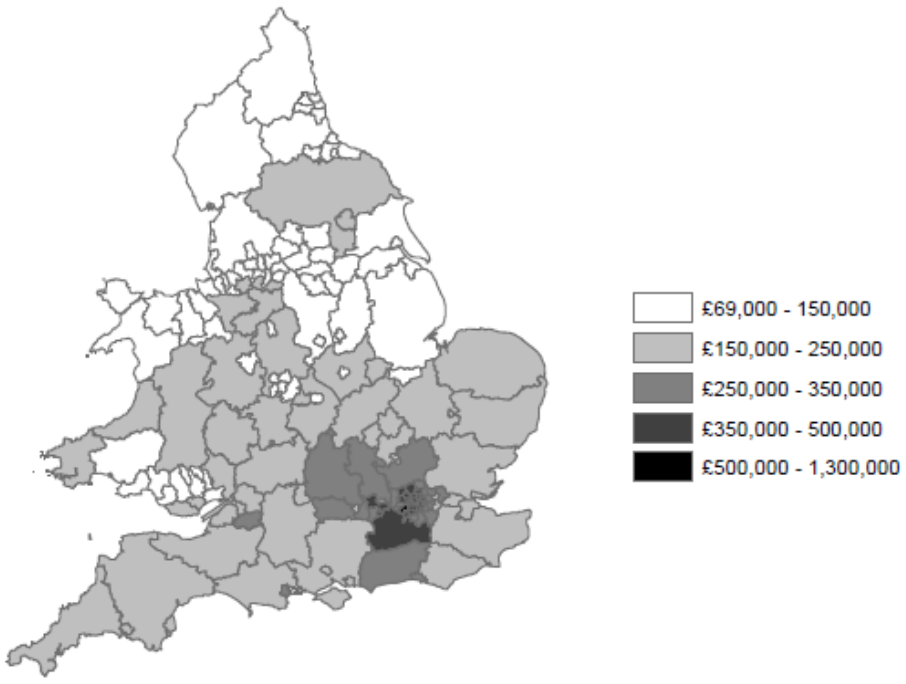
The local authorities in my sample do not exactly match the LPAs in Hilber and Vermeulen (2015), because the Land Registry house price index is available at a lower level of disaggregation than the mix-adjusted house price index used in their paper. In cases where there is no match, I take the average of the house price-earnings elasticities for all LPAs in a given local authority. Because the measures of supply constraints are standardised, it is possible to obtain negative elasticities for some local authorities, as shown in Figure 7.

Figure 1. Evolution of average house prices and share of foreign transactions



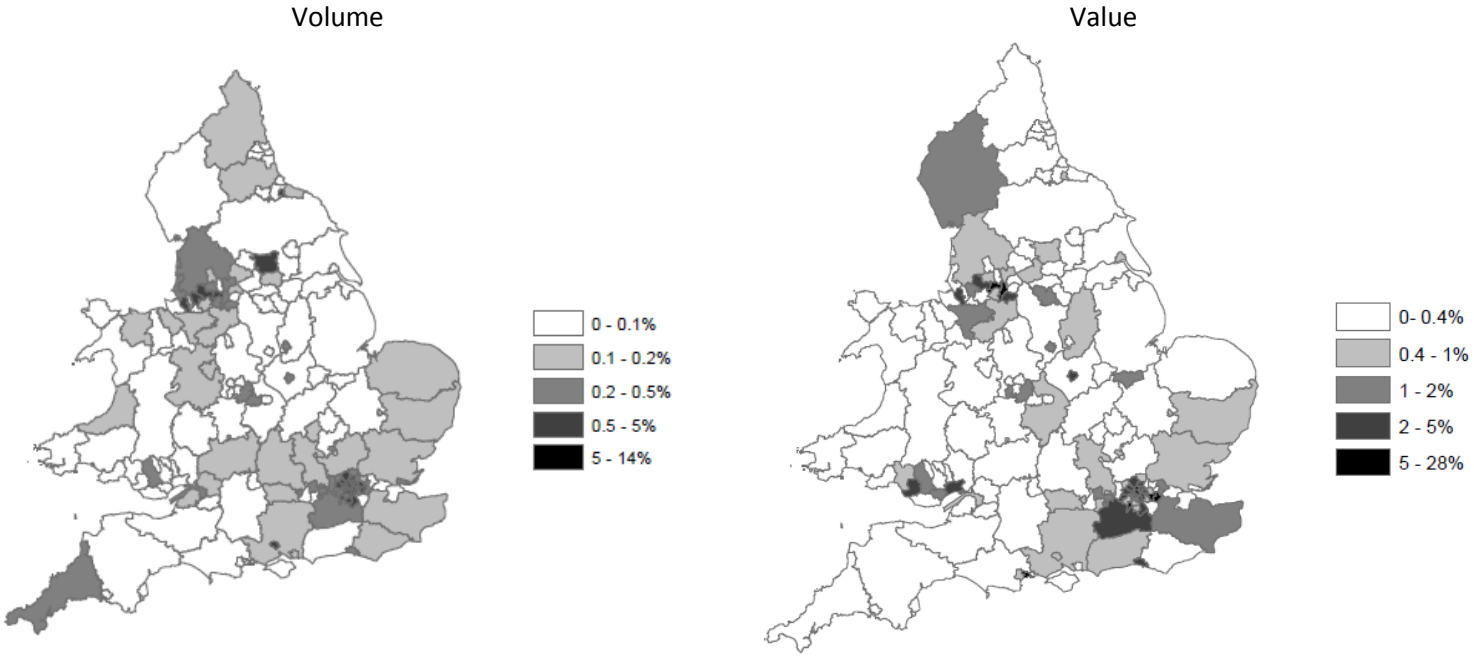
Source: Land Registry house price index, Land Registry Overseas Companies Dataset and Private Eye offshore companies dataset (for values).

Figure 2. Average house prices in England and Wales, 2014



Source: Land Registry house price index.

Figure 3. Average share of residential transactions in England and Wales registered to a foreign-owned company, 2014



Source: Land Registry Overseas Companies Dataset and Private Eye offshore companies dataset (for values).

Table 1. Local authorities with the largest share of foreign transactions, 2014

Local authority	Foreign transactions - volume (%)	House prices (£)	Local authority	Foreign transactions - value (%)	House prices (£)
Westminster	13.1	922,702	Westminster	27.2	922,702
Kensington and Chelsea	12.1	1,288,406	Kensington and Chelsea	23.5	1,288,406
Salford	3.9	116,588	Greenwich	14.4	298,352
Camden	3.6	756,487	Salford	13.1	116,588
Liverpool	2.6	111,859	Bournemouth	7.6	198,537
Hammersmith	2.6	721,100	Manchester	6.4	130,355
Tower Hamlets	2.4	382,242	Camden	6.1	756,487
Lambeth	1.8	433,625	Bexley	5.7	244,459
Leeds	1.7	146,745	Kingston Upon Thames	5.2	406,106
Barnet	1.4	430,363	Leicester	4.7	129,463

Source: Land Registry house price index, Land Registry Overseas Companies Dataset and Private Eye offshore companies dataset (for values).

Table 2. Countries of incorporation with the largest shares of investment, 2014

Country	Share of overseas investment in 2014 (in volume)
British Virgin Islands	33.5
Guernsey	19.4
Jersey	11.5
Isle of Man	10.1
Seychelles	2.9
Hong Kong	2.4
Luxembourg	2.1
Cyprus	1.7
Singapore	1.4
Panama	1.4

Source: Land Registry Overseas Companies Dataset.

Table 3. Descriptive statistics (1999 – 2014)

Variable	Observations	Mean	SD	Min	Max
Δ log house price index	2,580	0.069	0.091	-0.180	0.406
Δ total dwellings	1,963	0.007	0.010	-0.221	0.334
Share dwellings with no usual residents[(a)]	173	0.045	0.024	0.019	0.207
Share households in owner-occupied accommodation[(a)]	173	0.621	0.112	0.238	0.797
Share foreign transactions - volume	2,752	0.003	0.011	0.000	0.214
Share foreign transactions - value	2,752	0.007	0.028	0.000	0.499
Unemployment rate	2,386	0.069	0.028	0.011	0.180
Benefits rate	2,752	0.149	0.049	0.044	0.331
House price - earnings elasticity[(b)]	2,411	0.175	0.347	-0.492	1.151

(a) Cross-section from the 2011 Census.

(b) Author's calculations, based on coefficients and data in Hilber and Vermeulen (2015).

Table 4. House prices and foreign transactions

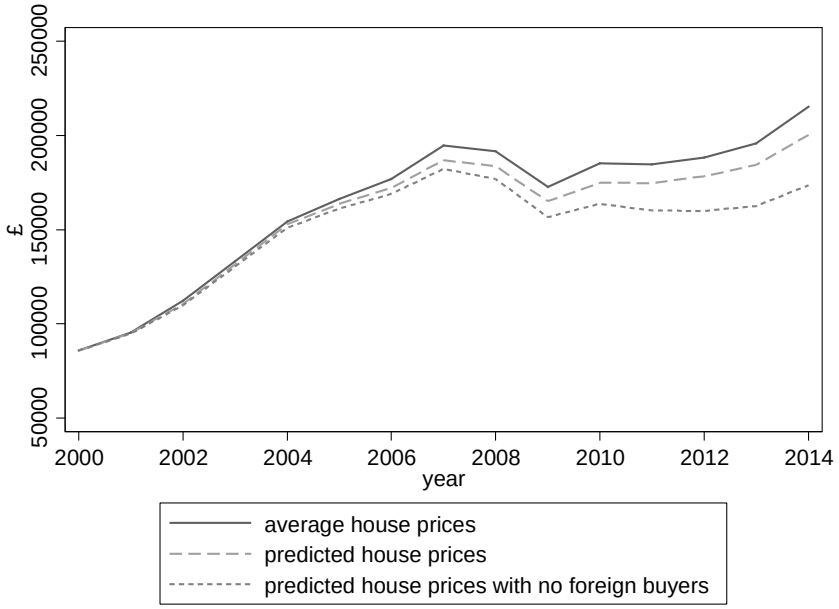
	Δ log house prices			
	(1)	(2)	(3)	(4)
Panel A. OLS				
Share foreign transactions - volume	0.647***	0.659***		
	(0.123)	(0.132)		
Share foreign transactions - value			0.161***	0.160**
			(0.060)	(0.066)
Lagged Δ log house price	0.510***	0.446***	0.520***	0.460***
	(0.011)	(0.017)	(0.011)	(0.017)
Lagged Δ unemployment rate		-0.085*		-0.101**
		(0.048)		(0.049)
Lagged Δ benefits rate		-1.139***		-1.071***
		(0.289)		(0.291)
R^2 within	0.858	0.862	0.857	0.860
Panel B. IV				
Share foreign transactions - volume	2.166***	2.116***		
	(0.828)	(0.787)		
Share foreign transactions - value			1.394***	1.427***
			(0.535)	(0.537)
Lagged Δ log house price	0.467***	0.388***	0.456***	0.361***
	(0.014)	(0.022)	(0.019)	(0.028)
Lagged Δ unemployment rate		-0.050		-0.099
		(0.048)		(0.067)
Lagged Δ benefits rate		-1.493***		-1.795***
		(0.294)		(0.343)
First-stage coefficients	-0.018***	-0.017***	-0.028***	-0.025***
	(0.006)	(0.006)	(0.010)	(0.008)
Kleinbergen-Paap Wald rk F-statistic	7.797	8.065	8.364	8.695
Anderson-Rubin Wald test	49.826***	48.912***	49.826***	48.912***
Observations	2,408	2,005	2,408	2,005
Number of clusters	172	172	172	172

Notes: Panel A reports OLS coefficients from regressions of the log change in house prices on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 2) and in value (columns 3 and 4). Panel B reports coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. The sample includes 172 local authorities in England and Wales for the period 1999-2014. Regressions include local authority and year fixed effects and a lagged dependent variable. Standard errors are clustered by local authority.

Stock-Yogo weak identification critical values: 16.38 (10%), 8.96 (15%), 6.66 (20%) and 5.53 (25%).

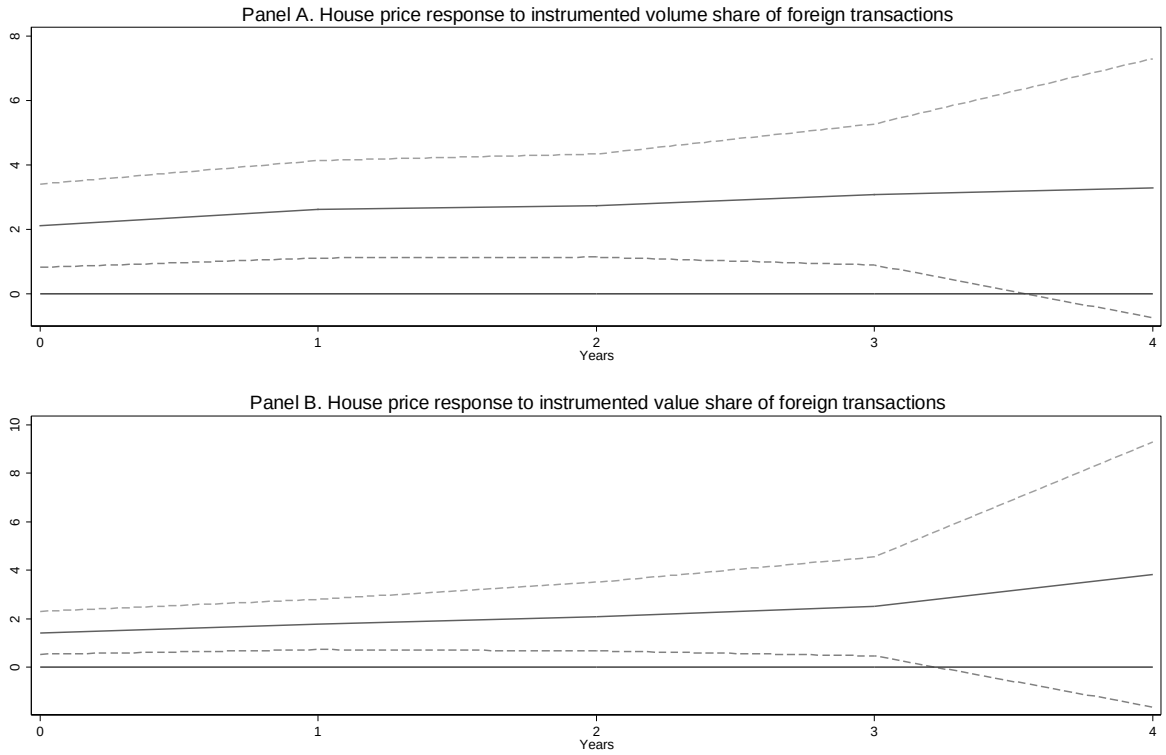
***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Figure 4. Counterfactual analysis



Notes: The figure reports the evolution of average house prices for 172 local authorities in England and Wales (solid line), the evolution of average house prices predicted by the model with the actual observed value share of foreign transactions (dashed line) and the evolution of average house prices predicted by the model when the value share of foreign transactions is set to zero in all local authorities (short dashed line). The coefficients used in the predictions are from an IV regression of the log change in house prices on the share of foreign transactions in volume. The share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). The sample includes 172 local authorities in England and Wales for the period 1999-2014. The regression includes local authority and year fixed effects and a lagged dependent variable.

Figure 5. House prices: impulse responses to instrumented shock to share of foreign transactions
(dashed lines are 90 percent confidence bands)



Notes: The figure reports estimated coefficients and 90 percent confidence interval from local projection instrumental variables (LP-IV) equations, which look at the effect of an increase in the share of foreign investment (in volume and in value) on house price growth for four years after the shock. The share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). The sample includes 172 local authorities in England and Wales for the period 1999-2014. The regression includes local authority and year fixed effects, a lagged dependent variable and lagged changes in the unemployment rate and in the benefits rate.

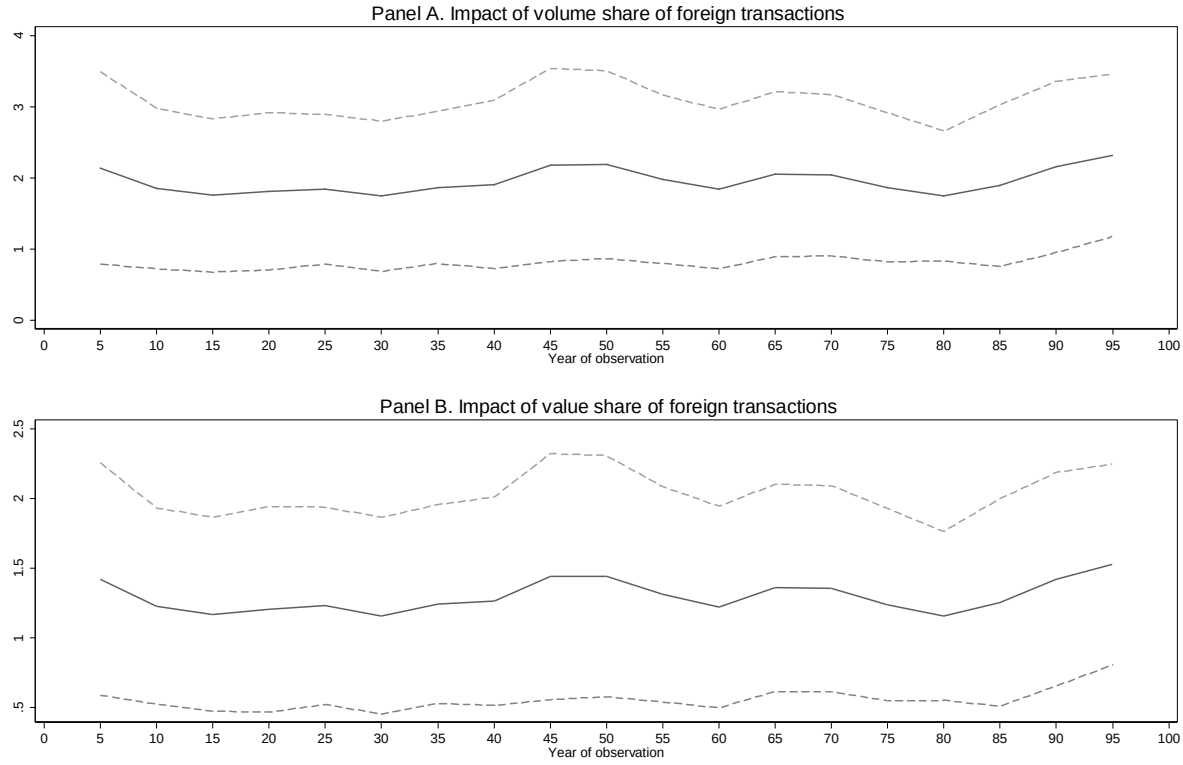
Table 5. House prices and foreign transactions – impact on different percentiles of the distribution of house prices

	Share foreign transactions			
	volume		value	
Dependent variable – percentile of distribution of house prices	(1)	(2)	(3)	(4)
Panel A. OLS				
5th percentile	0.814***	0.784***	0.175**	0.185**
	(0.198)	(0.163)	(0.078)	(0.084)
10th percentile	0.837***	0.834***	0.202**	0.210**
	(0.192)	(0.184)	(0.094)	(0.104)
25th percentile	0.772***	0.808***	0.160*	0.167*
	(0.164)	(0.189)	(0.082)	(0.093)
50th percentile	0.818***	0.864***	0.200***	0.211***
	(0.165)	(0.164)	(0.064)	(0.073)
75th percentile	1.020***	1.064***	0.254***	0.264***
	(0.147)	(0.155)	(0.078)	(0.088)
90th percentile	1.279***	1.270***	0.328***	0.317***
	(0.196)	(0.195)	(0.108)	(0.117)
95th percentile	1.597***	1.556***	0.401***	0.378***
	(0.223)	(0.199)	(0.128)	(0.137)
Panel B. IV				
5th percentile	2.053**	2.139***	1.314***	1.423***
	(0.817)	(0.822)	(0.491)	(0.508)
10th percentile	1.712***	1.852***	1.092***	1.229***
	(0.662)	(0.688)	(0.400)	(0.429)
25th percentile	1.669***	1.840***	1.069***	1.230***
	(0.606)	(0.639)	(0.388)	(0.432)
50th percentile	2.087***	2.186***	1.331***	1.444***
	(0.776)	(0.803)	(0.492)	(0.527)
75th percentile	1.945***	1.867***	1.246***	1.239***
	(0.687)	(0.638)	(0.432)	(0.420)
90th percentile	2.465***	2.156***	1.572***	1.422***
	(0.850)	(0.733)	(0.524)	(0.467)
95th percentile	2.754***	2.316***	1.757***	1.527***
	(0.865)	(0.695)	(0.529)	(0.439)
Controls	No	Yes	No	Yes
Observations	2,408	2,005	2,408	2,005
Number of clusters	172	172	172	172

Notes: Panel A reports OLS coefficients from regressions of the log change of different percentiles of the distribution of house prices on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 2) and in value (columns 3 and 4). Panel B reports coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). The sample includes 172 local authorities in England and Wales for the period 1999-2014. Regressions include local authority and year fixed effects and a lagged dependent variable. Controls include lagged changes in the unemployment rate and in the benefits rate. Standard errors are clustered by local authority.

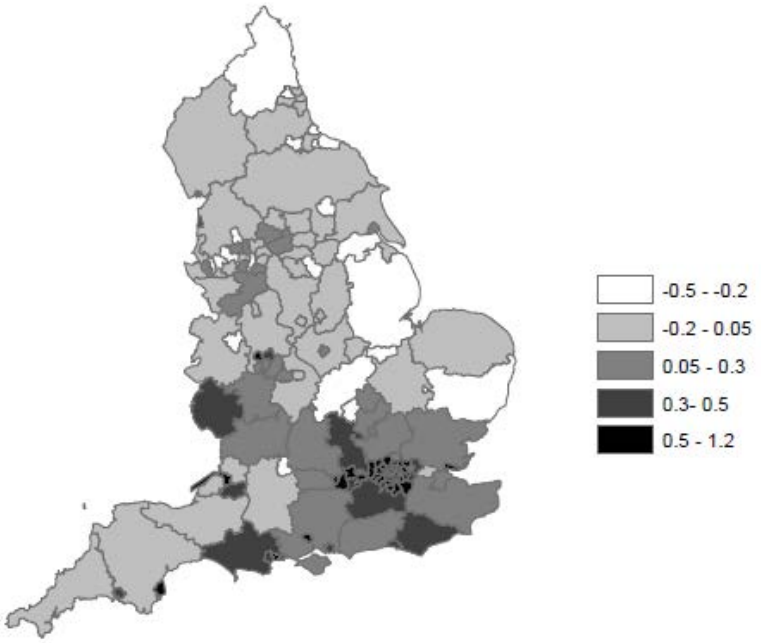
***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Figure 6. Effect of foreign transactions across the distribution of house prices
(dashed lines are 90 percent confidence bands)



Notes: The figures report the estimated IV regression coefficients and 90 percent confidence interval from a regression of the log change in different percentile of the distribution of house prices on the share of foreign transactions in volume and in value. The share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). The sample includes 172 local authorities in England and Wales for the period 1999-2014. Regressions include local authority and year fixed effects, lagged changes in the unemployment rate and in the benefits rate and a lagged dependent variable.

Figure 7. House price-earnings elasticity



Source: Author's calculations, based on coefficients and data in Hilber and Vermeulen (2015). See the appendix for more details on the calculation of the elasticities. Local authorities in England only.

Table 6. House prices and foreign transactions – effect across different quartiles of the distribution of house price-earnings elasticity

	Δ log house prices			
	volume share		value share	
	(1)	(2)	(3)	(4)
Panel A. OLS				
Quartile 1	-0.405	-0.166	-0.035	-0.025
	(0.626)	(0.705)	(0.022)	(0.030)
Quartile 2	-0.171	-0.136	-0.017	-0.007
	(0.162)	(0.135)	(0.032)	(0.031)
Quartile 3	1.033*	1.150**	0.380**	0.411**
	(0.602)	(0.559)	(0.164)	(0.159)
Quartile 4	0.298***	0.299***	0.156***	0.155***
	(0.078)	(0.098)	(0.034)	(0.038)
Panel B. IV				
Quartile 1	49.926	118.252	0.718	0.642
	(103.028)	(489.064)	(0.912)	(0.728)
Quartile 2	-5.942	-0.210	-0.500	-0.018
	(11.022)	(8.408)	(0.913)	(0.737)
Quartile 3	5.940***	6.370***	4.073***	3.812***
	(2.052)	(2.060)	(1.443)	(1.064)
Quartile 4	0.712**	0.652**	0.496**	0.483*
	(0.325)	(0.330)	(0.251)	(0.263)
Controls	No	Yes	No	Yes

Notes: Panel A reports OLS coefficients from regressions of the log change in house prices on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 2) and in value (columns 3 and 4). Panel B reports second-stage coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. Local authorities are classified into four groups, corresponding to each quartile of the distribution of the house price-earnings elasticity. Regressions are run separately for each of these four groups of local authorities. The sample includes 150 local authorities in England for the period 1999-2014. Regressions include local authority and year fixed effects and a lagged dependent variable. Controls include lagged changes in the unemployment rate and in the benefits rate. Standard errors are clustered by local authority.

***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Table 7. House prices and foreign transactions – alternative samples

	Δ log house prices			
	London LAs		High transaction LAs	
	(1)	(2)	(3)	(4)
Panel A. OLS				
Share foreign transactions - volume	0.281***		0.387***	
	(0.087)		(0.122)	
Share foreign transactions - value		0.160***		0.199***
		(0.035)		(0.045)
Lagged Δ log house price	0.321***	0.314***	0.413***	0.408***
	(0.075)	(0.072)	(0.036)	(0.034)
Lagged Δ unemployment rate	-0.026	-0.037	-0.060	-0.084
	(0.065)	(0.064)	(0.141)	(0.144)
Lagged Δ benefits rate	-0.755	-0.801	-1.832**	-1.817**
	(0.501)	(0.501)	(0.850)	(0.835)
R^2 within	0.896	0.897	0.781	0.781
Panel B. IV				
Share foreign transactions - volume	0.644**		1.458**	
	(0.301)		(0.623)	
Share foreign transactions - value		0.481*		1.057**
		(0.250)		(0.473)
Lagged Δ log house price	0.264***	0.210***	0.328***	0.251***
	(0.067)	(0.066)	(0.040)	(0.049)
Lagged Δ unemployment rate	-0.005	-0.027	0.033	-0.041
	(0.058)	(0.063)	(0.141)	(0.173)
Lagged Δ benefits rate	-1.011**	-1.294**	-2.641***	-3.016***
	(0.516)	(0.545)	(0.928)	(1.058)
First-stage coefficients	-0.032***	-0.043***	-0.027***	-0.037***
	(0.011)	(0.015)	(0.009)	(0.013)
Kleinbergen-Paap Wald rk F-statistic	8.627	8.129	8.040	8.021
Anderson-Rubin Wald test	6.003**	6.003**	16.798***	16.798***
Observations	400	400	338	338
Number of clusters	32	32	26	26

Notes: Panel A reports OLS coefficients from regressions of the log change in house prices on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 3) and in value (columns 2 and 4). Panel B reports coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. The sample covers the period 1999-2014 and is restricted to 32 local authorities in London (columns 1 and 2) and to 26 local authorities where the value share of foreign transactions in 2014 was higher than 0.5% (columns 3 and 4). Regressions include local authority and year fixed effects and a lagged dependent variable. Standard errors are clustered by local authority.

Stock-Yogo weak identification critical values: 16.38 (10%), 8.96 (15%), 6.66 (20%) and 5.53 (25%).

***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Table 8. House prices and foreign transactions – excluding transactions registered to companies incorporated in Guernsey, Jersey and the Isle of Man

	Δ log house prices			
	(1)	(2)	(3)	(4)
Panel A. OLS				
Share foreign transactions - volume	0.808***	0.813***		
	(0.201)	(0.219)		
Share foreign transactions - value			0.172*	0.164*
			(0.090)	(0.093)
Lagged Δ log house price	0.511***	0.447***	0.522***	0.464***
	(0.012)	(0.017)	(0.012)	(0.018)
Lagged Δ unemployment rate		-0.083*		-0.095*
		(0.048)		(0.049)
Lagged Δ benefits rate		-1.131***		-1.055***
		(0.288)		(0.293)
R^2 within	0.858	0.862	0.856	0.860
Panel B. IV				
Share foreign transactions - volume	2.690***	2.591***		
	(1.000)	(0.929)		
Share foreign transactions - value			1.860**	1.874**
			(0.749)	(0.736)
Lagged Δ log house price	0.468***	0.391***	0.460***	0.370***
	(0.015)	(0.021)	(0.021)	(0.029)
Lagged Δ unemployment rate		-0.045		-0.040
		(0.048)		(0.072)
Lagged Δ benefits rate		-1.463***		-1.847***
		(0.279)		(0.366)
First-stage coefficients	-0.014***	-0.014***	-0.021***	-0.019***
	(0.005)	(0.005)	(0.007)	(0.007)
Kleinbergen-Paap Wald rk F-statistic	8.464	8.948	7.782	8.252
Anderson-Rubin Wald test	49.826***	48.912***	49.826***	48.912***
Observations	2,408	2,005	2,408	2,005

Number of clusters	172	172	172	172

Notes: Panel A reports OLS coefficients from regressions of the log change in house prices on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 2) and in value (columns 3 and 4), excluding transactions registered to companies incorporated in Guernsey, Jersey and the Isle of Man. Panel B reports coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. The sample includes 172 local authorities in England and Wales for the period 1999-2014. Regressions include local authority and year fixed effects and a lagged dependent variable. Standard errors are clustered by local authority.

Stock-Yogo weak identification critical values: 16.38 (10%), 8.96 (15%), 6.66 (20%) and 5.53 (25%).

***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Table 9. House prices and foreign transactions – alternative instrument

	Δ log house prices			
	(1)	(2)	(3)	(4)
IV – instrument based on economic policy uncertainty abroad				
Share foreign transactions - volume	2.008**	1.391**		
	(0.859)	(0.651)		
Share foreign transactions - value			0.973***	0.680**
			(0.374)	(0.303)
Lagged Δ log house price	0.471***	0.417***	0.478***	0.419***
	(0.013)	(0.025)	(0.015)	(0.025)
Lagged Δ unemployment rate		-0.068		-0.100*
		(0.048)		(0.053)
Lagged Δ benefits rate		-1.317***		-1.368***
		(0.321)		(0.338)
First-stage coefficients	0.002***	0.002***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Kleinbergen-Paap Wald rk F-statistic	6.771	6.774	10.208	11.085
Anderson-Rubin Wald test	35.250***	14.038***	35.250***	14.038***
Observations	2,408	2,005	2,408	2,005
Number of clusters	172	172	172	172

Notes: The table reports IV coefficients from regressions of the log change in house prices on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 2) and in value (columns 3 and 4). The share of foreign transactions is instrumented with a variable based on economic policy uncertainty abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. The sample includes 172 local authorities in England and Wales for the period 1999-2014. Regressions include local authority and year fixed effects and a lagged dependent variable. Standard errors are clustered by local authority.

Stock-Yogo weak identification critical values: 16.38 (10%), 8.96 (15%), 6.66 (20%) and 5.53 (25%).

***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Table 10. Housing stock and foreign transactions

	Δ log dwelling stock			
	(1)	(2)	(3)	(4)
Panel A. OLS				
Share foreign transactions - volume	-0.005	-0.006		
	(0.015)	(0.017)		
Share foreign transactions - value			-0.009	-0.010
			(0.008)	(0.008)
Lagged Δ log dwelling stock	-0.061***	-0.075***	-0.061***	-0.075***
	(0.020)	(0.022)	(0.020)	(0.022)
Lagged Δ unemployment rate		-0.006		-0.006
		(0.009)		(0.009)
Lagged Δ benefits rate		-0.044		-0.043
		(0.126)		(0.127)
R^2 within	0.025	0.027	0.026	0.028
Panel B. IV				
Share foreign transactions - volume	-0.072	-0.071		
	(0.107)	(0.107)		
Share foreign transactions - value			-0.049	-0.049
			(0.071)	(0.074)
Lagged Δ log dwelling stock	-0.061***	-0.075***	-0.062***	-0.076***
	(0.021)	(0.023)	(0.021)	(0.023)
Lagged Δ unemployment rate		-0.008		-0.005
		(0.010)		(0.009)
Lagged Δ benefits rate		-0.045		-0.040
		(0.126)		(0.123)
First-stage coefficients	-0.017***	-0.016***	-0.025***	-0.023***
	(0.006)	(0.006)	(0.009)	(0.009)
Kleinbergen-Paap Wald rk F-statistic	7.616	7.960	7.832	7.535
Anderson-Rubin Wald test	0.516	0.478	0.516	0.478
Observations	1,800	1,613	1,800	1,613
Number of clusters	150	150	150	150

Notes: Panel A reports OLS coefficients from regressions of the log change in the stock of dwellings on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 2) and in value (columns 3 and 4). Panel B reports coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. The sample includes 150 local authorities in England for the period 2002-2014. Regressions include local authority and year fixed effects and a lagged dependent variable. Standard errors are clustered by local authority.

Stock-Yogo weak identification critical values: 16.38 (10%), 8.96 (15%), 6.66 (20%) and 5.53 (25%).

***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Table 11. Local authorities with the largest share of vacant homes, 2011

Local authority	Vacant homes (%)
City of London	20.7
Gwynedd (Wales)	14.1
Pembrokeshire (Wales)	12.5
Westminster	11.9
Cornwall	11.3
Anglesey (Wales)	10.5
Kensington and Chelsea	10.5
Isle of Wight	9.7
Ceredigion (Wales)	9.0
Conwy (Wales)	8.9

Notes: The share of vacant homes measures the percentage of household spaces with no usual residents (from the 2011 Census).

Table 12. Effect on share of household spaces with no usual residents and share of households in owner-occupied accommodation

	Share of household spaces with no usual residents		Share of households in owner-occupied accommodation	
	(1)	(2)	(3)	(4)
Panel A. OLS				
Share foreign transactions - volume	0.245**		-2.511***	
	(0.107)		(0.506)	
Share foreign transactions - value		0.184***		-1.069***
		(0.036)		(0.264)
R^2 within	0.074	0.180	0.254	0.200
Panel B. IV				
Share foreign transactions - volume	-0.124		-5.592***	
	(0.248)		(1.834)	
Share foreign transactions - value		-0.065		-2.957***
		(0.135)		(1.120)
First-stage coefficients	0.003***	0.006**	0.003***	0.006**
	(0.001)	(0.002)	(0.001)	(0.002)
Kleinbergen-Paap Wald rk F-statistic	8.591	6.514	8.591	6.514
Anderson-Rubin Wald test	0.340	0.340	94.259***	94.259***
Observations	172	172	172	172
Number of clusters	172	172	172	172

Notes: Panel A reports OLS coefficients from regressions of the share of household spaces with no usual residents and the share of households in owner-occupied accommodation on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 3) and in value (columns 2 and 4). Panel B reports coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic policy uncertainty abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. The sample includes 172

local authorities in England and Wales in 2011 (Census data). Standard errors are clustered by local authority.

Stock-Yogo weak identification critical values: 16.38 (10%), 8.96 (15%), 6.66 (20%) and 5.53 (25%).

***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Table A1. Data sources

Variable	
House price index	Land Registry house price index
Average house prices	Land Registry house price index
Percentiles of the distribution of house prices	Land Registry Price Paid Data (PPD)
Dwelling stock	Department for Communities and Local Government (DCLG) Housing statistics Table 125, from 2001, local authorities in England only
Number of vacant dwellings	DCLG Housing statistics Table 615, from 2004, local authorities in England only
Share of household spaces with no usual residents	2011 Census, from ONS Neighbourhood Statistics
Share of households in owner-occupied accommodation	2011 Census, from ONS Neighbourhood Statistics
Share of foreign transactions - volume	Number of residential transactions registered to foreign-owned companies divided by total number of residential transactions Number of foreign transactions: Land Registry Overseas Companies Dataset (OCD) Total number of transactions: Land Registry PPD
Share of foreign transactions - value	Value of residential transactions registered to foreign-owned companies divided by total value of residential transactions Value of foreign transactions: Land Registry OCD and Private Eye offshore companies dataset Total value of transactions: Land Registry PPD
Unemployment rate	Labour Force Survey (until 2003) and Annual Population Survey (from 2004), from Nomis.
Benefits rate	Proportion of working age population receiving any state benefits, from Nomis
House price - earnings elasticity	Hilber and Vermeulen (2015), local authorities in England only
Economic risk index	International Country Risk Guide (ICRG). The index includes: inflation, GDP per head, GDP growth, budget balance and current account as % of GDP. High values of the index denote lower risk.
Economic policy uncertainty index	Baker, Bloom and Davis (2016). The index is based on frequency counts of some key words in newspaper articles. It is available for: Australia, Brazil, Canada, China, France, Germany, India, Ireland, Italy, Japan, Korea, Netherlands, Russia, Spain and the US. High values of the index denote a higher degree of economic policy uncertainty.

Table A2. Housing stock and foreign transactions – effect by house price-earnings elasticity

	Δ log dwelling stock			
	volume share		value share	
	(1)	(2)	(3)	(4)
Panel A. OLS				
Low elasticity	-0.021	-0.030	-0.018	-0.018
	(0.122)	(0.118)	(0.019)	(0.021)
High elasticity	-0.003	-0.004	-0.002	-0.003
	(0.013)	(0.014)	(0.005)	(0.005)
Panel B. IV				
Low elasticity	-15.008	-23.399	-0.462	-0.506
	(14.505)	(27.800)	(0.388)	(0.414)
High elasticity	0.000	0.011	0.000	0.008
	(0.032)	(0.033)	(0.023)	(0.026)
Controls	No	Yes	No	Yes

Notes: Panel A reports OLS coefficients from regressions of the log change in the stock of dwellings on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 2) and in value (columns 3 and 4). Panel B reports second-stage coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. Local authorities are split by the median value of the house price-earnings elasticity. Regressions are run separately for each of these two groups of local authorities. The sample includes 150 local authorities in England for the period 2002-2014. Regressions include local authority and year fixed effects and a lagged dependent variable. Controls include lagged changes in the unemployment rate and in the benefits rate. Standard errors are clustered by local authority.

***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

Table A3. Vacant dwellings and foreign transactions

	Δ log short-term vacant dwellings		Δ log long-term vacant dwellings	
	(1)	(2)	(3)	(4)
Panel A. OLS				
Share foreign transactions - volume	1.093**	1.076**	-0.492	-0.455
	(0.427)	(0.432)	(0.520)	(0.527)
Share foreign transactions - value	0.150	0.156	-0.154	-0.158
	(0.169)	(0.168)	(0.269)	(0.266)
Panel B. IV				
Share foreign transactions - volume	-0.431	-0.340	-1.141	-1.001
	(2.105)	(2.078)	(2.242)	(2.230)
Share foreign transactions – value	-0.340	-0.271	-0.884	-0.785
	(1.691)	(1.679)	(1.698)	(1.717)
Controls	No	Yes	No	Yes
Observations	1,348	1,348	1,346	1,346
Number of clusters	150	150	150	150

Notes: Panel A reports OLS coefficients from regressions of the log change in the stock of short-term and long-term vacant dwellings on the share of residential transactions registered to foreign-owned companies in volume (columns 1 and 2) and in value (columns 3 and 4). Panel B reports second-stage coefficients of an IV specification in which the share of foreign transactions is instrumented with a variable based on economic shocks abroad (see text for details on the construction of the instrument). All variables are defined in appendix Table A1. The sample includes 150 local authorities in England for the period 2005-2014. Regressions include local authority and year fixed effects and a lagged dependent variable. Controls include lagged changes in the unemployment rate and in the benefits rate. Standard errors are clustered by local authority.

***Significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.