Essays on Prices, Wealth, and Mobility

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Declaration

I, Andrew Aitken, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Signed ..... (Andrew Aitken)

Date:

To Anna

Abstract

This thesis examines how economic shocks, specifically exogenous shocks from immigration and developments in the housing market, affect the price people pay for housing, whether or not they move, and whether who they vote for in an election is affected. I make use of two sources of shocks, one from a rapid increase in immigration to the UK since the mid-1990s, and the other from a rapid increase in average house prices, also from the mid-1990s.

In the first chapter I consider whether there is any evidence of a causal relationship between the increase in immigrants and the increase in housing rents and prices in the UK since the mid-1990s. The analysis uses the spatial correlation approach and a properly specified housing demand equation to estimate the causal impact of immigration on house prices and rents. Because the majority of immigrants rent housing rather than own on arrival it is important to study the first order effects on the rental market. I find evidence of a positive effect of immigration on housing rents, and significant negative effects of immigration on house prices.

In the second chapter, I examine whether natives and earlier cohorts of immigrants are displaced from particular local labour markets in response to immigrant inflows. Whether or not immigrants displace natives has important implications for understanding the operation of labour markets. I find strong evidence of native displacement in aggregate, however I also find evidence of sorting by natives and immigrants into different areas by skill time; for example high-skilled natives and high-skilled immigrants appear to be attracted to each over, suggesting that at least some immigrants and natives can be thought of as complements in the labour market.

The third chapter examines the consequences of rapidly increasing house prices on the political preferences of voters. I show that positive unanticipated housing wealth shocks for homeowners causes a significant increase in the likelihood of voting for the Conservative Party. I also present evidence that suggests that housing wealth shocks lead homeowners to hold more conservative economic and social views.

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Chapter 1

Introduction

This thesis examines how economic shocks, specifically exogenous shocks from immigration and developments in the housing market, affect the price people pay for housing, whether or not they move, and whether who they vote for in an election is affected.

Exogenous shocks are shocks that are unpredictable or unanticipated that can affect individuals, as well as firms, communities, cities, or regions, for example, and that come from 'outside' the individual, community or area, rather than from within (i.e. endogenous). The response of individuals or areas to shocks plays a central role in our understanding of the spatial organisation of households and firms, which in turn has been shown to have important implications for economic outcomes, such as productivity, or inequality. Blanchard and Katz (1992) is a seminal paper in economic geography that studies how regions evolve in response to economic shocks such as economic downturns.

Exogenous, unanticipated shocks are rarely observed, and this therefore makes efforts to identify their effects difficult. In this thesis I make use of two sources of exogenous shocks, one from a rapid increase in immigration to the UK since the mid-1990s, and the other from a rapid increase in average house prices, also from the mid-1990s. In chapter two I consider whether there is any evidence of a causal relationship between the increase in immigrants and the increase in house prices in the UK since the mid-1990s. Rising immigration has led to concern that this may put pressure on the housing market, leading to higher house prices and housing rents. In chapter three I consider whether the inflow of immigrants into local authorities across the UK has caused natives to be displaced, or conversely attracted to areas that immigrants locate in. Finally, in chapter four, I examine whether unanticipated housing wealth shocks have any affect on the voting behaviour of individuals' in terms of a greater preference for left or right parties, and on whether it affects the decision to vote or not.

A significant literature in the economics of migration has explored the effect that immigrants have on local labour markets, often exploiting exogenous shocks such as the Mariel boat lift in the case of Card (1990). Generally, economists have found relatively small, if any, effects of immigration on native wages or employment (see for example, Card (2001, 2007, 2005), Dustmann et al. (2005), Dustmann et al. (2012), Manacorda et al. (2012)). Chapter two argues that the housing market is an important arena in which to examine the effects of immigration, as an upward-sloping supply curve and new immigrant demand could be expected to push up house prices and rents in areas where immigrants settle. A key feature of the housing market that

makes it different from the labour market is the durable nature of the housing stock - it can neither be built or removed quickly (Glaeser and Gyourko, 2005), therefore, the price response could be expected to be much greater in the housing market than in the labour market.

The analysis in Chapter two uses a properly specified housing demand equation, embedded in the spatial correlation approach, to examine how immigration affects the sales prices and rents of houses across 170 local authorities in England and Wales between 1996 and 2010. The major contribution of this Chapter to the literature is to be the first to consider the affect of immigrant inflows on the rental sector. Because the majority of immigrants rent rather than own on arrival it is important to study the first order effects on the rental market. I control for a range of labour market and housing market conditions, including native mobility. Although the rapid increase in immigrants to the UK can be seen as a shock to the UK, where precisely immigrants choose to live may be endogenous to local economic conditions, and I therefore construct an instrumental variable making use of the historical location patterns of earlier waves of migrants, to overcome this problem. I that that an inflow of immigrants equal to 1% of the initial population of a local area over a three-year period is associated with a 0.14% - 0.18% increase in average housing rent in the same three-year period. This is a very small increase and is somewhat puzzling given that most immigrants are likely to rent on first arrival in the UK. Consistent with earlier work by Sá (2014), I also find statistically significant evidence of a reduction in average house prices by immigrants. An inflow of immigrants equal to 1% of the population of a local area over a three-year period reduces house prices by about

1.3 to 1.6% in the period 2003-2010, however there is no evidence of any significant affect on house prices for the period 1996-2002.

An important assumption underlying the results in chapter two, and many other studies of the labour market consequences of migration, is that the native population does not respond to immigrant inflows by moving out of an area that has experienced a high immigrant inflow. In chapter three I analyse this question in the context of local labour markets in the UK. Whether or not natives move in response to immigrant inflows also has important welfare consequences (negative if they did not otherwise plan to move), and has implications for the growth and decline of cities and regions, particularly if immigrants of particular skill types locate in similar areas, for example high skilled immigrants and high skilled natives in large cities such as London.

A standard model of labour market displacement suggests that an immigrant shock to a local labour market may set in motion a process of spatial arbitrage, whereby immigrants increase the local labour supply, lowering wages relative to other markets, and creating an incentive for natives to move to higher wage areas. Alternatively, an immigrant inflow may attract natives if the economic return to locating near immigrants is higher because of externalities or skill complementarities, for example. Using the spatial correlation approach, and instrumenting for immigrant inflows, I examine the empirical evidence for displacement or attraction. In aggregate my results suggest that natives move out of a local area when immigrants move in, at a rate of 20-30 for every 100 immigrants. However these results mask a degree of sorting of immigrants and natives of different skill types. For example disaggre-

gating by skill (based on position in the distribution of wages, or age of leaving full-time education), I find a degree of attraction between high-skilled immigrants and high-skilled natives, while also finding a negative association between low-skilled immigrants and high-skilled natives.

In chapter four I consider a possible consequence of the rapid increase in house prices that has occurred across large parts of the UK since the mid-1990s. This is the first work to consider how housing wealth might affect peoples' voting behaviour and economic and social attitudes, and unlike income which can fluctuate from year-to-year, wealth (of which housing is usually a major component) gives a more complete picture of an individuals' power over resources in society. The increase in house prices over this period represents a large increase in housing wealth, which to the extent that it is realisable through for example, equity withdrawal, moving house, or use as collateral, represents a significant increase in wealth for many individuals and households. The role of wealth in economic relations and society generally is coming under increasing scrutiny, particularly wealth inequality. Piketty and Saez (2003) and Atkinson et al. (2011), for example, show that the share of income accruing to the top one percent has grown over time. Rajan (2010) has argued that this growing inequality in the US put pressure on politicians to ease the supply of credit prior to the Great Recession. In a democracy, voting for a particular political party is one of the most important decisions people can make, and while there is a significant literature on the effects of campaign financing for example, on electoral outcomes, relatively little attention has been paid to the role of economic factors in affecting people's choices in the ballot box. Among others, both Bartels (2008) and

Stiglitz (2012), have emphasised the links between economic inequality and political inequality.

Until recently the UK has lacked any household surveys of wealth, making it difficult to study the influence of wealth on a wide of range of social and economic phenomena. In this chapter I make use of variation in wealth determined by the housing market to identity how household wealth shocks affect political preferences and voter turnout. Homeownership rates in the UK are high, and housing wealth represents the largest share of total household wealth for most people, so it therefore makes sense to consider how changing fortunes in the housing market might affect electoral choices. The rapid increase in house prices occurred differentially across space, and the boom was not confined to solely high income people, as many relatively low-income people who happened to live in high-growth areas also experienced a significant increase in housing wealth.

Using data from the British Household Panel Survey and Understanding Society for the period 1995-2012, I show that an increase in the housing wealth of home owners causes a significant increase in the likelihood of voting for the Conservative Party. I find no evidence of an effect of housing price growth on the voting intentions of renters. In an attempt to explore why increased housing wealth might alter the voting patterns of homeowners I also present evidence suggesting that growth in housing wealth leads homeowners to hold more conservative views on a variety of economic and social issues.

Chapter 2

The effects of Immigration on House Prices and Rents: Evidence from England and Wales

2.1 Introduction

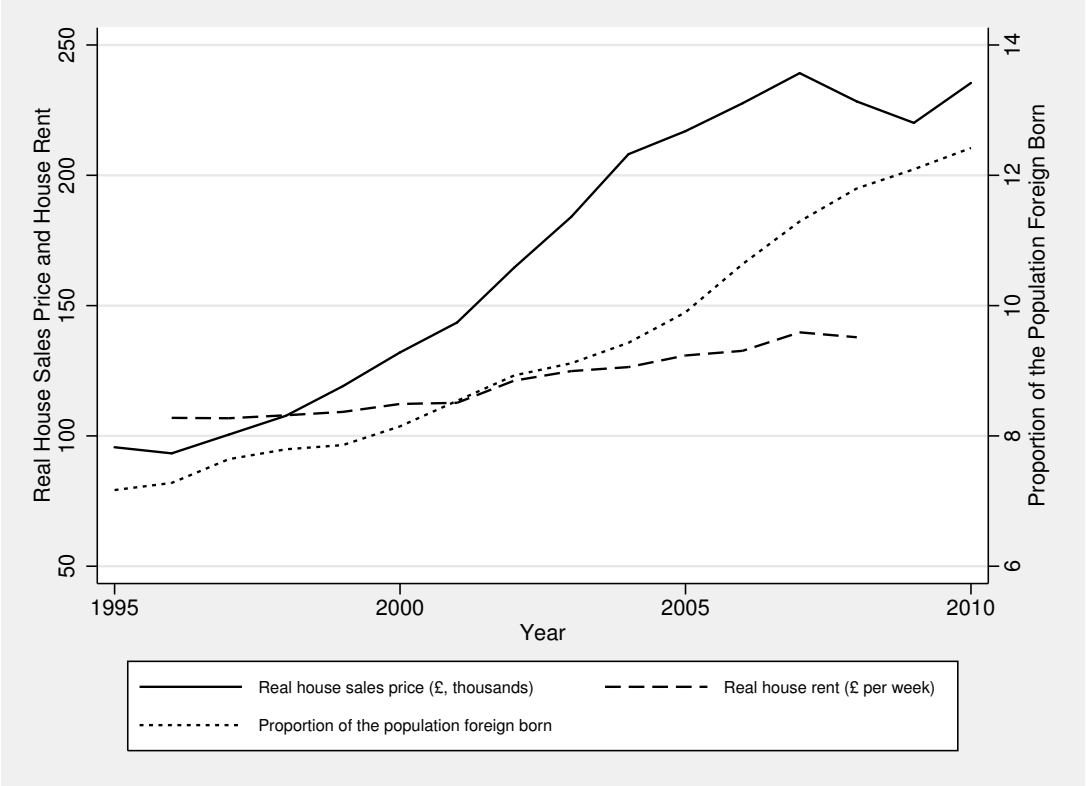
The relationship between rising house prices and immigration[1] [2] has been the subject of recent debate in the United Kingdom, as the proportion of foreign born

[1]Access to the special license version of the Labour Force Survey data used in this study was provided by the UK Data Archive. Access to housing rent data by Daniel Banks at Dataspring is gratefully acknowledged. Comments and advice on this chapter from Jonathan Wadsworth and Arnaud Chevalier are also gratefully acknowledged, as is help with funding from CReAM.

[2]In this chapter the terms foreign-born and immigrant are used interchangeably. The Labour Force Survey collects information on the country of birth, and therefore although some immigrants may in time become British citizens, they are still counted in the LFS as foreign born based on their country of birth. Foreign born refers to anyone not born in the UK (England, Wales, Scotland and Northern Ireland).

in the population has risen from 7 percent in 1996 to approximately 13 percent in 2010, at the same time that real house prices have appreciated by 146 percent across England and Wales. Between 1996 and 2008 private sector average real rents increased by 29 percent. The purpose of this chapter is to examine whether there is a causal relationship between the increase in immigration and the increase in house prices and rents illustrated in 2.1. A recent report of the UK House of Lords has drawn attention to the impact of immigration on housing prices, rents, homelessness, and affordability, however this did not attempt a causal analysis of the data (House of Lords, 2008a,b).

Figure 2.1: Average Real House Prices, House Rents and Proportion of the Population that is Foreign Born



Several previous studies have looked at the effect of immigration on wages in the UK, and have generally found the effect to be small. For example, Dustmann et al. (2003), using the spatial correlation approach, also used in this study, find a small positive effect of international migration on wages across British regions. This is only the second study to examine the effect of immigration on house prices, and the first to examine the effect of immigration on housing rents, which is potentially an important channel through which immigrants affect the housing market, as over 90% of immigrants rent rather than own during the first year of arrival. Concurrently

with this study, Sá (2014) has also studied the effect of immigration on house prices in the UK. She finds that immigration has a negative effect on house prices; her instrumental variable estimates suggest that an immigrant inflow equal to 1% of a local authority's initial population leads to a reduction in house prices of about 1.7%.

In this chapter I use the spatial correlation approach to examine how the proportion of the population that is foreign born affects house prices and rents in the UK.[3] I have an annual panel dataset covering the period 1996-2010 for 170 local authorities in England and Wales, consisting principally of immigration and population data from the Labour Force Survey, house price data from the Land Registry, and house rent data from the Valuation Office Agency (VOA) and Dataspring, in addition to a variety of other local level covariates. I embed the analysis in a standard housing demand model such as that used by Muellbauer and Murphy (1997), and Cameron and Muellbauer (1998). The private housing rental market in the UK has traditionally been relatively small but has grown rapidly in recent years, with the number of households renting privately standing at 3.4 million in 2009-10, a 68 percent increase since 1999. In contrast the number of owner-occupied households has increased by 3 percent from 1999 to 14.5 million in 2009-10.[4]

I examine the relationship between changes in population and changes in house prices and rents in local authorities, as this allows me to control for time-invariant unobservable characteristics of local authorities that may either attract or deter im-

[3]See Dustmann et al. (2008) for an overview of the spatial correlation approach.

[4]Data are from the English Housing Survey. Proportionately, 67 percent of households were owner-occupiers in 2009-10, down from 70 percent in 1999; 16 percent of households were renting privately in 2009-10, up from 10 percent in 1999; 17 percent of households were renting socially in 2009-10, down from 20 percent in 1999.

migrants individuals leading to different house prices and rents. Unobserved characteristics of local areas (such as transport, amenities, education and health facilities, employment opportunities) and unobserved characteristics of the housing stock (such as age, quality, and size of dwellings) will both influence the characteristics of the local population and the housing stock.

2.2 Theory and methodology

The effect of migration on house prices and rents will depend on both the size relative to the native population, and composition of immigrant inflows. Different groups of migrants may demand different types of housing, and may rent or own. Theoretically, an increase in the immigrant population could push up house prices and rents in a local area, particularly if the supply of housing is relatively inelastic, and in the short run at least, housing supply is relatively fixed. However, there is every reason to expect that an influx into a particular area of the native-born population to also push up house prices and rents in that area, therefore it is questionable as to why there should be any distinction between the effect of the native born and foreign born population on house prices and rents.

One possible reason for there to be a differential effect is that immigrants may be more likely to concentrate in particular parts of the country, particularly London and other urban areas, in comparison to the native-born population. This might be because of a desire to live near earlier immigrants from the same country of birth, and therefore immigrants may exhibit a preference for living in immigrant cities as in

the model of Saiz (2007). Immigrants may also demand housing services in particular submarkets. If for example immigrants are on average wealthier than native-born they may demand more expensive housing in already growing areas. In contrast poorer or relatively unskilled immigrants may be more likely to locate in relatively cheaper or declining areas. Immigration may also influence the housing market indirectly by leading to the out-migration of some of the native-born population from particular areas, depressing house prices if the outflow is greater than the immigrant inflow. If immigration has a negative effect on native-born wages (or even just some part of the population, such as the lower-skilled) this could also affect house prices indirectly, given that real income is a major determinant of house prices. However, if as Saiz (2007) points out, the displacement of natives by immigrants is one-for-one then there should be no or little effect on house prices, and therefore a positive effect of immigration on house prices would suggest that any displacement of natives is less than one-for-one. However, even if displacement of natives (to another local authority) is one-for-one, it is still possible that immigrant inflows could have either a negative or positive effect on house prices if their tastes are systematically different from the native born on average.

As mentioned above, an increase in the share of immigrants in an area could lead to the displacement of natives, as found by Saiz and Wachter (2011) in the US, due to a preference of the native born to live near other native born. This negative effect on house prices and rents is more likely to be apparent at neighbourhood level rather than local authority level, unless the native born cross local authority level boundaries. In other words, the effects of this sorting are likely to largely cancel out

at local authority level, as the movement of native born is going to put pressure on house prices in other parts of a local authority. Therefore to find a negative effect on house prices of a greater share of immigrants at local authority level because of the displacement of native born seems less likely.[5] Saiz and Wachter (2011) present a framework based on racial segregation models in which immigration pushes up average metropolitan (local authority) prices, but prices may not increase as fast in immigrant neighbourhoods. In their model house prices will increase equally in all neighbourhoods if the native born are indifferent to the presence of immigrants, even if immigrants tend to cluster in particular areas. This implies that there should not be any correlation between immigration and house prices. If the native born have a preference to live with other native born, house price growth should be weaker in immigrant areas, and native flight (and the subsequent fall in prices/rents) is likely to be at least partly offset by lower income natives taking advantage of lower prices. However, as Saiz and Wachter (2011) point out, if natives value diversity then prices and population will also go up in immigrant areas.

Expectations have an important role in influencing house price behaviour particularly during booms when people often expect rapid house price appreciation to continue indefinitely into the future. If people believe that immigration levels are high, then this, in conjunction with an often-held view that there is a shortage of land, could help raise expectations that house prices are going to continue to rise further, than in the absence of immigration, helping to promote a house price bub-

[5]House prices also tend to be downwardly sticky (see for example Glaeser et al. (2005) and Genesove and Mayer (2001)) which is likely to mitigate any rapid decline in house prices; although native born owners might like to move, it does not necessarily mean that they will if moving means that they will realize a capital loss.

ble.[6]

The degree to which an increase in immigration affects house prices should also depend partly on the elasticity of housing supply, as shown by Saiz (2007).[7] In areas with more elastic housing supply, the effect of immigration (and population increases generally) on prices and rents should be lower. Saiz (2007) also shows that the impact of immigration should be higher in areas with low price elasticity of demand or in which the responsiveness of the UK born to an increase in the foreign born population is low. Immigrants are also likely to find it more difficult to access credit in comparison with the native population because of a lack of UK work history and a UK bank account.[8]

There are three major difficulties in assessing the effect of immigration on house prices and rents that could lead to biased results. First, immigration may be endogenous, migrants might be attracted to areas that have successful economies, and therefore there may be a spurious correlation between migration and house prices. Conversely migrants may be attracted to declining areas with lower housing costs, leading to an underestimate of the effect of immigration on prices and rents. Second, estimation could be biased by omitted variables that drive both house prices and im-

[6]See for example Case and Shiller (2003), Shiller (2007). Case and Shiller (2003) suggest that although changes in "fundamentals" such as income growth or interest rate changes can lead to changes in house prices, expectation can become self-reinforcing leading to a bubble, which they describe as "a situation in which excessive public expectations for future price increases cause prices to be temporarily elevated" (p. 299).

[7]See for example Glaeser et al. (2008) for the more general result with respect to the total population.

[8]There are also differences between EU and non-EU immigrants. Immigrants from the EU are free to work in the UK and therefore are more likely to buy a house if they settle permanently. For non-EU immigrants, visa requirements have changed over time, under current rules it is primarily only the highly skilled and/or wealthy that are able to settle permanently.

migrant inflows, such as expectations of future economic growth, or improvements to the environment or amenities such as parks, schools and other facilities. Estimation in first differences helps to overcome some of the problem associated with unobserved local authority characteristics, however it does not resolve the problem of differing trends in unobserved local authority characteristics (for which I try to control for using local authority-specific time trends). Third, error in the measurement of the foreign born population could result in attenuation bias, biasing the estimated coefficient on the foreign-born share toward zero (Aydemir and Borjas, 2011). And this error will be exacerbated in first differences. Error could also arise due to the timing of immigrant arrival in the country and their inclusion in the LFS, or as a result of migrants moving after spending some time in their initial arrival location, both of which would lead to an underestimate of the effect of immigration on house prices and rents.

The extensive literature on modelling housing markets also provides insights that need to be taken into account. Equilibrium house prices are, as in other markets, a function of demand and supply factors, however the long-lived and durable nature of housing means housing stock is a slow moving variable in comparison with house prices (Glaeser and Gyourko, 2005). It is possible to motivate the derivation of an inverse demand equation for house prices using a utility maximising framework (See for example Pain and Westaway (1997) or Grimes and Aitken (2010)). I estimate the following inverse long-run equation for prices in first differences to remove the effect of unobserved local authority specific characteristics that may determine local authority

house prices and may also be correlated with immigrant location choices:[9] Table A2 in Appendix A shows that regressing the level of the foreign born share of the lagged total population with fixed effects is equivalent to estimating the equation in first differences without fixed effects. A test of the residuals indicates evidence of AR(1) serial correlation,[10] suggesting that the first difference model is more appropriate than the fixed effects specification. I therefore present all of the results in first differences. Given that prices and rents in the housing market are not likely to adjust instantaneously to population inflows, I also estimate a variant of equation 3.1 taking the change over a three year period.

$$\Delta ln\left(\frac{PH_{it}}{PC_{it}}\right) = \beta_1(\Delta FB_{it}/Pop_{i,t-1}) + \beta_2(\Delta UK_{it}/Pop_{i,t-1}) + \gamma\Delta X_{it} + \varphi_t + \lambda_i + \epsilon_{it} \tag{2.1}$$

With the exception of Sá (2014), Stillman and Maré (2008), and Ottaviano and Peri (2007), most previous studies have only included the change in foreign-born population, and not the change in the native-born population, in their econometric estimation. Without controlling for the change in the native born population, the estimate of the effect of the foreign-born share on prices, β_1, is likely to be biased upwards, as it will capture the effect of the omitted variable, and I therefore include the change in the native born population relative to the lagged total population, to control for the potential outflow of the native population. The dependent variable is the change in the log of average house prices (or log change in average house

[9] See Appendix A.2 for the derivation.
[10] Wooldridge (2002).

rent) in local authority i between years *t-1* and *t*. I also estimate models using median and lower quartile house prices. The vector of time-varying control variables represented by X_{it} consists of the user cost of capital, average weekly gross pay in the local authority, the area unemployment rate, the lagged dwelling stock, and the proportion of the population with no qualifications. Ideally I would like to have a measure of household permanent income, but in the absence of consumption data at local authority level I rely on average real weekly pay, and the unemployment rate, as proxies. I expect real income to have a positive effect on house prices, and the unemployment rate to have a negative effect on house prices. I include the proportion of the population with no qualifications as a proxy for the socio-economic status of a local authority, to control for the likely propensity of immigrants to locate in either strongly growing areas, or slower growing/declining areas. There is growing evidence that people (at least the native born population) are attracted to cities and urban areas where the average skill and qualification level of the population is much higher (Glaeser and Saiz, 2004), in contrast, some segments of the immigrant population will be attracted to cities for the same reasons, while others may prefer to locate in slower growing areas with lower housing costs. Year fixed effects, φ_t capture national trends in inflation, mortgage rates and over economic variables such as movements in the economic cycle. Although time invariant factors specific to each local authority have been differenced out, I also estimate models with local authority fixed effects, λ_i, to control for different trends in local authority characteristics over time such as amenities that are associated with house price/rent growth.

The user cost of capital, the opportunity cost of capital, in this case representing

the lost income that could have been received had the capital been invested elsewhere (Himmelberg et al., 2005). Following Himmelberg et al. (2005) the annual cost of ownership is calculated according to the following formula:

$$\textit{Annual Cost of Ownership} = P_{it}\left(r_{it} + \tau_{it} + \upsilon_{it} + \kappa_t - E_{it}\frac{P_{i,t+1}}{P_{it}}\right) \tag{2.2}$$

where the expression in brackets is the user cost of capital. The first term ($P_{it} \cdot r_{it}$), the price of housing multiplied by the risk-free interest rate, represents the foregone interest that could have been earned elsewhere.[11] The second term is the price of housing multiplied by the stamp duty rate τ. The third term is the price of housing multiplied by υ, the council tax rate. The fourth term represents depreciation of the housing stock multiplied by house prices, where κ is the depreciation rate. The final term is the expected capital gain (or loss). I assume that expectations of house price changes are based on past realisations of house prices, and therefore model the capital gains using the average return in the previous two years. I attempt to mitigate some of the endogeneity problem this introduces by using regional capital gains, rather than local authority capital gains.[12] While such extrapolative expectations may appear naive there is significant evidence that people do form expectations based on past asset price behaviour (Case and Shiller, 1989, 2003). Case and Shiller (1989) find that the house price change in one year helps predict the price change in the

[11] Often the tax adjusted interest rate is used in the construction of the user cost, however as mortgage interest payments have not been tax deductible since April 2000, I ignore this issue here.

[12] The ten regions are the East, North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, Wales, London, the South West and the South East.

following year. The survey results of Case and Shiller (2003) suggest that in markets experiencing rapid house price inflation, house buyers build in high-expected capital gains for the following decade.

On the supply side, new investment in housing is negatively influenced by construction costs, including labour and building material costs, land availability, planning restrictions, and positively influenced by current house prices.

Before turning to the effect of increased immigration on house prices and rents, I first estimate Equation 2.3 with the change in the total population on the right hand side; as to the best of my knowledge house price equations at local authority level have not previously been estimated for the UK. Previous models of the UK housing market have all been estimated using regional data, see for example, Muellbauer and Murphy (1997), Cameron et al. (2006) and Meen (1996). This gives me a base reference to compare to previous regional estimates of house price models, and to check that the covariates have the expected sign before decomposing the population change into the change in foreign born and change in UK born population.

$$\Delta ln\left(\frac{PH_{it}}{PC_{it}}\right) = \beta(\Delta Pop_{i,t-1}) + \gamma\Delta X_{it} + \varphi_t + \lambda_i + \epsilon_{it} \tag{2.3}$$

The market for rental property is a broad segment of the overall market for housing services, and because immigrants are more likely to rent rather than own when first arriving in the country, it is interesting to analyse the effect of immigration on average house rents.[13] Table 2.1 shows that immigrants are more likely to rent than

[13]The markets for rental accommodation and the markets for home ownership are interrelated, and this means that I do not necessarily expect to find a stronger effect on rents than house prices; holding everything else constant, increased pressure in the rental market increases asset values and

own in the first few years after arrival in the UK, with only 5% of immigrants owning after 1 year in the UK, rising to 38% owning after 10 years.[14] In the same way that home ownership is affected by the cost of capital, the supply and demand of rental housing is also affected by the cost of capital. Theoretically, house prices and rents should be strongly correlated, but in practice there are institutional characteristics of the rental market such as contractual arrangements, regulations, transaction costs and search, that cause the evolution of rents to be sluggish relative to house prices (DiPasquale and Wheaton, 1992). For example, the longer the average contractual length of rental contracts the greater will be the degree of stickiness in the rent-price relationship, and there are likely to be substantial differences in quality between rental units and owner-occupied dwellings. My specification for estimating the effect of immigration on rents is the same as that used for house prices, except I replace the user cost of capital with the change in average house prices. As the cost of ownership increases, I expect the demand for rental housing to increase; I therefore expect the effect of a change in house prices to be positive. I expect the coefficient on housing stock to be negative. The expected effect of real income on rents is ambiguous, as an increase in income may result in a move out of the rental market into home ownership, or there could be a positive income effect, particularly if barriers such as credit constraints make home ownership relatively difficult (DiPasquale and Wheaton, 1992).

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should lead to greater investment in residential construction, with some lag.

[14] All tables in this thesis are produced using 'estout' and associated Stata commands written by Jann (2005, 2007).

Table 2.1: Tenure of foreign born by year of arrival

	Tenure		
Years since arrival in the UK	% Own	% Rent	% Other
0	3	95	2
1	5	94	1
2	10	89	1
3	14	85	1
4	19	80	1
5	24	75	1
6	28	71	1
7	32	67	1
8	35	64	1
9	37	62	1
10	38	60	2
2010 average for:			
Foreign Born	45	55	1
UK Born	69	31	1

Note: This table shows the percent of immigrant household heads by tenure. Ownership includes being owned outright, and being bought with mortgage or loan. Rent includes both rented and rent free. Other includes squatting, and 'part rent, part mortgage'. *Source:* LFS, 2010

2.2.1 Endogeneity and instruments

Endogeneity is a potential problem as immigrants may choose to locate in areas with strong economic growth and therefore likely strong house price growth, resulting in an upward bias in the elasticity, or they might choose areas that are relatively less expensive resulting in a downward bias in the estimated elasticity. Following Bartel (1979), Altonji and Card (1991), Saiz (2007), and others, I construct a supply-push instrument for migration. This instrument is constructed weighting the historical spatial distribution of immigrants by the contemporaneous national growth in immigrants, based on the idea that immigrants are more likely to locate where earlier immigrants have settled (Munshi, 2003). I therefore take the foreign born population in each local authority in 1981 and attribute to each local authority the net immigrant growth rate for the whole of the UK each year from the LFS. This approach allows me to construct an "imputed" foreign born population for each local authority i at time t according to the following formula:

$$SPIV_{i,t} = \sum_{r=1}^{R} \left(\frac{FB_{i,r,1981}}{FB_{1981}} \right) \times \left[(FB_{r,t} - FB_{r,t-1}) - (FB_{i,r,t} - FB_{i,r,t-1}) \right] \quad (2.4)$$

To construct the instrument I sum over region of birth, r, as shown in Equation 2.4. From the 1981 census I can identify the number of immigrants in each local authority by twelve broad regions of birth (Africa (New Commonwealth), Bangladesh,

India, Pakistan, China, Ireland, Old Commonwealth, EC (1992) members, Other Europe, South East Asia (NC), Caribbean (NC), and the rest of the World). I then use the historical pattern of immigrant location by region of birth as the base off of which to predict local authority level immigration growth based on national growth in immigrants by country of birth. I follow Smith (2012) and Wozniak and Murray (2012), and make an adjustment to the usual Card (2001) instrument by excluding the contribution of each local authority to the national growth in immigrants (the right-hand side of Equation 2.4). This removes changes in an area's immigrant population that are driven by local characteristics. The supply-shock (SPIV) is then assumed to be driven by factors that are exogenous to area i. The left-hand side of Equation 2.4 is the share of immigrants in each local authority in the base period. SPIV can therefore be interpreted as the net change in the immigrant population of area i that would arise if the area received its 1981 share of the net change in the UK immigrant population by region of birth, minus the contribution to that change from area i.

2.3 Literature review

Several studies have examined the local impact of immigration on house prices, with several finding a significant positive relationship. Saiz (2003) utilizes the experiment provided by the Mariel boatlift when Cuban refugees led to 9 percent more people requiring housing in Miami. He found a small decline in house prices, and an increase in housing rent of eight percent. Because this was a specific event in

one place at one time, Saiz (2007) uses the spatial correlation approach to study the local impact of immigrants at MSA level using both annual and decennial data between 1983 and 1997, and finds that an immigrant inflow equal to one percent of a city's population is associated with an increase in average house prices and rents of about one percent. Also using US data, Ottaviano and Peri (2007) adopt a spatial correlation approach in a general equilibrium framework and estimate jointly the effect of immigrants on wages and rents for the average individual as well as for individuals in each skill group. They find a positive correlation between immigration and wages/housing prices on average, but find that low skilled native workers experience a small negative wage effect from immigration and a small positive rent effect. For skilled workers, immigration is associated with a positive wage effect and a large positive effect on house prices. Greulich et al. (2004) focus on the effect of immigration on the rents of lower income U.S. natives who are more likely to be in competition with lower income immigrants for housing services. They do not find much of an effect of immigration on this group, suggesting that either natives move out or elastic housing supply mitigate the migrant inflow.

In the UK, Sá (2014) has also used the spatial correlation approach to examine the effect of immigration on average house prices at local authority level in England and Wales for the period 2003-2010. She finds a significant negative association between immigrant inflow and average real house prices using both OLS and IV (instrumenting using predicted immigrant inflows based on historical location patterns by region of birth), controlling for the change in employment relative to the population, and year and local authority fixed effects. She finds that an increase in immigrants equal

to 1% of a local authority's initial population leads to a reduction in house prices of between 1.6 - 1.7%, and she attributes this to a negative income effect on housing demand due to higher income natives leaving areas where immigrants cluster, thus pushing down prices Sá (2014). In contrast to Sá (2014) I examine the effect of immigrant inflows on housing rents as well as prices, as over 90% of immigrants rent on arrival, and it is reasonable to expect a first order effect on rents. I also include a range of other controls in my house price equation, such as the user cost of capital and the lagged housing stock which are known to be important in modelling house prices (see for example Meen (1996) and Cameron et al. (2006)).

Studies using data for Switzerland, Spain, New Zealand, and Canada also use the spatial correlation approach to examine the effect of immigration on house prices, and they all use a form of the supply-push instrument used here. Degen and Fischer (2009) use data for 85 Swiss districts between 2001 and 2006 and find that an immigrant inflow equal to 1 percent of an area's population increases the prices of single-family homes by approximately 2.7 percent, conditioning on local variables. They do however, lack income data, giving rise to possible omitted variable bias due to the important role that income has on determining house prices. In contrast to other countries that have been studied, the housing market and levels of immigration in Switzerland are quite different. Switzerland has a system of nationwide rent control, a low level of homeownership, a low house price inflation environment, and moderate immigration; therefore the finding of a significant positive effect is not something that is restricted only to boom environments such as Spain and the UK. Similarly to the UK, Spain has also recently experienced a housing boom in conjunc-

tion with a rapid expansion in immigration during 1998-2008, a period examined by Gonzalez and Ortega (2009) who estimate a house price elasticity of 3.2 percent at provincial level. They control for GDP growth and the ratio of employment to population at the provincial level in their regressions.

In contrast to the previous studies, Stillman and Maré (2008) and Akbari and Aydede (2009) use census data and generally find less significant effects on house prices. Because the supply of housing is more able to respond to population change over longer time periods this could account for why the estimated effects are smaller than in those studies using higher frequency data.[15] Stillman and Maré (2008) examine how international migration affects house prices and rents in New Zealand using census data available at five-yearly intervals from 1991-2006. They find that an increase in the total population leads to an increase in house prices, but no evidence that the inflow of foreign-born immigrants into a local area has a positive effect on house prices, conditioning on the change in the native born population. They are able to distinguish between foreign-born and returning New Zealanders, and find a positive relationship between house prices and returning New Zealanders. They also find differences in the relationship over time. Using Canadian five-yearly census data for 1996-2006 Akbari and Aydede (2009) find no effect of immigration on house prices, controlling for per capita income before taxes, the unemployment rate, the labour force participation rate, and the housing stock.

Saiz and Wachter (2011) also use the spatial correlation approach at the neighbourhood level, within US metropolitan areas, and find that growth in immigrant

[15]Although Saiz (2007) also uses Census data in addition to annual data, and the results are similar for each specification.

share is associated with lower house price appreciation, in contrast to the results of Saiz (2007) at MSA level. They attribute this negative effect to native flight from areas that have a relatively higher immigrant population. Because immigrants choosing areas that are relatively cheaper could also drive this result, they create an instrument using a spatial diffusion model to generate predictions of immigrant location.

Internal migration between British regions has been the subject of several studies, and house prices have often been seen as playing an important role in mediating inter-regional migration flows. Cameron and Muellbauer (1998) estimate an equation for net commuting, and separately, for net migration between British regions between 1978 and 1995. They find that migration responds strongly to relative earnings and relative employment prospects, but also that high relative house prices discourage net migration to a region. Although they do not consider foreign immigration, they do find that an exogenous inflow from another region has a negative effect on house prices. Cameron et al. (2005) build on Cameron and Muellbauer (1998) and model regional migration between regions in England and Wales as a system of eight equations, using data from the National Health Service Central Register for 1975 to 2003. Again, they do not specifically consider the role of international migration in inter-regional flows. They find that higher relative house prices reduce net in-migration and gross in-migration, and increase gross out-migration, additionally; the expectation of relative capital gains increases net and gross in-migration, and reduces gross out-migration.

Hatton and Tani (2005) analyse the effect of international migration on inter-

regional migration between 1982 to 2000 using National Health Service registrations, and International Passenger Survey data. The focus of their paper is the extent to which inter-regional mobility acts as an adjustment mechanism in response to international migration, which might explain the apparent lack of a wage effect as found by Dustmann et al. (2005) and others. Hatton and Tani (2005) model net inter-regional in-migration rates as a function of house prices, unemployment rate and earnings, and similarly to Cameron et al. (1998, 2005) find that the level effect of house prices is strongly negative, with the change in house prices having a positive influence reflecting expected capital gains. Hatton and Tani (2005) also find evidence of displacement effects, their estimates suggesting that a net increase of 100 immigrants to a region produces net out-migration to other regions of 35 people.

2.4 Data

This chapter uses immigration data from the UK Labour Force Survey (LFS), a household survey containing a variety of labour market statistics. The standard version of the LFS is available for Government Office Regions, however I was given access to a special license version of data that is available at local authority level from 1996 to 2010. This provides data on the foreign-born and UK-born population at local authority level. I have data for 170 local authorities in England and Wales. The LFS counts foreign-born residents irrespective of their formal immigrant status. LFS data excludes those who live in communal accommodation such as hostels, shelters, and caravan parks. I also do not have data on the number of illegal

immigrants, or indeed even the scale of illegal immigration in the UK. In 2001, the Home Office estimated that 430,000 people were illegally resident in the UK House of Lords (2008b), but some of these may be included in the LFS.

2.4.1 House prices

The house price data used in this analysis comes from the Land Registry, that has a dataset of over 15 million transactions in England and Wales from 1995 to the present. The data covers all private residential transactions with the exception of sales at less than market price (such as Right to Buy), sales below £1,000, and sales above £20m. The Department for Communities and Local Government (DCLG) makes the Land Registry data available and produces figures for mean, median and lower quartile prices at local authority level. The Land Registry also produces a mean house price series using repeat sales regression (RSR) techniques on the repeat sales of about 5 million properties over the period 1995-2010, and this enables me to control to a large extent for the size and quality of the dwelling stock as it is comparing the sale prices of the same properties over time. This assumes that the characteristics of a particular property, observed on at least two occasions, are largely unchanged, which is not true to the extent of depreciation and home improvement. The index is also subject to transaction bias as the sample of properties included in the measure are a non-random sample of the value of the entire housing stock, as a property has to be sold at least twice for there to be a matching pair. Houses that sell more frequently may be systematically different in location, size and quality from those that sell less frequently, in spite of this, there would have to be a differential

attraction between immigrants and the native born to the more frequently sold and less frequently sold properties for this to bias the regression results. The main house price series I use in the analysis is therefore based on the repeat sales mean from the Land Registry.

2.4.2 Rent data

House rent data are available at local authority level from two sources, from 1996 until 2001 data is available from the now defunct Rent Service (now incorporated in the Valuation Office Agency, part of the DCLG), while from 2002 until 2008 I have data from Dataspring.[16] For both data series the coverage is for private rental accommodation, and I am able to use data based on the average bedroom size, as well as data for different bedroom sizes. I therefore use three main rental series in my analysis, the first is the average local authority rent across all bedroom sizes, the second is the average rent for rental units with one or two bedrooms, and finally the average rent for rental units with three or four bedrooms.

The rental data is based on what is termed the "local reference rent", which is the rent that is determined by a rent officer when housing benefit claimants in the private sector make a claim that the rent that they are paying is unfair. The local reference rent is the mid-point between what the rent officer believes to be the highest and lowest non-exceptional rents in a particular area, and the reference rent is determined for different bedroom sizes.[17] It is important to therefore note that this rent data

[16] A research unit at the Cambridge Centre for Housing and Planning Research (CCHPR), Department of Land Economy, University of Cambridge. Unfortunately data after 2008 is unavailable.

[17] See Valuation Office Agency (2008) for a description of how a neighbourhood is defined. The housing benefit allowance is determined by local authorities and is available to those in both public

is not the result of arms-length market transactions, and because a determination is only made because of a claim by someone receiving the housing benefit, the data may not be fully representative of market prices if there is a geographic concentration of housing benefit recipients in particular neighbourhoods. These data suggest that real average rents have increased by 19 percent between 1996 and 2008. In comparison, the national level ONS Retail Price Index data for rent shows that rental costs have increased by 42 percent over the same period. Clearly, these data sources are different, and the ONS series is likely to be more representative of a variety of rental stock quality, but neither the VOA/Dataspring data I use, or the ONS data make any adjustment for changes in size and quality. Both data sources indicate that rents have not increased by the same order of magnitude as house prices.

2.4.3 Control variables

Data on the stock of dwellings in each local authority are obtained from the Department for Communities and Local Government. I have data on all owner-occupied housing, privately rented housing, local authority owned housing and the stock of housing in the (non-local authority owned) social sector. From the Annual Survey of Household Earnings (ASHE) I have data for the gross weekly wage of full-time permanently employed adults at local authority level. Data on unemployment and the proportion of the population with no qualifications at local authority level are available from the Labour Force Survey.

and private sector housing. Generally those with total income of less than £16,000 a year can claim, with the level of benefit determined by income, family size, and age. It can only be used for the payment of rent, and not for buying a house or mortgage payments.

To construct my measure of the user cost of capital I use data on stamp duty rates from HMRC.[18] These national level rates specify a series of tax rates and thresholds based on the price of a house, I therefore estimate an average stamp duty rate for each local authority based on the average house price in each local authority. From the VOA I have data on average council tax in each local authority from 1996, which allows me to calculate, as a fraction of the average house sales price in each local authority, the average council tax rate for each local authority.

2.5 Results

2.5.1 Descriptive evidence

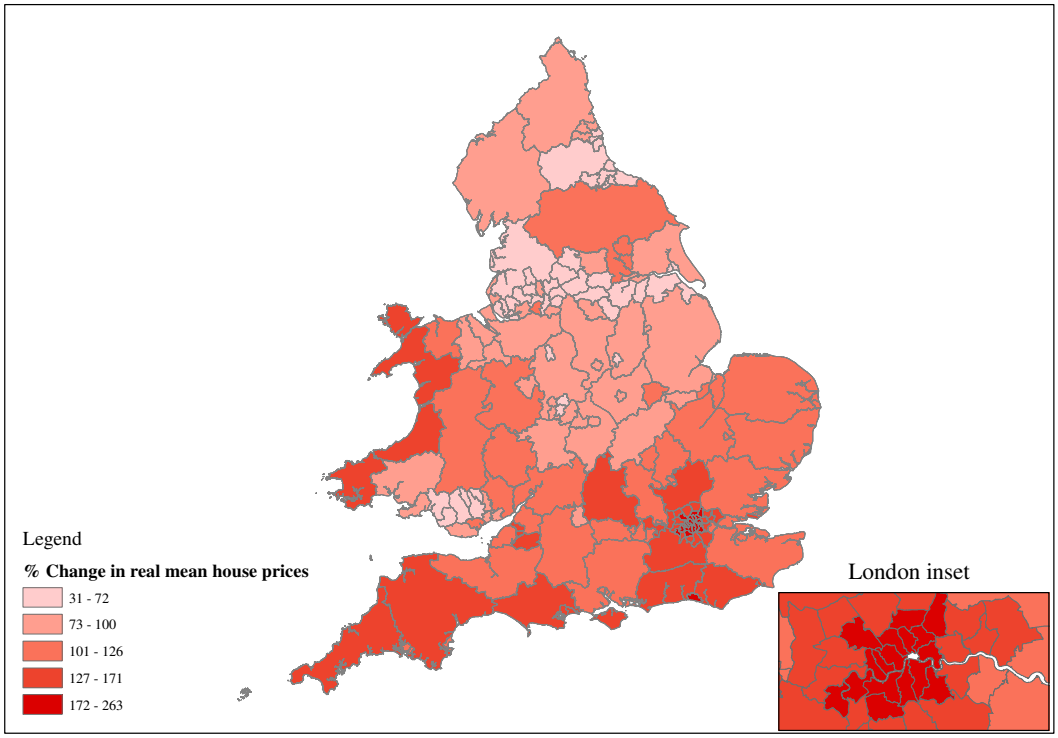
This section summarizes the association between house prices and house rents and population changes over time and across space. Between 1996 and 2010 average real house prices grew by 109 percent across England and Wales, an average increase of 8 percent per year.[19] There is wide spatial variation in the change in house prices as shown in the map in Figure 2.2, with the largest increases concentrated in Greater London, (with the highest increases in house prices of over 200 percent over the period) parts of the South East and South West, and coastal Wales. The North East had the smallest increase of 117 percent. At local authority level the highest growth occurred in the London authorities of Hackney (250%), Newham (238%), Southwark

[18]For example, current stamp duty rates on residential property are: Zero for up to £125,000, 1 percent for over £125,000 to £250,000, 3 percent for over £250,000 to £500,000, 4 percent for over £500,000 to £1 million, and 5 percent for over £1 million.

[19]In England, average real house prices grew by 112% between 1996 and 2010, in Wales they grew by 95%.

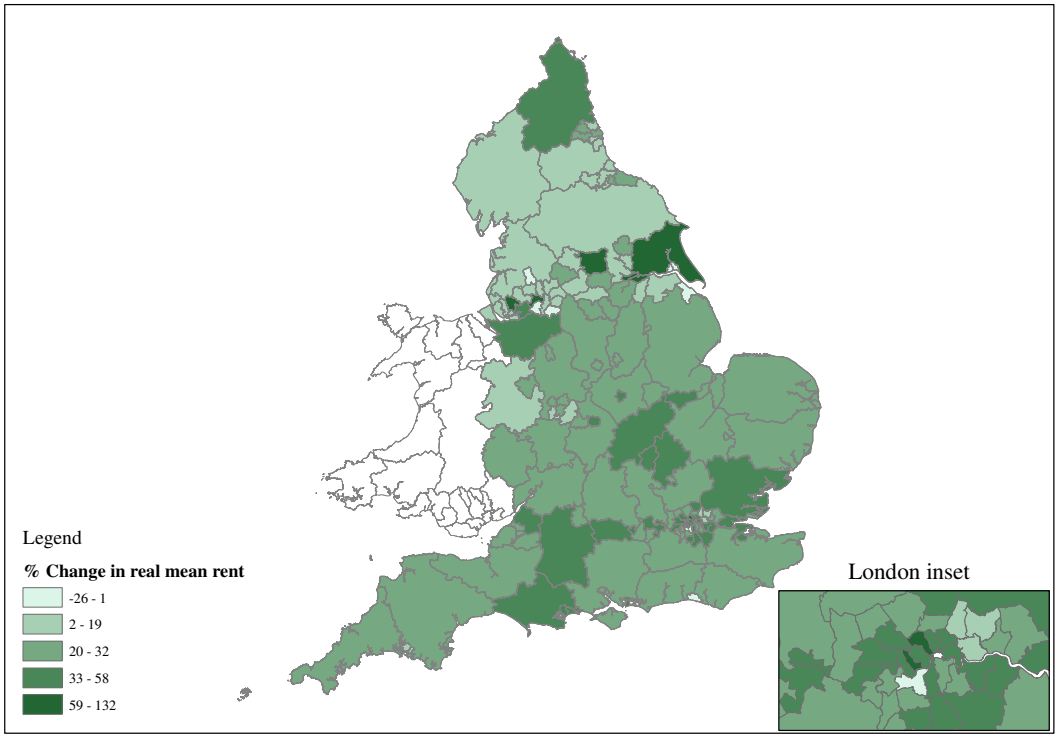
(231%), Westminster (228%), and Lewisham (223%). Outside of London, the areas with the highest average real house price growth included Brighton and Hove (239%), Southend-on-Sea (195%), the Isle of Wight (176%), Pembrokeshire (173%), and Bath and North East Somerset (173%). The five local authorities that had the smallest increase between 1996 and 2010 were Wolverhampton (92%), Neath Port Talbot (89%), Blaenau Gwent (88%), Middlesbrough (87%), and Knowsley (81%).

Figure 2.2: Percentage change in Real Mean House Prices (1996-2010)



Notes: Figure shows the percentage change in real mean house prices (repeat sales) between 1996 and 2010. *Source:* Land Registry.

Figure 2.3: Percentage change in Real Mean House Rent (1996-2008)



Notes: Figure shows the percentage change in real mean rents (average of all bedroom sizes) between 1996 and 2008 for 148 English local authorities. *Source:* VOA/Dataspring.

Across England (Welsh rental data are unavailable), average real rents for all bedroom sizes rose by 19 percent between 1996 and 2008, as shown in Table 2.2. Prices for one and two bedroom dwellings rose by 14%, while rents for three and four bedroom dwellings increased by 21%. Regionally, average real rents for all bedroom sizes rose the highest in London, by 37%, and grew the least in the North West by 16%. There is significant variation across local authorities, as shown in Figure 2.3, with the largest increases as high as 131 percent in St. Helens, Leeds (103%), Kensington and Chelsea (89%), Camden (67%), Salford (66%), East Riding

of Yorkshire (65%), Westminster (58%), and Islington (58%). At the bottom end, real rents declined by 26% in North East Lincolnshire, and also fell in Wandsworth (-13%), Stockport (-9%), Trafford (-7%), Brighton and Hove (-7%), Blackburn with Darwen (-2%), and rose by 0.7% in Kingston upon Hull, and by 3% in Bolton.

Table 2.2: Descriptive Statistics

	1996		2010		% Change (1996-2010)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Mean house price (repeat sales)	81,925	28,759	180,279	104,752	109	44
Mean house price	88,676	39,769	222,392	135,498	142	35
Median house price	74,315	27,208	183,949	89,881	141	35
Lower quartile house price	54,842	18,393	137,801	63,826	144	41
Mean weekly rent (all bedrooms)	111	37	143	61	27	19
Mean weekly rent (1+2 bedrooms)	102	33	113	46	8.7	14
Mean weekly rent (3+4 bedrooms)	129	53	159	95	20	21
UK born population	275,929	225,093	280,531	237,092	.65	7.1
Foreign born population	21,659	23,016	39,780	38,682	102	69
Total population	297,588	234,975	320,311	254,390	7.5	8
Percent UK born	.92	.088	.87	.12	-6.1	6.6
Percent foreign born	.08	.088	.13	.12	89	65
Δ UK_{it} / $Pop_{i,t-1}$	.00051	.014	.0027	.021	-147	284
Δ FB_{it} / $Pop_{i,t-1}$	.0013	.014	.0049	.021	-70	271
Instrument (Foreign born)	.044	.071	.0086	.055	-142	427
Number of dwellings	125,754	97,756	141,790	112,042	12	7
Unemployment rate	8.5	3.3	8.2	2.2	2.2	21
Proportion with no qualification	.17	.14	.12	.038	14	522
Real gross weekly pay	460	66	595	130	29	17
User cost of capital	.14	.021	.13	.0095	-.43	17

Note: Percentage changes are for the period 1996-2010, except for the change in rents which is between 1996-2008, and for immig_rob which is between 2003-2010. Rental data for Welsh local authorities is unavailable, and therefore rental data covers 148 English local authorities. All other data covers 170 English and Welsh local authorities. All monetary amounts are in £2010.

The population of England and Wales grew by 7.4 percent between 1996 and 2010, with significant growth and decline in some local authorities. The total population declined in 22 out of the 170 local authorities, predominantly in the formerly industrialised areas of the North West, North East, West Midlands, Wales and Yorkshire and the Humber.[20] Disaggregating the population change between UK born

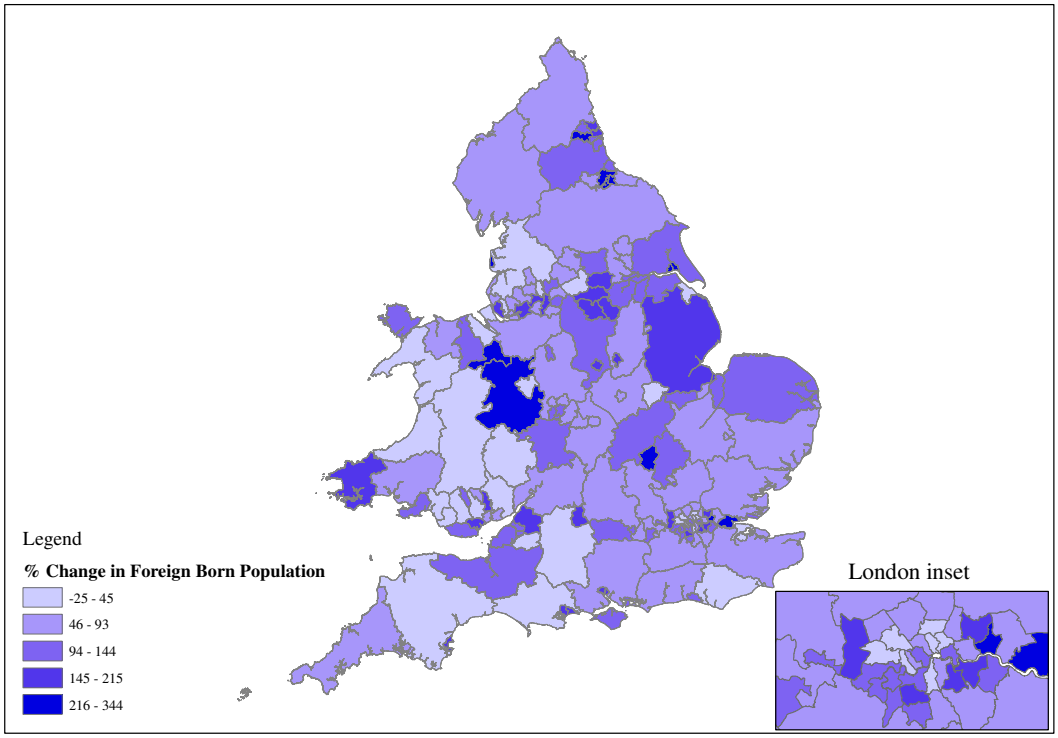
[20]The total population declined by 5% in Blaenau Gwent, and also fell in Blackpool (-5%),

and foreign-born finds some very large growth in the foreign born population in some local authorities, and generally, relatively modest growth in the UK born population of most local authorities. The absolute number, and also the proportion, of the population who were born in the UK declined in the majority of local authorities. In contrast, the number of foreign born fell in only three local authorities, North East Lincolnshire, Rutland, and Gwynedd, and the share of the population that was foreign born fell only in Rutland (-31%), North East Lincolnshire (-24%), Gwynedd (-4%), Hackney (-2%), Bury (-1%), and Monmouthshire (0.1%). On average, the proportion of the population that is foreign born increased by 89% across all local authorities, with the foreign born share of ten local authorities increasing by over 200 percent.[21] The largest increases were in Barking and Dagenham (258%), Middlesbrough (279%), Gateshead (292%), Shropshire (311%), Kingston upon Hull (338%) as shown in Figure 2.4.

Sefton (-5%), Wirral (-4%), and Merthyr Tydfil (-4%). The five local authorities with the largest population growth were Kingston upon Thames (21%), Milton Keynes (23%), Camden (26%), Tower Hamlets (32%), and Westminster (42%)

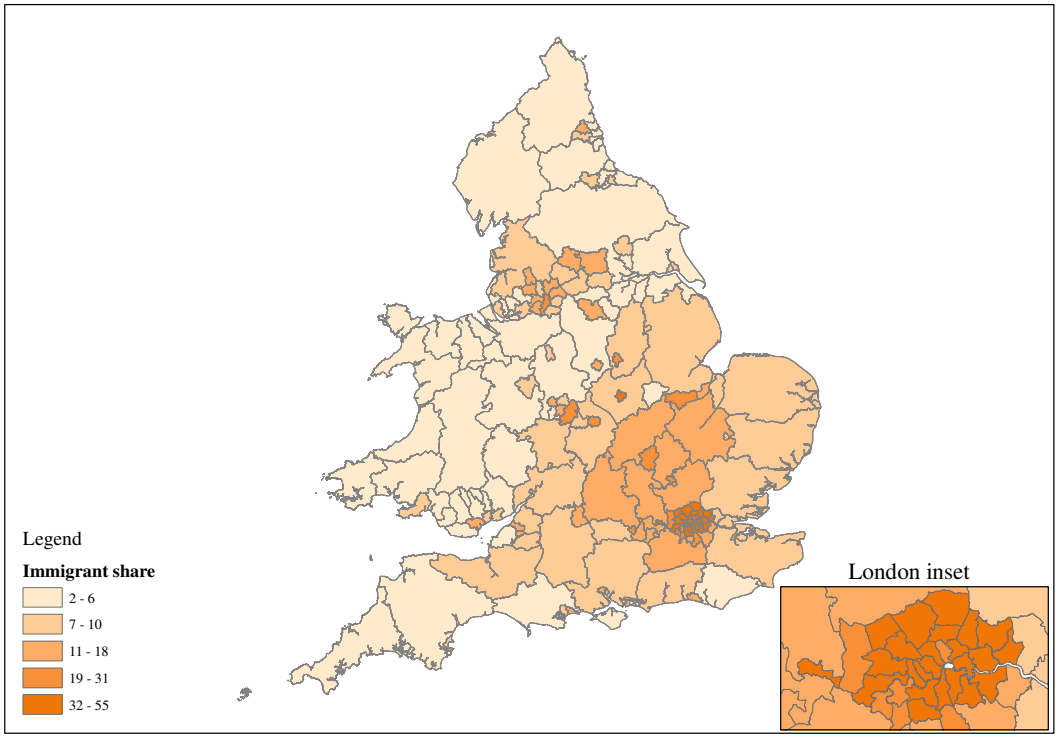
[21]For example, the proportion of foreign born increased from 1.9% to 8.5% in Kingston upon Hull, In Shropshire the proportion increased from 1.1% to 4.6%, In Gateshead from 1.5% to 6.0%.

Figure 2.4: Percentage change in Foreign Born Population (1996-2010)



Notes: Figure shows the percentage change in the foreign born population between 1996 and 2010.
Source: LFS.

Figure 2.5: Foreign Born Share of the Population (2010)



Notes: Figure shows the foreign born population as a proportion of the total population for 2010.
Source: LFS.

As Figure 2.5 and Table 2.3 illustrate there is a distinct spatial pattern in the distribution of the foreign born population, with the share of the population of local authorities varying from 2% of the population of Knowsley, to 54.7% of Brent. In 2010, 77% of the foreign born population in the UK were living in predominantly urban areas, while the remaining 23% were living in predominantly rural areas.[22] In

[22]Urban and rural are defined by Defra (2005). Defra classifies local authorities into one of six groups; 'Major Urban', 'Large Urban', 'Other Urban', 'Significant Rural', 'Rural 50', and 'Rural 80'. 'Major Urban' for example, consists of districts with either 100,000 people or 50 percent of their population in an urban area with a population of more than 750,000. I aggregate these further into two groups, 'Urban' consisting of the first three urban groups, and the remainder I define as 'Rural'. The 41 local authorities classified as rural are Bath and North East, Bedfordshire, Bucking-

Table 2.3: Descriptive Statistics for the Local Authorities with the 10 largest and 10 smallest Immigrant-to-Population ratios

	FB/Pop. (2010)	Pop. (2010)	House Price (2010)	Rent (2010)	% Δ FB/Pop. (1996-2010)	% Δ HP (1996-2010)	% Δ Rent (1996-2008)
Largest immigrant share:							
Brent	54.7	256,600	305,606	224	42	194	35
Westminster	54.6	253,100	617,882	363	134	207	58
Newham	48.9	240,100	224,217	179	77	170	17
Kensington and Chelsea	46.1	169,500	861,539	443	50	221	89
Harrow	44.4	230,100	288,192	219	90	150	31
Tower Hamlets	43.9	237,900	341,948	247	101	173	44
Ealing	43.0	318,500	315,791	249	31	171	39
Haringey	42.3	225,000	337,649	219	28	202	21
Hounslow	41.4	236,800	280,971	217	110	144	35
Merton	41.3	208,800	326,444	219	164	178	30
Average	46.1	237,640	390,024	258	83	181	40
Smallest immigrant share:							
Torfaen	2.8	90,500	110,028	.	149	89	.
Cumbria	2.7	494,300	131,620	91	87	100	16
St. Helens	2.7	177,400	106,546	208	57	66	131
Caerphilly	2.5	173,100	101,742	.	43	71	.
Wigan	2.4	307,600	98,881	93	48	56	15
Hartlepool	2.4	91,300	95,551	88	118	43	12
Rhondda, Cynon, Taff	2.2	234,300	79,805	.	30	65	.
Redcar and Cleveland	2.2	137,400	113,081	93	48	58	20
Blaenau Gwent	2.2	68,400	76,910	.	48	66	.
Knowsley	2.0	149,100	108,450	109	45	53	17
Average	2.4	192,340	102,261	114	67	67	35
Average over all 170 LA's	13.3	324,878	180,279	143	102	109	27

Note: This table shows the local authorities with the 10 largest and 10 smallest immigrant-to-population ratios in 2010, the 2010 population, house prices, and rents. The percentage change in immigrant share (FB/Pop.) and real average house prices (HP) is between 1996 and 2010. The percentage change in real average rents is between 1996 and 2008. Rental data is for 148 English local authorities only as Welsh data is unavailable. All monetary amounts are in £2010.

contrast, 55% of the UK born population were living in urban areas, and 45% in rural areas. Of the total foreign born population, 39.9 percent lived in London in 2010, 13.6% lived in the South East, 8.3% in the East, 8.1% in the West Midlands, 7.8% in the North West, 6.5% in the East Midlands, 6.2% in Yorkshire and the Humber, 5.3% in the South West, 2.3% in Wales, and 2.0% percent lived in the North East. Table 2.3 shows that the ten local authorities with the largest immigrant share in 2010 had an increase in immigrant share averaging 24% between 1996 and 2010. This coincided with an average increase in real average house prices of 181% in these local authorities, compared to an average house price increase of 67% in the ten local authorities with the smallest immigrant share. The average increase in the foreign born share of the population in the ten smallest immigrant-share areas was just under 1%. Real rents increased by an average of 40% in the ten local authorities with the highest immigrant share between 1996 and 2008, and increased by an average of 35% in the smallest immigrant-share local authorities.

hamshire, Calderdale, Cambridgeshire, Cheshire, Cumbria, Derbyshire, Devon, Dorset, Durham, East Riding of Yorkshire, East Sussex, Essex, Gloucestershire, Hampshire, Herefordshire, Kent, Lancashire, Leicestershire, Lincolnshire, Norfolk, North Lincolnshire, North Somerset, North Yorkshire, Northamptonshire, Northumberland, Nottinghamshire, Oxfordshire, Redcar and Cleveland, Rutland, Shropshire, Somerset, Staffordshire, Suffolk, Wakefield, Warwickshire, West Berkshire, West Sussex, Wiltshire, and Worcestershire.

Figure 2.6: Foreign Born Population vs. House Prices and Rents

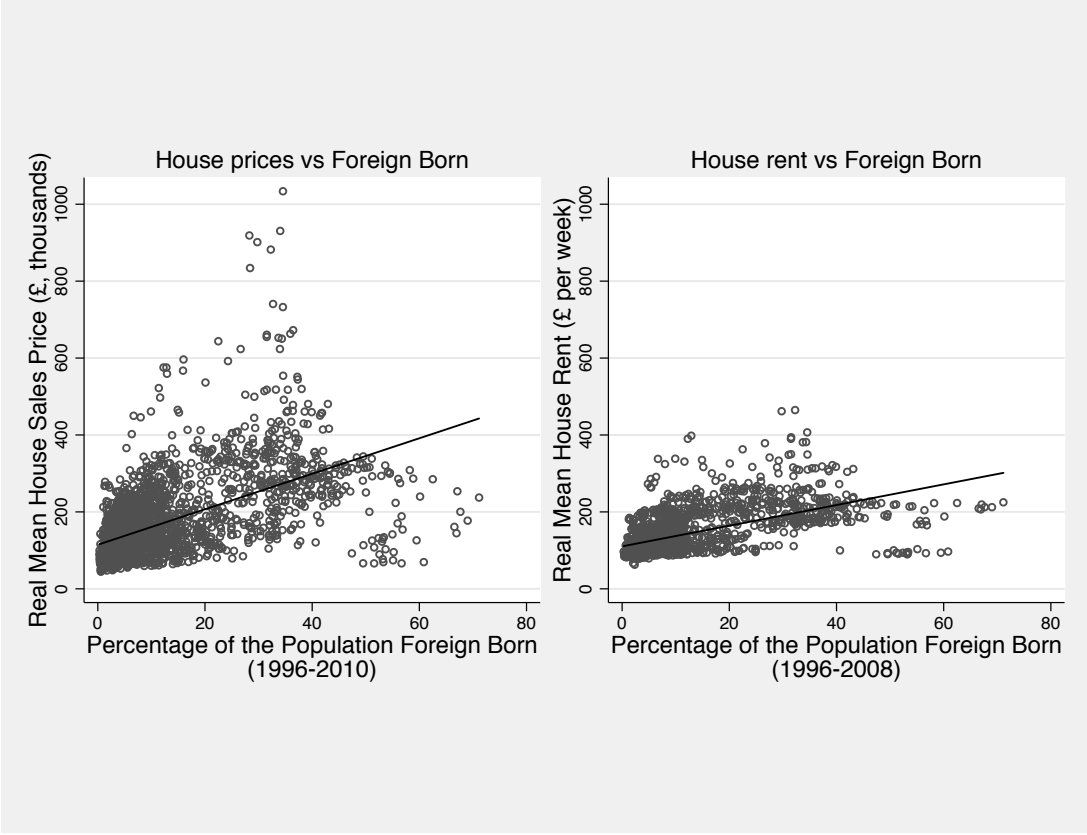
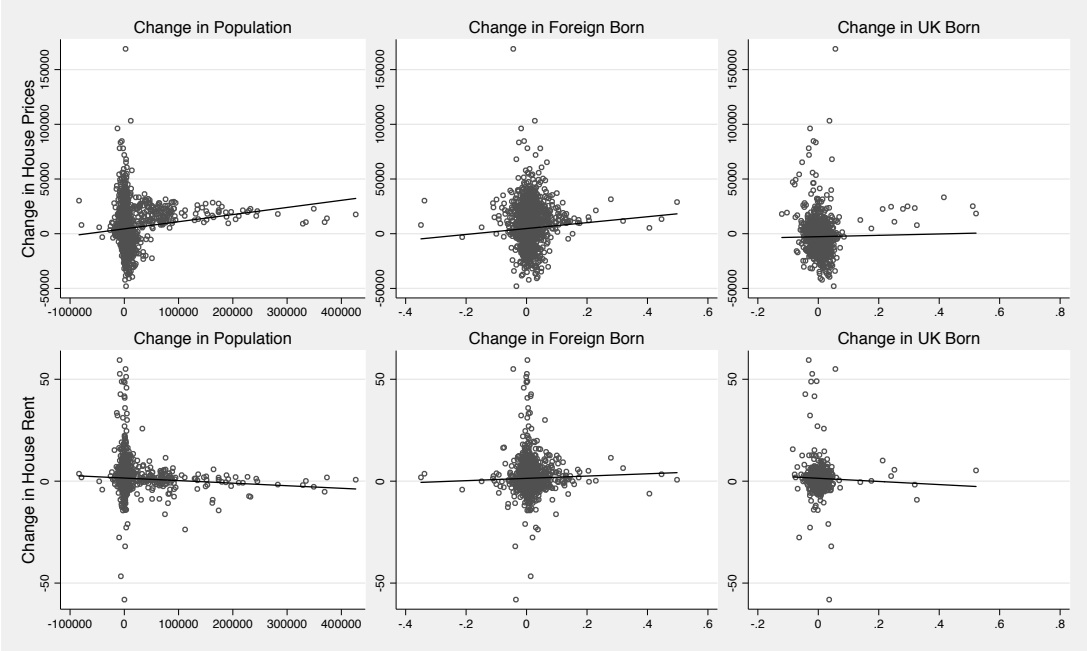


Figure 2.6 illustrates the correlation between the proportion of the population that is foreign born and house prices and rents, and shows the regression line. This confirms that the positive association shown in Figure 2.1 for the UK is also apparent across local authorities between 1996 and 2010 (1996 and 2008 for rents), suggesting that higher house prices and rents are associated with local authorities with a larger share of immigrants in the population. Clearly, this does not necessarily imply a causal relationship between increasing immigration and increasing house prices, if, for example, migrants choose to locate in faster growing areas because of better job

prospects or amenities.

The first row of Figure 2.7 shows the correlation between the change in real average house prices (repeat sales) and, respectively, the normalised (by lagged total population) change in total population, normalised change in the foreign born population (regression variable), and the normalised change in the UK born population, between 1996 and 2010 for all 170 local authorities. There is a positive correlation between the change in the total population and the change in average real house price across LA-year observations, with a correlation coefficient of 0.12, this positive association is also apparent in the second and third columns showing the change in the foreign born population and the UK born population, but the correlation between the change in real house prices and the UK population is very weak, with a correlation coefficient of 0.016. The bottom row of Figure 2.7 also shows the correlation between the change in real average weekly rent (for all bedroom sizes) and normalised population changes. These indicate a slight negative correlation between the change in rent and total population, and a slight positive correlation between the change in the foreign born population and the change in real average rent.

Figure 2.7: Change in Population, Real House Prices, and Rents (1996-2010)



Notes: Figure shows annual changes in total population, foreign born population (normalised), and UK born population (normalised) against annual changes in average real house prices (top row), and annual changes in average real weekly rents (bottom row). *Source:* LFS and the Land Registry.

Naturally these graphs do not take into account the heterogeneity of the different population groups and local authority characteristics, nor the possibility that people who migrate may self-select into areas experiencing either rapid house price growth or stagnation/decline. The more sophisticated regression analysis that follows explores these relationships further.

2.5.2 Regression estimates

2.5.3 Effect of total population on house prices and rents

This section presents my estimates for the effects of immigration on housing markets. I first present the results for the effect of a change in the *total population* on house prices and rents, before presenting the immigration OLS and IV results. Panel unit roots tests (Table A1 in Appendix A) on the data for house prices, rents, immigration and other covariates suggest that they are stationary in first differences, alleviating concerns of spurious regression.

Table 2.4 presents the correlation between the change in average house rents for different bedroom sizes and the change in total population. All specifications include year and local authority fixed effects. Columns (1) - (3) present the results using data for the average rent across all bedroom sizes, columns (4) - (6) present the results when I consider only the rent for rental units with three or four bedrooms, and the last three columns present the results for the average rent across one and two bedroom units. I test the effect of a one year change in population and rent, and given that changes in rent are not likely to be felt immediately following an increase in population, I also test the effect of a three change in population and rent (columns (3), (6) and (9)). Irrespective of the length of the lag there is no evidence that an increase in population has any effect on average housing rent.

In Table 2.5 I estimate the effect of population change on average house prices. The local authority controls I include are the unemployment rate, an estimate of the user cost of capital, the dwelling stock (lagged by one year), and the proportion of

the population with no qualifications. I find that over the whole period 1996-2010, a one percent increase in the population is correlated with about a 0.2 percent increase in average house prices. For the earlier period, 1996-2002 there is no evidence of any significant effect of population change on house prices. These estimates are significantly lower than those of approximately unity found in the existing house price literature during the 1980s/1990s estimated at a regional level (for example Muellbauer and Murphy (1997), and Cameron et al. (2006)). The coefficient on the user cost is similar to earlier estimates using regional data (see for example Meen (1996)). In addition to the population measures, the controls are arguably endogenous and therefore perhaps should not be included, on the other hand as Stillman and Maré (2008) argue, to the extent that changes to these local characteristics are a consequence of migration, they should be included as part of the effect of migration.

Table 2.4: Change in Population and Mean Rent (OLS)

	Δ Log rent (all bedrooms)			Δ Log rent (3 + 4 bedrooms)			Δ Log rent (1 + 2 bedrooms)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δ Log Population	0.000	0.001		-0.010	-0.009		0.021	0.022	
	(0.031)	(0.032)		(0.060)	(0.060)		(0.023)	(0.023)	
Δ Log Population$_{t-3}$			0.027			0.064			0.064
			(0.045)			(0.074)			(0.074)
Δ Log unemployment rate		0.004	0.040**		0.021	0.087***		0.026*	0.087***
		(0.010)	(0.015)		(0.012)	(0.012)		(0.012)	(0.012)
Δ Log house price		0.066***	0.024		0.080***	1.991***		0.065**	1.991***
		(0.016)	(0.042)		(0.022)	(0.026)		(0.020)	(0.026)
Δ Log housing stock (t-1)		0.060	0.238		0.029	-1.250		0.041	-1.250
		(0.057)	(0.425)		(0.077)	(0.649)		(0.051)	(0.649)
Δ Population with no quals.		-0.112**	-0.088		-0.143*	-0.011		-0.113*	-0.011
		(0.039)	(0.071)		(0.059)	(0.065)		(0.046)	(0.065)
N	1776	1776	1480	1776	1776	1480	1776	1776	1480
adj. R^2	0.22	0.23	0.30	0.15	0.16	0.88	0.48	0.48	0.88
Local Authorities	148	148	148	148	148	148	148	148	148

Note: The dependent variable is the change in log real average house prices. Data cover the period 1996-2008 for 148 English local authorities. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table 2.5: Change in Population and House Prices (OLS)

	1996-2010			1996-2002			2003-2010		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δ Log population$_{t-1}$	0.151*	0.175*		0.121	0.046		0.130*	0.166**	
	(0.074)	(0.071)		(0.164)	(0.182)		(0.064)	(0.058)	
Δ Log population$_{t-3}$			-0.144			0.332			-0.033
			(0.146)			(0.378)			(0.098)
Log unemployment rate		-0.041***	0.044**		-0.053***	-0.060**		-0.042***	-0.024
		(0.007)	(0.017)		(0.011)	(0.018)		(0.009)	(0.017)
Log user cost of capital		-0.317***	-0.820***		-0.064	-0.130		-0.454***	-1.251***
		(0.043)	(0.106)		(0.041)	(0.069)		(0.040)	(0.099)
Log housing stock (t-1)		-0.060	-2.539		0.025	-0.655		0.854	1.802
		(0.067)	(1.466)		(0.086)	(0.554)		(0.624)	(1.525)
Population with no quals.		-0.102	-0.233		-0.005	0.003		-0.146**	-0.198
		(0.064)	(0.137)		(0.077)	(0.107)		(0.052)	(0.114)
N	2380	2380	2380	1020	1020	1020	1190	1190	1190
adj. R^2	0.70	0.72	0.72	0.72	0.77	0.78	0.76	0.92	0.79
Local Authorities	170	170	170	170	170	170	170	170	170

Note: The dependent variable is the change in log real average house prices over a three year period. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

2.5.4 Effect of immigration on housing rents

Because I expect immigration to have a first order effect on the rental market, I turn first to estimating the effect of immigration on housing rents. Table 2.6 reports the OLS estimates of equation 3.1 for respectively, average rents across all bedroom sizes, average rents for three and four bedrooms, and average rents for one and two bedrooms. I show the results using both the first difference in population and house prices, and also in columns (4), (7), and (9) the results using a longer difference of the preceding three years. Table 2.6 show that there is no evidence of any statistically significant effect of an increase in the foreign born population on average house rent. In Table 2.7 I present the corresponding IV estimates, showing only the estimates using the three-year change. I find a significant positive effect of immigrant inflows on housing rents when averaging across all bedroom sizes, with estimated coefficients of between 0.14 - 0.18 (significant at 5%). This implies that an increase in the stock of immigrants equal to 1% of the local population during a three-year period generates an increase in house rents of about 0.14% to 0.18% in the same three-year period. Examining the effects of immigration on the average rent of small and large rental units fails to find any significant effect. In Tables 2.8-2.9 I show estimates for two sub-period; 1996-2002, and 2003-2008, the positive effect of immigration on rents appears only in the second period from 2003-2008, with estimated coefficients of between 0.14 to 0.15.

Table 2.6: Change in Foreign Born Population and Mean House Rents (OLS)

	Δ Log rent (all bedrooms)				Δ Log rent (3 + 4 bedrooms)				Δ Log rent (1 + 2 bedrooms)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(Δ FB)/Pop$_{t-1}$	0.028	0.024	0.048		-0.019	-0.017	-0.007		-0.001	0.004	0.016	
	(0.046)	(0.045)	(0.047)		(0.069)	(0.070)	(0.081)		(0.027)	(0.026)	(0.028)	
(Δ UK)/Pop$_{t-1}$		-0.021	-0.022			0.007	0.006			0.022	0.022	
		(0.022)	(0.024)			(0.028)	(0.029)			(0.023)	(0.024)	
(Δ FB$_{t-3}$)/Pop$_{t-3}$				0.044				-0.019				-0.008
				(0.057)				(0.091)				(0.052)
(Δ UK$_{t-3}$)/Pop$_{t-3}$				0.007				0.026				0.059
				(0.033)				(0.041)				(0.037)
Δ Log unemployment rate			0.002	0.041**			0.022	0.071***			0.026*	0.073***
			(0.011)	(0.015)			(0.013)	(0.017)			(0.013)	(0.018)
Δ Log house price			0.072***	0.031			0.081**	-0.060			0.064**	-0.113*
			(0.018)	(0.043)			(0.026)	(0.074)			(0.023)	(0.049)
Δ Log housing stock (t-1)			0.055	0.226			-0.023	0.069			0.031	-0.139
			(0.067)	(0.419)			(0.079)	(0.463)			(0.068)	(0.430)
Δ Population with no quals.			-0.105*	-0.087			-0.141*	-0.155			-0.114*	-0.139
			(0.043)	(0.072)			(0.064)	(0.109)			(0.049)	(0.094)
N	1764	1764	1764	1470	1750	1750	1750	1457	1762	1762	1762	1468
adj. R^2	0.22	0.22	0.21	0.30	0.15	0.15	0.14	0.32	0.48	0.48	0.48	0.40
Local Authorities	148	148	148	148	148	148	148	148	148	148	148	148

Note: Data cover the period 1996-2008. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table 2.7: Change in Foreign Born Population and House Rents (IV)

	Δ Log rent (all bedrooms)			Δ Log rent (3 + 4 bedrooms)			Δ Log rent (1 + 2 bedrooms)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$(\Delta \text{ FB}_{t-3})/\text{Pop}_{t-3}$	0.143*	0.180*	0.183*	0.082	-0.227	-0.117	0.013	-0.101	-0.032
	(0.057)	(0.076)	(0.089)	(0.091)	(0.290)	(0.258)	(0.053)	(0.171)	(0.143)
$(\Delta \text{ UK}_{t-3})/\text{Pop}_{t-3}$		-0.113	-0.055		-0.538*	-0.488*		-0.204	-0.171
		(0.134)	(0.124)		(0.246)	(0.235)		(0.203)	(0.186)
Δ Log unemployment rate			-0.000			0.020			0.025*
			(0.011)			(0.013)			(0.012)
Δ Log house price			0.082***			0.106***			0.072**
			(0.017)			(0.026)			(0.025)
Δ Log housing stock (t-1)			0.071			0.036			0.057
			(0.065)			(0.086)			(0.068)
Δ Population with no quals.			-0.097*			-0.109			-0.101*
			(0.043)			(0.066)			(0.047)
N	1480	1480	1480	1480	1480	1480	1480	1480	1480
Local Authorities	148	148	148	148	148	148	148	148	148
F-stat (FB)	27.96	14.54	13.52	15.08	14.50	14.39	30.17	19.38	19.12
F-stat (UK)		68.00	64.64		98.60	101.91		31.41	30.67

Note: The dependent variable is the change in log real average house prices over a three year period. Data cover the period 1996-2008. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table 2.8: Change in Foreign Born Population and Mean House Rents (OLS)

	1996-2002						2003-2008					
	All		3+4 rooms		1+2 rooms		All		3+4 rooms		1+2 rooms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(Δ FB$_{t-3}$)/Pop$_{t-3}$	0.042	0.018	-0.059	-0.088	-0.010	-0.023	0.075	0.042	-0.001	-0.052	0.007	-0.038
	(0.097)	(0.097)	(0.142)	(0.140)	(0.074)	(0.077)	(0.073)	(0.065)	(0.109)	(0.100)	(0.080)	(0.073)
(Δ UK$_{t-3}$)/Pop$_{t-3}$	-0.048	-0.090	0.045	0.014	-0.242	-0.271	-0.030	-0.026	0.013	0.022	0.021	0.030
	(0.158)	(0.151)	(0.226)	(0.219)	(0.184)	(0.187)	(0.034)	(0.032)	(0.044)	(0.042)	(0.044)	(0.043)
Δ Log unemployment rate		-0.017		0.020		-0.041		0.013		0.019		0.071***
		(0.022)		(0.030)		(0.025)		(0.017)		(0.024)		(0.020)
Δ Log house price		0.196		0.173		0.136		-0.405***		-0.748***		-0.660***
		(0.109)		(0.148)		(0.134)		(0.092)		(0.129)		(0.106)
Δ Log housing stock (t-1)		0.470		0.097		0.914		0.779		1.689		-0.497
		(0.399)		(0.408)		(0.544)		(1.274)		(1.473)		(1.326)
Δ Population with no quals.		-0.250		-0.346		-0.167		0.032		0.013		-0.133
		(0.141)		(0.190)		(0.215)		(0.093)		(0.165)		(0.118)
N	888	888	888	888	888	888	740	740	740	740	740	740
adj. R^2	0.34	0.31	0.15	0.11	0.64	0.65	0.20	0.20	0.24	0.23	0.14	0.15
Local Authorities	148	148	148	148	148	148	148	148	148	148	148	148

Note: The dependent variable is the change in log real average house prices over a three year period. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table 2.9: Change in Foreign Born Population and Mean House Rents: Subperiods (IV)

	1996-2002						2003-2008					
	All		3+4 rooms		1+2 rooms		All		3+4 rooms		1+2 rooms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(Δ FB$_{t-3}$)/Pop$_{t-3}$	0.545	0.543	-1.433	-1.446	0.960	0.954	0.153*	0.140*	-0.004	-0.020	0.067	-0.001
	(0.627)	(0.630)	(1.659)	(1.541)	(0.767)	(0.758)	(0.068)	(0.062)	(0.137)	(0.142)	(0.108)	(0.105)
(Δ UK$_{t-3}$)/Pop$_{t-3}$	0.669	0.685	-1.745	-1.721	1.179	1.171	-0.127	-0.113	-0.276**	-0.282**	-0.157	-0.169
	(0.754)	(0.752)	(2.007)	(1.871)	(0.868)	(0.847)	(0.070)	(0.074)	(0.100)	(0.104)	(0.124)	(0.125)
Δ Log unemployment rate		0.005		0.014		0.004		-0.013		0.006		0.028*
		(0.019)		(0.032)		(0.021)		(0.011)		(0.012)		(0.013)
Δ Log house price		0.140*		0.120		0.000		-0.055		-0.016		-0.074
		(0.071)		(0.123)		(0.083)		(0.052)		(0.053)		(0.064)
Δ Log housing stock (t-1)		0.029		-0.114		0.148		0.316		-0.047		0.018
		(0.086)		(0.175)		(0.133)		(0.787)		(0.731)		(0.864)
Δ Population with no quals.		-0.087		-0.582		-0.000		-0.084		0.003		-0.093
		(0.132)		(0.377)		(0.187)		(0.071)		(0.093)		(0.082)
N	888	888	888	888	888	888	740	740	740	740	740	740
Local Authorities	148	148	148	148	148	148	148	148	148	148	148	148
F-stat (FB)	14.50	14.39	14.50	14.39	14.50	14.39	14.54	13.52	14.32	13.41	14.53	13.51
F-stat (UK)	98.60	101.91	98.60	101.91	98.60	101.91	68.00	64.64	67.82	65.19	67.96	64.60

Note: The dependent variable is the change in log real average house prices over a three year period. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

2.5.5 Effect of immigration on house prices

In Tables 2.10-2.11, I turn to looking at the effect of a change in the foreign born population on real average house prices. As before, all specifications include year and local authority fixed effects. The results in Table 2.10 are for annual changes in population and prices, and in Table 2.11 I show the equivalent estimates for change over a longer period of three years. An increase in the foreign born population is associated with lower house prices. The first specification in Table 2.10 excludes the change in the native population, and it suggests that there is an upward bias on the foreign born coefficient in column 1. In column 2, I control for the change in the UK born population, as the native population could also be changing, partly in response to immigrant inflows. Column 2 indicates that native inflows to an area actually have a positive effect on average house prices.

The estimates for the whole period 1996-2010 in column (3) suggest that an immigrant inflow equal to one percent of a local authority's population is associated with a decrease in average house prices of about 0.25 percent. For the period 2003-2010, the estimated coefficient is 0.13. Turning to the longer period changes in Table 2.11, here the dependent variable is the change in the log of the average house price between years t and $t-3$ and the change in both the foreign-born, and UK born population is between years t and $t-3$ relative to the total population in year $t-3$ The coefficients are much larger and suggest that it does take time for house prices to adjust to an inflow of immigrants. The estimate in column (3) suggest that an increase in the stock of immigrants equal to 1% of the local population over a three year period reduces house prices by about 0.6%.

Table 2.10: Change in Foreign Born Population and House Prices (OLS) (Annual change)

	1996-2010			1996-2002			2003-2010		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Δ FB)/Pop$_{t-1}$	-0.317***	-0.292***	-0.245***	0.041	0.029	0.060	-0.158*	-0.131*	-0.131*
	(0.070)	(0.066)	(0.063)	(0.037)	(0.040)	(0.067)	(0.067)	(0.066)	(0.058)
(Δ UK)/Pop$_{t-1}$		0.092*	0.080*		-0.044	0.003		0.100*	0.090*
		(0.041)	(0.040)		(0.085)	(0.103)		(0.048)	(0.045)
Δ Log unemployment rate			-0.038***			-0.048***			-0.031***
			(0.009)			(0.012)			(0.006)
Δ Log user cost of capital			-0.426***			-0.072			-0.310***
			(0.039)			(0.046)			(0.044)
Δ Log housing stock (t-1)			0.751			-0.032			-0.188
			(0.609)			(0.090)			(0.103)
Δ Population with no quals.			-0.138**			0.005			-0.108
			(0.052)			(0.076)			(0.058)
N	2380	2380	2380	1020	1020	1020	1190	1190	1190
adj. R^2	0.79	0.79	0.82	0.77	0.77	0.76	0.70	0.70	0.74
Local Authorities	170	170	170	170	170	170	170	170	170

Note: The dependent variable is the change in log real average house prices. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table 2.11: Change in Foreign Born Population and House Prices (OLS)
(3 year change)

	1996-2010			1996-2002			2003-2010		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Δ FB$_{t-3}$)/Pop$_{t-3}$	-0.774***	-0.696***	-0.603***	0.039	0.075	0.071	-0.321**	-0.229**	-0.206**
	(0.151)	(0.142)	(0.118)	(0.066)	(0.078)	(0.080)	(0.109)	(0.108)	(0.103)
(Δ UK$_{t-3}$)/Pop$_{t-3}$		0.227**	0.223***		0.163	0.129		0.304**	0.295**
		(0.081)	(0.066)		(0.213)	(0.213)		(0.112)	(0.100)
Δ Log unemployment rate			-0.024			-0.059**			0.043*
			(0.016)			(0.018)			(0.017)
Δ Log user cost of capital			-1.169***			-0.128			-0.796***
			(0.092)			(0.069)			(0.101)
Δ Log housing stock (t-1)			1.340			-0.634			-2.760*
			(1.382)			(0.543)			(1.283)
Δ Population with no quals.			-0.139			0.002			-0.232
			(0.098)			(0.107)			(0.121)
N	2040	2040	2040	680	680	680	850	850	850
adj. R^2	0.86	0.86	0.89	0.92	0.92	0.92	0.71	0.72	0.74
Local Authorities	170	170	170	170	170	170	170	170	170

Note: The dependent variable is the change in log real average house prices over a three year period. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Due to endogeneity and possible unobserved omitted variables I estimate Equation 3.1 using instrumental variables. I first make use of the fact that immigrants tend to locate in areas where previous immigrants have located to create instruments for the foreign born. I use the change in the UK born population lagged two years as my instrument for the UK born population in all of the following IV estimates. Tables 2.12 - 2.13 present the IV results for both the first difference estimates and the longer three-year change, respectively. The coefficients on the change in the foreign born population in specifications (1) - (3) range are between -0.8 to -0.9, thus being significantly lower than the corresponding OLS estimates in Table 2.10. The coefficients on the change in the UK born population are generally insignificant, except for in the later period only (2003-2010) where they are approximately -0.8. In the period 2003-2010, the estimates range from -1.3 to -1.6 which are similar in magnitude to the estimates of Sá (2014). The estimates in Table 2.13 are for the change in population and house prices over a three-year period, and as with the OLS estimates are considerably larger in absolute terms. The estimates for the 2003-2010 suggest that an increase in the foreign-born population equal to 1% of the local population reduces house prices by between 2.2-2.3%. The bottom panel of the tables gives the first stage coefficients and a test of weak identification - the Angrist-Pischke F statistic that partials out the influence of the other endogenous variable (Angrist and Pischke, 2009).[23] The size of the IV estimates in contrast to the OLS estimates suggests that the OLS results are biased upwards due to endogeneity or measurement problems or both. This suggests that immigrants are choosing areas with relatively

[23]See also Baum et al. (2007, 2010).

large increases in house prices, and the OLS estimates are therefore overstating the positive effect of new immigrants on house prices. However, it is arguable as to whether this instrument is truly exogenous, and these results should therefore be treated with caution. If there are unobservable factors that led immigrants to settle in particular places in 1981 these factors may still be relevant and correlated with the decisions of contemporaneous migrants.

Table 2.12: Change in Foreign Born Population and House Prices (IV) (Annual change)

	1996-2010			1996-2002			2003-2010		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Δ FB$_{t-1}$)/Pop$_{t-1}$	-0.761***	-0.939**	-0.816**	0.093	-0.048	-0.039	-1.609***	-1.423*	-1.311*
	(0.171)	(0.345)	(0.295)	(0.060)	(0.579)	(0.576)	(0.329)	(0.657)	(0.594)
(Δ UK$_{t-1}$)/Pop$_{t-1}$		-0.331	-0.275		-0.165	-0.186		-0.840*	-0.768*
		(0.188)	(0.146)		(0.698)	(0.697)		(0.411)	(0.355)
Log unemployment rate			-0.030**			-0.049***			-0.022*
			(0.011)			(0.011)			(0.010)
Log user cost of capital			-0.429***			-0.077			-0.333***
			(0.037)			(0.045)			(0.050)
Log housing stock (t-1)			0.552			-0.034			-0.215
			(0.566)			(0.083)			(0.127)
Population with no quals.			-0.065			-0.003			-0.095
			(0.065)			(0.077)			(0.069)
N	2380	2380	2380	1020	1020	1020	1190	1190	1190
Local Authorities	170	170	170	170	170	170	170	1 170	170
F-stat (FB)	31.19	17.55	17.60	16.62	16.87	16.47	32.78	23.62	23.50
F-stat (UK)		45.54	41.17		107.64	107.57		28.59	27.79

Note: The dependent variable is the change in log real average house prices. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table 2.13: Change in Foreign Born Population and House Prices (IV)
(3 year change)

	1996-2010			1996-2002			2003-2010		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Δ FB$_{t-3}$)/Pop$_{t-3}$	-1.539***	-1.404***	-1.063***	0.289	0.868	1.112	-2.346***	-2.343**	-2.189**
	(0.641)	(0.689)	(0.625)	(0.223)	(0.887)	(1.064)	(0.855)	(1.029)	(0.997)
(Δ UK$_{t-3}$)/Pop$_{t-3}$		0.150	0.176		0.992	1.296		0.004	0.018
		(0.185)	(0.155)		(1.108)	(1.235)		(0.273)	(0.259)
Log unemployment rate			-0.016			-0.067***			0.050*
			(0.019)			(0.020)			(0.022)
Log user cost of capital			-1.024***			-0.097			-0.667***
			(0.101)			(0.061)			(0.127)
Log housing stock (t-1)			0.126			-0.350			-3.670***
			(1.433)			(0.911)			(0.933)
Population with no quals.			0.017			0.071			-0.244
			(0.144)			(0.113)			(0.182)
N	2040	2040	2040	680	680	680	850	850	850
Local Authorities	170	170	170	170	170	170	170	170	170
F-stat (FB)	12.36	7.97	7.67	5.25	5.11	4.80	12.80	10.76	10.75
F-stat (UK)		113.07	113.43		60.67	59.71		131.80	131.35

Note: The dependent variable is the change in log real average house prices over a three year period. All specifications include year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

2.6 Conclusion

In this chapter I analyse how population change, and international migration in particular, affects house prices and rents in local authorities across England and Wales between 1996 and 2010. Over this period both immigration and house prices have risen rapidly, and the purpose of this chapter is to explore whether there is any causal link between increased immigration and increases in housing rents and prices. To mitigate problems of measurement error and endogeneity I use a common instrument used in the migration literature to predict the inflow of the foreign born population using historical patterns of immigrant settlement from the 1981 Census.

Using instrumental variables I find that an immigrant inflow equal to one percent of the initial population increases average housing rents by about 0.14 to 0.18 percent. The instrumental variable estimates also suggest that an immigrant inflow equal to one percent of the population reduces average house prices by about 1.6 percent, conditioning on the change in the UK born population and other covariates. If immigrants are particularly sensitive to housing costs, this may bias the results *downwards*, conversely if immigrants respond to factors that I am unable to directly control for such as better amenities, expectations of economic growth or changes in preferences for particular locations, I may *overestimate* the affect of immigration on house prices and rents.

Much attention in the UK has recently been focused on the relative lack of response from the construction sector to what has been significant increases in house prices in the last 20 years. The 2004 Barker Review of Housing Supply concluded that a higher rate of house building was necessary, and supply needed to be more

responsive to prices particularly to allow for building in places where people actually want to live Barker (2004). More recently, Nickell (2011) argues that house building in England has fallen behind household growth, and for this reason house prices have risen dramatically since the late 1990s, and immigrants are getting the blame, although their contribution to the housing shortage is relatively small. Increases in house prices as a result of population growth from any source should help to generate new construction in the long run, but this depends on land availability and planning rules. To the extent that London can be considered a "Superstar City" in the terminology of Gyourko et al. (2013), it is possible that high prices reflect a premium for living in such places, and even a sustained expansion of the housing stock may not ameliorate high prices. One possible way in which the housing market in the UK has adjusted to increased levels of immigration in recent years, beyond any price effect, is the development of the rental sector itself, demand for which has been met by the supply of houses/flats for rental accommodation by investors looking for capital gains, which may have contributed to price increases.

Chapter 3

Changing Places? Spatial Mobility of Immigrants and Natives in Great Britain

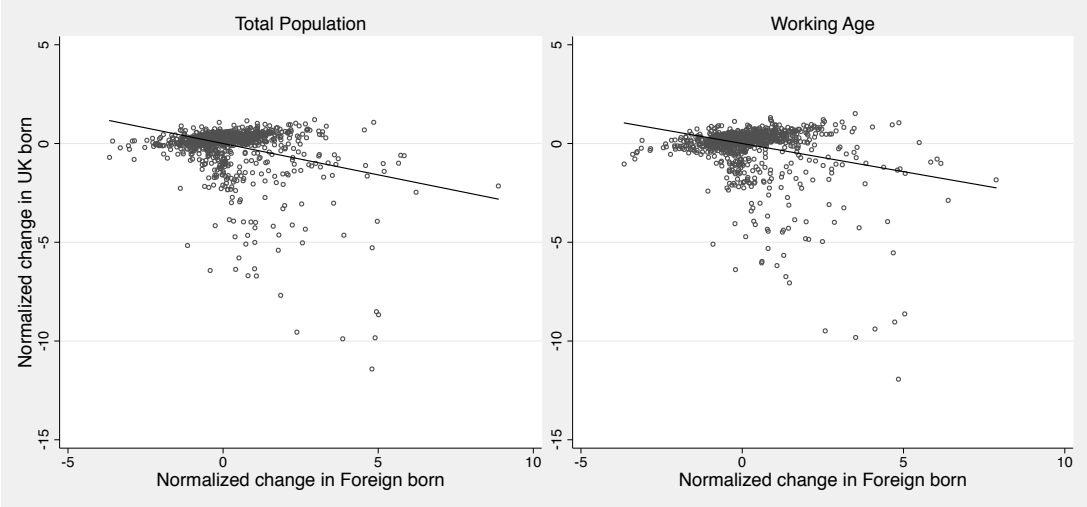
3.1 Introduction

An unresolved question regarding immigration to the UK is whether natives and earlier cohorts of immigrants are displaced from particular local labour markets in response to immigrant inflows.[1] And despite previous evidence to the contrary, there is still widespread belief that immigrants have a deleterious effect on the wages and employment opportunities of natives. In this paper I exploit variation in skills and variation in the location patterns of immigrants to analyse the extent to which immigrant inflows cause the UK born population to change location. The analysis starts by estimating the relationship between changes in the immigrant and native population in a local area. The OLS and IV results show that aggregate immigrant inflows are associated with increases in the local native population. Because of heterogeneity amongst immigrants and natives, the overall proportion of immigrants in a local market is an insufficient measure of the degree of competition between natives and immigrants, and I therefore divide the population into skill groups, to examine the degree of differential response to an immigrant shock. The scatter plots in Figure 3.1 indicate that overall there is a positive correlation between the change in immigrants and the change in natives across 200 local authorities in the UK. The analysis that follows seeks to examine whether or not this is a causal relationship. These relationships are explored in more detail and I show that there is no evidence of native outflows from local authorities in response to immigrant inflows. To overcome the

[1]In this paper the terms foreign-born and immigrant are used interchangeably. The Labour Force Survey/Annual Population Survey collects information on the country of birth, and therefore although some immigrants may in time become British citizens, they are still counted in the LFS as foreign born based on their country of birth. Foreign born refers to anyone not born in the UK (England, Wales, Scotland and Northern Ireland).

problem of endogeneity - immigrants are likely to be drawn to areas that are experiencing growth in labour demand - I make use of the concentration of immigrants in particular areas where earlier waves of migrants settled to create an instrument.

Figure 3.1: Change in Immigrants vs change in UK born



Note: This figure graphs the standardized change in the UK born population (total and working age), against the standardized change in the foreign born population. Authors' calculations from the APS.

Whether or not immigrants displace natives has important implications for understanding the operation of labour markets. If natives, or earlier cohorts of immigrants, move in response to immigrant supply shocks, then the effect of immigration on wages and employment is spread across the national labour market, and estimates of the effect of immigration using a spatial correlation approach on native mobility, will be biased downwards. The effect of immigration on the wages of the native population has generally found to be small in both the US and UK (see for example Card (2005); Altonji and Card (1991); LaLonde and Topel (1991); Dustmann

et al. (2005)). Unless the distribution of skills amongst immigrants is identical to the distribution among natives, immigrant inflows will also alter the composition of skills among the population which could conceivably affect wages.[2] As Dustmann et al. (2005) highlights, an essential difference between the US and British experiences of immigration is that the skill distribution of immigrants to the UK has generally been similar to the native skill distribution (or immigrants are on average higher skilled than natives), in contrast to the US, where immigrants have tended to be predominantly low-skilled. A distinction between US work and the current paper, is that US studies typically rely on census data, and therefore these are estimates of long-run relationships, which may differ from short-run relationships.[3] In the UK, Sá (2014) has perviously estimated the relationship between immigrant inflows and net native outflows at local authority levels, but this was not the main focus of her work, and the present study provides a more comprehensive analysis, primarily by considering heterogeneity in skill.

Two approaches have generally been used to estimate the effect of immigration on native workers, the area approach pioneered by Grossman (1982), where the effect of immigration supply shocks are estimated by comparing variation in the shock amongst local labour markets, and a time-series approach. The main disadvantage of the area approach is that local labour markets are not isolated, and this approach has been criticised by Borjas et al. (1996, 1997). However, unlike this chapter, early area based studies ignored the significant heterogeneity in skills and other characteristics

[2]It is also conceivable that there could be native outflows due to discrimination/prejudice, but that is beyond the scope of this work.

[3]See for example Card (2001); Borjas (2006, 2003); Altonji and Card (1991).

amongst natives and immigrants.[4]

3.2 Analytical framework

The primary question addressed in this paper is whether net changes in immigrant inflows result in the departure of natives from a local area. That is, do natives and immigrants change places? Displacement may occur if the immigrant inflow lowers wages in one area relative to other areas, creating an incentive for natives, or older cohorts of immigrants, to move. As natives leave, wage levels return to the previous equilibrium and the outflows reduce, how much time is required for this process to end is an open empirical question, and one that I attempt to address below, making use of data on year of arrival in the UK. Displacement, if it occurs, need not necessarily be one-for-one, it may be that only some natives, or those from older immigrant cohorts decide to move. Borjas et al. (1996, 1997) argue that out-migration of natives is an important factor in the failure of most area-analyses in the US to find evidence of an effect of immigrant inflows on natives wages. Therefore evidence for or against displacement is of critical importance in understanding how labour markets work in response to a labour supply shock. An alternative to the displacement hypothesis is one of attraction, high skill natives may be attracted to areas with clusters of high skill immigrants (or at least both groups may be attracted to similar areas due to city size, economic growth, or amenities, for example). It is also possible that low-skilled natives might be attracted to areas where high-skill immigrants locate because of jobs in complementary areas, such as low-wage service sector jobs.

[4]Grossman (1982); Borjas (1987); Altonji and Card (1991); LaLonde and Topel (1991).

There is substantial methodological debate in the literature as to how to define the estimating equation, and various papers have used alternative equations. Peri and Sparber (2011) review a number of these and conclude, based on simulations that the best approach to avoid any built in bias towards displacement is to specify the dependent variable as the first difference in the native population and the independent variable as the first difference of the foreign born population, normalising both by the first lag in the total population in the previous period, so that the estimates are not affected by cell size. I follow their approach and estimate the same specification. Normalising population changes helps to mitigate spurious correlation between ΔUK and ΔFB as area size will drive changes in both (Peri and Sparber, 2011). A possible concern with either the normalised or unnormalised specification is attenuation bias, a concern emphasised by Aydemir and Borjas (2011), arising from measurement error, which would drive the estimates toward zero. As a robustness check I also estimate results excluding large cities. I estimate the following model of immigrant inflows on net native outflows:

$$\Delta UK_{it}/Pop_{t-1} = \beta_1 \Delta FB_{it}/Pop_{t-1} + \gamma \Delta X_{it} + \varphi_t + \lambda_i + \epsilon_{it} \tag{3.1}$$

The dependent variable is the change in the native population ΔUK in area i between year t and $t-1$, divided by the lagged total population, Pop_{t-1} and the main explanatory variable of interest is the change in the foreign born population ΔFB between year t and $t-1$, divided by the lagged total population, Pop_{t-1}. ϵ_{it} is

an i.i.d. error term. Unobserved determinants of population growth are likely to drive both immigrant and native population flows, resulting in a biased estimate of β. Time invariant factors specific to each local authority, such as the initial size of the local population, are differenced out, but I also estimate models with local authority fixed effects, λ_i, to control for unobserved linearly time-varying trends in local authority characteristics, such as amenities, changing industrial structure or changing demographics, factors that are likely to drive both immigrant and native population growth. The coefficient β represents the causal effect of immigration on native population growth. A value of $\beta = 1$ implies that each additional immigrant adds one native born to the local population. A value of $\beta < 1$, means that for an additional immigrant moving into area i, 1β native would be displaced. The case of $\beta = 0$ would imply that immigrant inflows are completely offset by natives leaving the area.

Earlier studies such as Card (2001, 2007) have employed a specification similar to that in Equation 3.5 in regression analysis. Using metropolitan level census data from 1980-2000, Card (2007) finds evidence that growth in immigrants is met with growth in the native population at the rate of almost one-for-one. Card and DiNardo (2000) and Card (2001, 2005, 2007), use similar specifications, but using the change in the total population on the left hand side, rather than just the change in the native population. They find that native mobility has very little offsetting effect in response to immigrant supply shocks. Card and DiNardo (2000) examine the extent to which immigrant inflows between 1980 and 1990 change the distribution of skills across US cities. Their results suggest that there is a small increase in the population

of natives of the same skill group. Using the presence of Mexican immigrants in an MSA in 1970 as an instrument, they find slightly larger point estimates than the corresponding OLS estimates.[5]

Using a single cross section of 175 cities from the 1990 Census, Card (2001) defines skill groups based on occupations and fails to find any significant offsetting effect of native movement in response to inflows of new immigrants. However, he also finds that a 10% increase in the relative population share of an occupation group is associated with a 0.5 percentage point reduction in the employment rate of the group, and a slightly larger effect using instrumental variables. Card (2005) finds similar results, while focusing particular attention on the effect of more recent US immigration on low-skilled natives, he finds no significant effect on relative wages as a result of low-skilled immigration, but a small negative impact on relative employment.

Card (2007) distinguishes between an overall composition effect resulting from increased immigration into a city, and separate selectivity effects for natives and immigrants. He finds a strong positive relationship between the proportion of immigrants in a city and and the proportion of low-skill natives, and find that on average immigration raises the proportion of natives in the lower skill groups, and lowers the proportion of higher skilled natives.[6]

[5]Pooling all there skill groups the point estimates are between 0.24 and 0.28, depending on the controls. (Their specification includes the lagged relative growth of the native population (the dependent variable) as an explanatory variable, and also immigrant share in each skill group in 1980).

[6]The OLS estimates suggest that a 10 percentage point increase in the proportion of immigrants in a city is associated with a 1.73 percentage point increase in the proportion of the adult population in the lowest skill quartile. Most of this is due to the composition effect of more immigrants (1.31pp), while 0.26pp is due to the native population being less skilled in high immigrant cities, and the remaining 0.16pp is due to the immigrant population being less skilled in high immigrant cities. He also finds a positive association with the highest skill quartile and immigrant share. The

In contrast to the studies by Card and co-authors, which all utilise a similar methodology and regression specification, Borjas (2006) uses a different specification and finds quite large offsetting behaviour by natives. In a 2006 paper he finds that 10 new immigrants entering a city results in 6.1 natives leaving the city. However Peri and Sparber (2011) argue that the way Borjas specifies his regression equation creates a mechanical bias in the estimates in favour of finding displacement.[7] Borjas (2003) using national level education and experience cells, finds relatively large negative effects on wages (an increase equivalent to 10% of the labour force leads to a 3% decline in wages of the native born).

Mobility in the Britain has been shown by at least one study to be relatively low, with regional mobility rates averaging 2-3% over the period 1977-1999 (Gregg et al., 2004). Several other studies have examined migration within Britain without a particular focus on the effects of immigration. For example, Cameron and Muellbauer (1998) study regional migration between 1983-1995 and find that migration responds strongly to relative earnings and relative employment prospects.[8] High relative house prices also discourage net migration.[9] A possible threat to identification comes from the presence of local productivity shocks, as migrants might be more likely to locate in

corresponding IV estimates are very similar to the OLS estimates.

[7]The first specification used by Borjas (2006) is the following, where N represents natives, and F immigrants:
$ln(N_{ijt}) = \alpha + \beta_1 \cdot \left(\frac{F_{ijt}}{N_{ijt}+F_{ijt}}\right) + \gamma \cdot X_{ijt} + s_i + r_j + \tau_t + (s_i \times r_j) + (s_i \times \tau_t) + (t_j \times \tau_t) + \epsilon_{ijt}$
where j represents 32 skill groups, i 51 states, and t five census years. The appearance of N_{iji} in the dependent variable and in the denominator of the main explanatory variable may create a spurious negative correlation (Peri and Sparber (2011). The second specification in Borjas (2006) also has a similar problem, and Peri and Sparber (2011) show that the bias is increasing in the standard deviation of ΔN_{ijt}.

[8]See also Pissarides and Wadsworth (1989); Jackman and Savouri (1992); Hughes and McCormick (1994), and McCormick (1997).

[9]A point also mentioned by Gregg et al. (2004).

areas that have higher long term growth prospects. To test for the relative importance of these factors, I therefore include average real house prices in the vector X_{it}, in addition to the size of the local housing stock as migrants moving into an area require somewhere to live.

Existing work using UK data suggests that there is some evidence of a displacement effect of immigration. Estimating the effect of immigration on net migration between 11 regions for the period 1981-2000, Hatton and Tani (2005) find consistent negative displacement effects (using OLS), although the effect is only significant for the six southern-most regions, where a net increase of 100 immigrants to these regions results in out-migration of about 44 people to other areas in the UK. Hatton and Tani use National Health Service (NHS) registration data to measure the flow of people between regions (irrespective of country of birth), and International Passenger Survey data (IPS) to measure the flow of immigrants to UK regions. They regress the net inter-regional migration rate from region j to region i on the inflow rate of foreign born to region i minus the inflow rate to region j. They also include the unemployment rate, vacancy rate, wages, and house prices as determinants of migration. The data used by Hatton and Tani does not allow them to desegregate by skill groups, and as with Borjas (2006), the data are for very broad regions (Borjas uses state level data) that will undoubtedly mask movement between smaller labour market areas within these regions. More recently, Sá (2014), in studying the effect of immigration on house prices, also estimates the effect of total immigrant inflows on total native outflows at local authority level, finding an OLS estimate of 0.27 (significant at 5%), and an IV estimate of -0.87 (significant at 1%). She uses the

LFS for 170 local authorities in England and Wales for the period 2003-2010.

Several papers have examined the effects of migration on the labour market in the UK. Dustmann et al. (2005) use data from the LFS covering 17 regions of Britain for the period 1983-2000, to examine the labour market consequences of migration in the UK. Unlike this paper they are focused on wages and employment, rather than changes in total or working age population. They find that an immigrant inflow equal to one percent of the native population would result in a 0.07 percentage point reduction in the native employment rate, but this is not statistically significant. They also find no significant effect of immigration on native unemployment or participation. Analysing the effect of immigration separately for three education groups they find that there is only a significant effect on employment, unemployment and participation for the medium education group (those with O-levels but no higher).[10] Manacorda et al. (2012) focus on the effect of immigration on the structure of wages in the UK from the mid-1970s to the mid-2000s, and argue that natives and immigrants are imperfect substitutes which helps to explain the relative lack of any significant effects of the increase in the supply of immigrants on native wages. Manacorda et al. (2012) show that immigration has mainly reduced the wages of previous immigrants relative to the native born.

Immigrants do not randomly choose where to locate, and unobserved factors that attract immigrants to particular local authorities are also likely to attract the native population (and earlier cohorts of immigrants), thereby confounding causal inference,

[10]For employment they find that an immigrant inflow (those with 'medium' education) equal to one percent of the native population would result in a 0.18 percentage point reduction in the native employment rate for those with O-levels. The corresponding point estimates for unemployment are 0.10, and for participation, -0.11.

and biasing the estimation. There is a threat to identification from both the demand side and the supply side, although most previous studies focus possible endogeneity of the supply of immigrants. Local productivity shocks are unobserved and migrants might be more likely to locate in areas that have higher growth prospects.

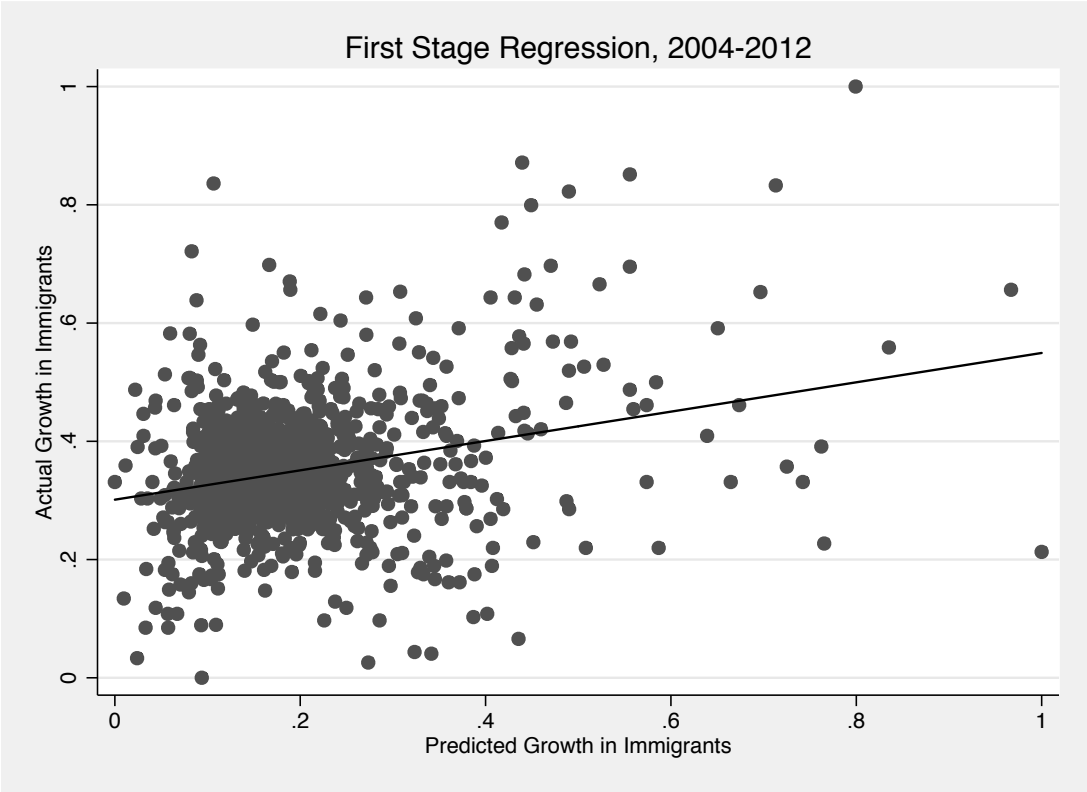
Because immigrants are likely to be attracted to areas for specific reasons such as amenities or stronger economics growth/employment, I use the commonly used approach in the literature inspired by Bartel (1989), and used by many others since such as Altonji and Card (1991). This instrument is constructed weighting the historical spatial distribution of immigrants by the contemporaneous national growth in immigrants, based on the idea that immigrants are more likely to locate where earlier immigrants have settled (Munshi, 2003). I therefore take the foreign born population in each local authority in 1992/1993 and attribute to each local authority the net immigrant growth rate for the whole of the UK each year from the APS. As a base I use data from the secure access version of the LFS which unlike the APS is based on a smaller sample, and therefore I pool over eight quarters of the LFS in 1992 and 1993 when creating instruments for individual skill groups to overcome the problem of missing data in some local authority-skill group cells. This approach allows me to construct an "imputed" foreign born population for each local authority i at time t according to the following formula:

$$SPIV_{i,t} = \sum_{r=1}^{R} \left(\frac{FB_{i,r,1992/93}}{FB_{1992/93}} \right) \times \left[(FB_{r,t} - FB_{r,t-1}) - (FB_{i,r,t} - FB_{i,r,t-1}) \right] \quad (3.2)$$

where I sum over the 11 regions of birth, r shown in Table 3.4. Following Smith (2012) and Wozniak and Murray (2012), I make an adjustment to the usual Card (2001) instrument by excluding the contribution of each local authority to the national growth in immigrants (the right-hand side of Equation 3.2). This removes changes in an area's immigrant population that are driven by local characteristics. The supply-shock (SPIV) is then assumed to be driven by factors that are exogenous to area i. The left-hand side of Equation 3.2 is the share of immigrants in each local authority in the base period. SPIV can therefore be interpreted as the net change in the immigrant population of area i that would arise if the area received its 1992/1993 share of the net change in the UK immigrant population by region of birth, minus the contribution to that change from area i. The predictive power of this instrument is shown in Figure 3.2, which plots the instrumented immigrant inflow against the actual immigrant inflow.

This IV strategy could fail if local immigrant inflows are positively correlated with unobserved local demand conditions, as mentioned above. The IV estimates would then be biased upwards, making it less likely to find evidence of displacement. I address the problem of local productivity shocks by controlling for an imputed productivity shock based on the initial industrial production in each area, following the approach of Bartik (1991). I start with the initial two-digit industry shares in each local authority and weight these by the national growth in employment in each two-digit industry to create the predicted local growth in employment demand, assuming that there are no changes in industrial composition. The predicted employment growth is calculated by the following:

Figure 3.2: Actual vs. Predicted Growth of Immigrants



Note: This graph plots the standardized actual growth in immigrants as defined in Equation 3.1, against the predicted growth immigrants (standardized) as explained in the text and Equation 3.2. The solid line is the best linear fit.

$$\gamma_{it} = \sum_{k=1}^{K} \psi_{i,k,t-1} \left(\frac{\nu_{-i,k,t} - \nu_{-i,k,t-1}}{\nu_{-i,k,t-1}} \right) \tag{3.3}$$

where $\psi_{i,k,t-1}$ is the employment share of industry k in area i, and $\nu_{-i,k,t-1}$ is the national employment share in industry k, excluding that in area i. The total predicted employment is thus $\hat{E}_{i,t} = (1+\gamma_{i,t})E_{i,t-1}$. The identifying assumption is that changes in industry shares at the national level are uncorrelated with local authority level supply shocks and can therefore be taken to represent exogenous demand-induced variation in area employment.

Estimating the effect of aggregate immigrant inflows on the total native population may mask the effect of immigrants in different skill groups on natives in similar skill groups, particularly given the heterogeneity in skills amongst immigrants. If natives and immigrants in similar skill groups are substitutes there may be more likely to be a negative (displacement) effect on natives in a similar skill group. On the other hand, if particular skill groups are complements, attraction may result. I therefore pool by skill group, where the skill groups are defined three ways as described above, the first being based on three observed occupations (professional, intermediate, and routine), the second based on three observed education groups, and the third based on allocating individuals probabilistically to four quartiles based on predicting their wages from observable characteristics. I estimate Equation 3.4 which is similar to Equation 3.1, except that now ΔUK_{ijt} and ΔFB_{ijt}, are respectively, the change in the UK born and foreign born population in each skill group j, in each area i. In

addition to the year and local authority fixed effects, I also include skill group fixed effects to control for unobserved heterogeneity across skill groups:

$$\Delta UK_{ijt}/Pop_{t-1} = \beta_1 \Delta FB_{ijt}/Pop_{t-1} + \gamma \Delta X_{ijt} + \varphi_t + \lambda_i + \zeta_j + \epsilon_{it} \tag{3.4}$$

Because I focus on skill-specific migration flows I also create skill-specific instruments to be able to identify the causal effect of immigrant inflows. I therefore construct instruments as in Equation 3.2, separately for each skill group for each of my three definitions of skill.

3.3 Local population data from the Annual Population Survey

This paper uses immigration data from the UK Labour Force Survey (LFS), a household survey containing a variety of labour market statistics, that has been running since the mid-1970s. A version of the data with a boosted sample size is available and is called the Annual Population Survey (APS), making this data more robust for small area estimates, however the data is only available at local authority level from 2003 onwards. The standard version of the APS is available for Government Office Regions, however I was given access to a secure access version of data that is available at local authority level from 2003 to 2012. There are approximately 27,000 foreign born observations, and 263,000 UK born observations in each year in

the APS, compared to an average of 10,600 foreign born and 102,500 UK born in the local authority level LFS. This provides data on the foreign-born and UK-born population at local authority level. The main advantage of using the APS for this study is that data is available annually, and in addition to counts of the foreign and native population, a rich array of labour market and other characteristics are available, allowing for the construction of a variety of skill groups. APS data excludes those who live in communal accommodation such as hostels, shelters, and caravan parks. Sample weights are provided in the APS which should normally be used, although some papers in the literature have not used them (see for example Dustmann et al. (2005, 2012)). The Office for National Statistics advises that the sample weights should be used and the details are discussed in Appendix B.5. For comparison I also present the main regression estimates using unweighted data in Appendix B.6. Table 3.1 shows summary statistics for all of the variables used in the regression analysis, showing the mean of the first difference of the UK born and foreign born in aggregate, and for each skill cell, in both the weighted and unweighted data. The figures are averages across local authorities for the period 2003-2012. Examining the size of these cells by local authority for each skill definition shows that the ranking changes between the weighted and unweighted data, which could account for the differences in results between the weighted and unweighted data.

As a robustness check I also use an alternative source of data. Legal employment in the UK requires a National Insurance Number (NINo), and this data is administered by the Department for Work and Pensions (DWP). National Insurance data has been used in several recent studies (such as Paolo et al. (2012)). A National In-

surance number is a requirement for anyone starting work or claiming benefits or tax credits in the UK, and therefore immigrants who are working require a NINo. The data covers all migrants entering the UK, although migrants who leave and re-enter at a later date are not required to register for a new NINo. The downside to this data compared to LFS/APS data is that no other information on the characteristics of the individuals is available, and there could be lags in people arriving and actually finding work and getting a NINo.

The Office for National Statistics (ONS) also produces estimates of internal migration based primarily on NHS (National Health Service) data. These annual estimates are derived from combining three administrative data sources, the Patient Register Data Service (PRDS), the National Health Service Central Register (NHSCR) and Higher Education Statistics Agency (HESA) data. The primary source of this is data is due to people changing their GP registration, and the main limitation is that there may be a delay when someone moves in re-registering with a new doctor, and some moves may not result in a change in GP. From 2012 onwards, ONS has also adjusted the data for students using HESA data as it is known that students have relatively low rates of GP registration. This data is available for 345 local authority districts in England and Wales. A separate data series is available, so-called 'Flag 4' which records GP registrations of those whose previous address was overseas, this can include the UK born if they have been living overseas.

Table 3.1: Summary Statistics

	Total Population		Working Age	
Variable	Mean	S.D.	Mean	S.D.
Aggregate population				
(Δ UK)/Pop$_{t-1}$	0.046	0.132	0.044	0.133
(Δ FB)/Pop$_{t-1}$	0.009	0.027	0.012	0.033
Δ Local demand shock	-0.003	0.036	-0.003	0.036
Δ Log real house price	0.011	0.071	0.011	0.071
Δ Log housing stock	0.037	1.442	0.037	1.442
Occupation groups				
(Δ UK)/Pop$_{t-1}$ (professional)	0.012	0.06	0.009	0.066
(Δ UK)/Pop$_{t-1}$ (intermediate)	0.003	0.09	0.001	0.094
(Δ UK)/Pop$_{t-1}$ (routine)	-0.004	0.08	-0.007	0.079
(Δ FB)/Pop$_{t-1}$ (professional)	0.006	0.019	0.021	0.057
(Δ FB)/Pop$_{t-1}$ (intermediate)	0.007	0.019	0.041	0.128
(Δ FB)/Pop$_{t-1}$ (routine)	0.006	0.019	0.036	0.113
Education groups				
(Δ UK)/Pop$_{t-1}$ (highest)	0.039	0.228	0.036	0.229
(Δ UK)/Pop$_{t-1}$	0.107	0.257	0.104	0.259
(Δ UK)/Pop$_{t-1}$ (lowest)	0.040	0.149	0.030	0.149
(Δ FB)/Pop$_{t-1}$ (highest)	0.014	0.042	0.014	0.042
(Δ FB)/Pop$_{t-1}$	0.014	0.041	0.014	0.041
(Δ FB)/Pop$_{t-1}$ (lowest)	0.015	0.045	0.015	0.045
Skill (wage) groups				
(Δ UK)/Pop$_{t-1}$ (4th quartile)	0.032	0.109	0.032	0.109
(Δ UK)/Pop$_{t-1}$ (3rd quartile)	0.032	0.120	0.032	0.120
(Δ UK)/Pop$_{t-1}$ (2nd quartile)	0.032	0.109	0.032	0.108
(Δ UK)/Pop$_{t-1}$ (1st quartile)	0.049	0.134	0.049	0.135
(Δ FB)/Pop$_{t-1}$ (4th quartile)	0.037	0.166	0.037	0.167
(Δ FB)/Pop$_{t-1}$ (3rd quartile)	0.032	0.157	0.032	0.156
(Δ FB)/Pop$_{t-1}$ (2nd quartile)	0.038	0.180	0.038	0.179
(Δ FB)/Pop$_{t-1}$ (1st quartile)	0.072	0.252	0.073	0.254

Note: Cells for skill groups (occupation, education-experience, and wage) all refer to working age population only (aged 16-65).
Source: Authors' calculations from the Annual Population Survey.

3.3.1 Defining skill groups

Skill groups have frequently been defined differently by different authors, with the main divide being between a deterministic allocation versus a probabilistic allocation. I take both approaches and define skill groups in three different ways. One approach is to use occupation groups that individuals actually work in, and I use this as my first definition. Eckstein and Weiss (2004) in the case of Israel has drawn attention to the fact that immigrants will often down-grade in the destination country by not making full-use of their potential, perhaps because of a lack of language skills. This phenomena is also apparent in the UK as shown in Table 3.2 which shows the distribution of occupations for immigrants and natives, averaging over 2011 and 2012, using the National Statistics Socio-economic Classification (NS-SEC), which appears in the APS datasets. I exclude employers and the self-employed as these have no information on wages. The last column shows the average wage in each occupation. I split the immigrant sample into those who arrived within the last two years (recent arrivals), and those that arrived prior to two years ago. It is noticeable that the distribution of occupations for earlier immigrants is quite similar to the distribution for natives, in contrast to the distribution of occupations among more recent immigrants, where for example there is a much larger share in routine occupations, 24%, compared to 12% for natives, and 15% for earlier immigrants.

Table 3.3 breaks down the occupational distribution by education, and shows that within each education grouping more recent immigrants are distributed more heavily towards the bottom of the occupational distribution. For example among the highly skilled, approximately 2% of natives are in routine occupations, compared to

11% of recent immigrants (and 6% of earlier immigrants). This suggests that there is signifiant occupational downgrading among recent immigrants within education groups. For the purposes of the regression analysis I define three broad occupation groups; professional (Higher managerial and professional, Lower managerial and professional), intermediate (Intermediate occupations, Small employers and own account workers, Lower supervisory and technical), and routine (Semi-routine occupations, Routine occupations, Never worked, unemployed).

The second definition I use is defined by the age that individuals leave full-time education. This is less subject to measurement error since since it is possible that the reported qualifications of immigrants in the APS do not accurately correspond to the native equivalent, or are simply missing.[11] I define three broad groups; the low skill group refers to those who left full-time education aged 16 or below; medium, to those who left full-time education between 17 and 20, and high refers to those who left full-time education aged between 21 and 40. These groups are summarised in the second panel of Table 3.4.

The third skill definition I use is based on a probabilistic strategy similar to that used previously by Card (2007) for example. I first estimate a set of ordered probit models, separately for immigrants and natives, for the probability that an individual would earn an hourly wage in one of four quartiles. I use the coefficients to assign the probabilities that a particular individual is classified in quartile 1, 2, 3, or 4 (highest wage). This procedure also allows me to assign non-workers, or those with missing

[11]Full-time education refers to education without a break, therefore holiday jobs do not count as a break provided that the person intended to complete a course, nor does a gap of up to a year between going to school and going to college or university, or National Service between school or college.

wage data to a skill group. The results of the ordered probit model are shown in Table B1.

Table 3.2: Occupational Distribution of Natives and Foreign Born in 2011 and 2012

Occupation	Natives	Foreign Born		Average hourly wage
		Earlier	Recent	
Higher managerial and professional	15.9	18.4	17.2	22.5
Lower managerial and professional	30.3	27.7	21.7	15.3
Intermediate occupations	16.8	12.7	9.6	10.4
Lower supervisory and technical	8.9	8.9	7.7	10.5
Semi-routine occupations	16.4	17.4	20.1	7.9
Routine occupations	11.7	14.9	23.8	7.9

Source: Authors' calculations from the Annual Population Survey 2011, 2012.

Table 3.3: Occupational Distribution of Natives and Foreign Born by Education in 2011 and 2012

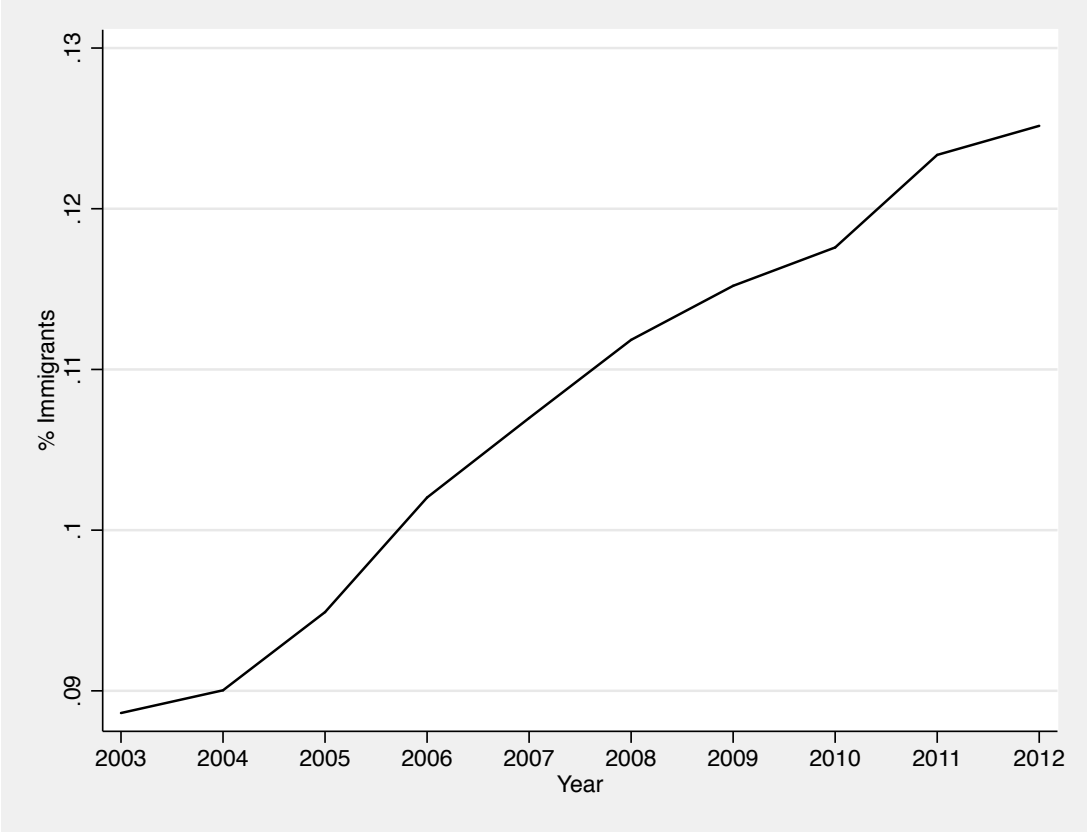
	High education			Intermediate education			Low education		
		Foreign Born			Foreign Born			Foreign Born	
Occupation	Natives	Earlier	Recent	Natives	Earlier	Recent	Natives	Earlier	Recent
Higher managerial and professional	37.8	33.5	28.8	17.8	13.1	8.4	7.4	4.1	2.7
Lower managerial and professional	44.8	33.4	30.3	35.8	28.6	15.7	20.8	15.5	6.0
Intermediate occupations	9.8	11.6	10.1	19.8	14.2	10.0	16.3	11.1	5.3
Lower supervisory and technical	2.0	5.3	4.4	6.9	9.2	9.9	13.0	14.7	12.9
Semi-routine occupations	4.0	10.3	15.6	13.2	18.3	22.9	23.1	27.8	29.0
Routine occupations	1.6	5.9	10.8	6.6	16.7	33.1	19.5	26.9	44.2

Source: Authors' calculations from the Annual Population Survey 2011, 2012.

3.3.2 The characteristics of immigrants

Immigration to the UK has increased substantially in recent years as shown in Figure 3.3. Table 3.4 presents some characteristics of the native-born and foreign-born population in the UK for 2003 and 2012.

Figure 3.3: Proportion of Immigrants in the UK over time



Note: Authors' calculations from the weighted APS.

The first panel in Table 3.4 shows the distribution of education levels using actual qualifications achieved, whether GCSE grades A-C or equivalent, GCE A levels or equivalent, or those with a degree or equivalent. In 2003 a slightly higher proportion of immigrants (17.0 percent) had a degree compared to 14.0 percent of the UK born. By 2012 these proportions had increased to 37.5 and 23.2 percent respectively. The second panel shows the education cells based on years of full-time education. This indicates that immigrants were overwhelmingly more highly educated than natives, In 2003, 34.6 percent of immigrants left full-time education between the age of 21

Table 3.4: Characteristics of Foreign born and UK born in 2003 and 2012

	2003		2012	
% With given characteristics	Foreign Born	UK Born	Foreign Born	UK Born
Qualifications				
Degree or equivalent	17.0	14.0	37.5	23.2
Higher education	5.4	7.1	8.2	9.0
GCE, A-level or equivalent	10.3	19.8	13.6	24.8
GCSE grades A*-C or equivalent	7.4	19.5	9.4	24.6
Other qualifications	25.8	8.3	18.8	7.8
No qualifications	15.8	11.9	11.8	9.2
Missing	18.4	19.5	0.8	1.4
Occupation				
Professional	31.3	32.7	29.7	34.0
Intermediate	20.6	26.9	22.4	26.2
Routine	48.1	40.4	47.9	39.8
Education groups (age left FT education)				
High	34.6	15.9	42.3	20.8
Medium	33.8	27.4	35.1	32.8
Low	25.9	53.3	19.0	45.8
Missing	5.7	3.4	3.6	0.6
Skill groups (wage)				
1st quartile	16.2	15.9	36.7	31.0
2nd quartle	23.8	25.1	21.1	25.4
3rd quartile	25.9	27.6	21.6	24.5
4th quartile	34.2	31.4	20.6	19.2
Labour force status				
Employed	63.7	73.5	66.3	71.4
Unemployed	5.1	3.5	6.8	6.1
Inactive	31.2	23.0	26.8	22.6
Age				
16-20	5.7	10.5	5.4	10.2
21-25	10.7	9.5	10.7	10.8
26-30	15.3	8.8	16.1	9.9
31-35	14.2	11.1	16.4	8.8
36-40	12.6	12.4	13.4	9.4
41-45	12.0	11.2	11.0	11.3
46-50	10.3	10.1	9.1	11.9
51-55	8.3	9.9	7.7	10.5
56-60	6.4	10.4	6.1	9.4
61-65	4.6	6.3	4.2	7.8
Sex				
Male	48.4	49.8	48.4	50.1
Female	51.6	50.2	51.6	49.9
Region of Birth				
Africa (New Commonwealth)	13.0		10.2	
Bangladesh	4.9		3.4	
Caribbean (NC)	3.4		2.3	
China	1.5		1.5	
India	9.4		8.9	
Old Commonwealth	8.4		5.5	
Other Europe	10.4		21.3	
Pakistan	5.9		6.5	
Republic of Ireland	6.2		3.3	
Rest of World	18.5		21.3	
Sth East Asia (NC)	5.2		4.5	

Note: Source: Authors' calculations from the APS. Working age population (16-65 years).

and 40 (high)[12], in contrast to 15.9 percent of the native population. In 2012 the overall picture is similar, with a small decline to 19.0 percent in the proportion of immigrants with a low education, and corresponding increases in the proportion with medium or high education levels. The increase in immigrants from countries that have joined the EU more recently (as opposed to the 1992 members) has increased markedly between 2003 and 2012. In 2003, 9.7 percent of immigrants came from 'Other Europe', in contrast to 18.2 percent in 2012.

There are also differences in the educational attainment of natives and immigrants depending on the length of time that they have been in the UK, as shown in Table 3.3. Immigrants that have been in the UK for less than five years are more highly educated compared to those who have been living in the UK for more than five years. In 2012, 46.8 percent of immigrants who had been in the UK for less than five years had left full-time eduction aged 21-40 years, in contrast to 35.5 percent of those who had been resident for more than five years. For those who had left full-time education aged less than five years, the fractions are 13.6 percent and 28.6 percent respectively. Of course, some of these differences and those in Table 1 will be due to differences between age cohorts, a dimension that I can not examine here in the absence of longitudinal data.

3.3.3 Decomposing immigrant and native population growth

The growth of the population has not been spread evenly across the country, and it can be decomposed into two parts - the growth of the immigrant population, and

[12]This category also includes those still in full-time education, and may therefore be below the age of 21.

the growth of the native born population. At time t the total population in local authority i, is Pop_t, the sum of the native born population, UK_t, and the foreign born population, FB_t. The growth of the total population can then be shown by the following equation:

$$(Pop_t - Pop_{t-1})/Pop_{t-1} = (UK_t - UK_{t-1})/Pop_{t-1} + (FB_t - FB_{t-1})/Pop_{t-1} \quad (3.5)$$

Table 3.5 presents the decomposition in Equation 3.5 for the working age population (aged 16-64) for selected local authorities between 2003 and 2012. There is significant heterogeneity in the relative growth of the two components across cities. In London for example, Merton, Westminster, and Barking and Dagenham, all had large increases in the size of their immigrant populations (between 16 - 20 percent). Brent and Newham both had net declines in their native born populations of 10 and 9 percent. Several other London local authorities also had declines in their native born populations, such as Greenwich (8 percent decline) and Merton (6 percent decline) These areas also had increases in their immigrant populations of between 3 and 15 percent.

Population growth can further be decomposed by skill groups, and Table 3.6 presents the growth in each of the three education groups used previously for natives and immigrants between 2003 and 2012 (summing across each row should therefore add to the percentage change for the total population in Table 3.5 however I do not exclude those with no education information in Table 3.5 hence the discrepancy). A striking feature of Table 3.6 is the marked decline in the native population with

Table 3.5: Components of Population Growth for selected Local Authorities (2003-2012)

	2012 population			Percentage change (2003-2012)		
Local Authority	Foreign Born/Pop.	Foreign Born	UK Born	(Δ Foreign Born)/Pop.	(Δ UK Born)/Pop.	(% Change Total
Brent	64.7	110,558	60,195	8.9	-12.1	-3.2
Westminster	60.5	123,408	80,513	17.1	3.9	21.0
Newham	64.4	102,290	56,522	6.7	-11.6	-4.9
Tower Hamlets	56.5	102,045	78,507	18.1	3.2	21.4
Camden	50.5	89,883	88,166	14.3	3.8	18.1
Merton	51.3	76,655	72,826	21.5	-9.0	12.5
Haringey	45.0	71,176	86,929	0.4	-0.2	0.2
Hackney	45.9	72,679	85,675	8.5	6.2	14.7
Waltham Forest	45.3	70,909	85,491	13.8	-6.7	7.2
Greenwich	42.9	66,128	88,098	17.3	-11.4	5.9
Islington	37.1	56,419	95,608	6.6	7.0	13.6
Leicester	39.7	83,001	126,269	15.0	-1.8	13.2
Enfield	38.9	74,912	117,560	9.0	1.7	10.7
Barking and Dagenham	38.5	46,280	73,893	18.2	-4.7	13.5
Manchester	28.8	108,438	267,690	16.8	9.9	26.8
Birmingham	28.5	194,277	486,977	13.1	-3.1	10.0
Coventry	26.1	55,832	158,051	11.2	-0.2	11.0
Nottingham	24.3	55,214	172,124	15.8	3.6	19.4
Bradford	20.0	67,456	270,382	5.4	7.2	12.6
Bristol	15.9	51,886	274,869	10.9	11.2	22.1
Sheffield	15.2	59,214	330,146	9.2	6.5	15.6
Leeds	15.0	84,703	481,773	6.6	9.5	16.1
Liverpool	11.1	34,216	274,803	6.5	0.4	6.9
Kingston upon Hull	10.4	19,111	165,441	6.8	5.3	12.1
Stoke-on-Trent	9.3	14,576	141,541	4.8	-3.3	1.4
Average (2012)	*29.5*	*90,391*	*262,303*	*9.3*	*1.1*	*10.4*

Note: Authors' calculations from weighted data using the Annual Population Survey.

Table 3.6: Components of Population Growth by Education Group for selected Local Authorities (2003-2012)

		Low education		Medium education		High education	
Local Authority	% Change Total	(Δ Foreign Born)/Pop.	(Δ UK Born)/Pop.	(Δ Foreign Born)/Pop.	(Δ UK Born)/Pop.	(Δ Foreign Born)/Pop.	(Δ UK Born)/Pop.
Brent	1	3	-7	7	-3	3	-2
Westminster	23	-1	0	5	2	15	3
Newham	-10	-8	-14	2	-2	10	2
Tower Hamlets	17	-4	-5	4	2	15	5
Camden	21	0	-1	5	2	11	4
Merton	12	3	-10	7	-0	12	1
Haringey	3	-3	-6	1	3	5	3
Hackney	18	3	-5	0	9	7	2
Waltham Forest	5	1	-12	2	2	8	3
Greenwich	8	0	-11	9	0	9	1
Islington	15	-1	-5	0	6	9	5
Leicester	18	1	-11	10	9	5	2
Enfield	14	1	-10	6	7	4	5
Barking and Dagenham	17	3	-14	9	9	7	3
Manchester	28	1	-8	7	13	8	7
Birmingham	13	4	-6	6	6	5	-1
Coventry	14	3	-2	7	4	2	-0
Nottingham	22	1	-9	10	11	6	4
Bradford	14	-0	1	3	6	2	2
Bristol	25	3	-6	2	12	6	7
Sheffield	19	0	-6	4	14	4	2
Leeds	19	2	-4	3	11	2	5
Liverpool	11	1	-8	3	8	3	4
Kingston upon Hull	17	-0	-7	5	15	2	2
Stoke-on-Trent	6	1	-8	3	8	1	2
Average (2012)	*11.1*	*0.3*	*-5.1*	*2.9*	*7.6*	*2.7*	*2.6*

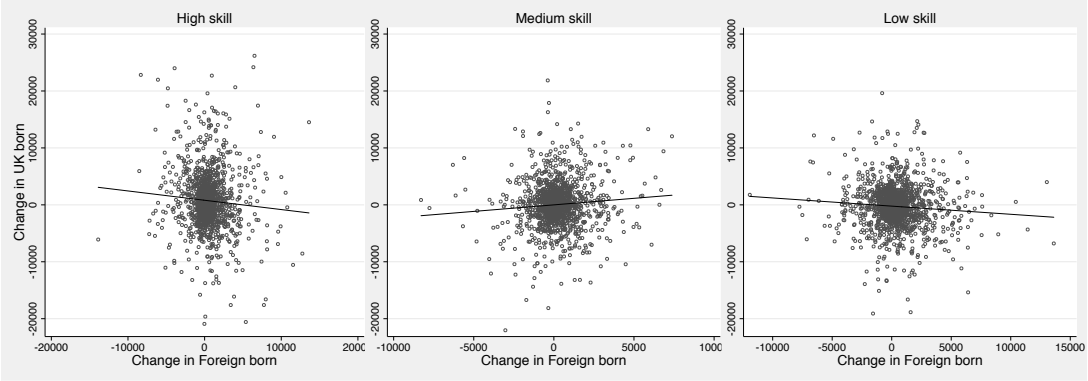
Note: Authors' calculations from weighted data using the Annual Population Survey.

low education in all of these local authorities, and this decline has been the primary driver of the decline in the native (and total) population in cities such as Manchester, Nottingham and Sheffield, the average decline across all 200 local authorities is 10.8 percent, although this will be partly driven by cohort effects from an ageing population. The foreign born population with low education has also generally declined across all local authorities, averaging -0.2 percent. In contrast, the population of immigrants who left full-time education between the ages of 21 and 40 (high education) grew by an average of 1.4 percent across all local authorities, and the average growth of the UK born population is 0.4 percent. As Table 3.6 shows, there is significant variation across local authorities, with the London boroughs of Newham, Merton, Greenwich, and Barking and Dagenham experiencing large increases in the high and medium skill cells (average of 9.8 percent and 8 percent respectively).

The nature of the correlation between changes in the foreign born population and native population in different skill groups is explored further in Figures 3.4 - 3.6. Figure 3.4 shows the annual change in the UK born against the change in the foreign born for 200 local authorities. There is a negative correlation between high skilled (professionals) immigrants and the UK born, and also between low skilled (routine occupations) immigrants and the UK born, while there is a positive correlation between medium skilled immigrants and medium skilled natives. Each graph also shows the linear line of best fit. Figure 3.5 presents similar graphs for the three broad education groups, high skill (those who left full-time education between the ages of 21 and 40), medium skill (those who left full-time education between the ages of 16 and 20), and low skilled (those who left before the age of 16). There is

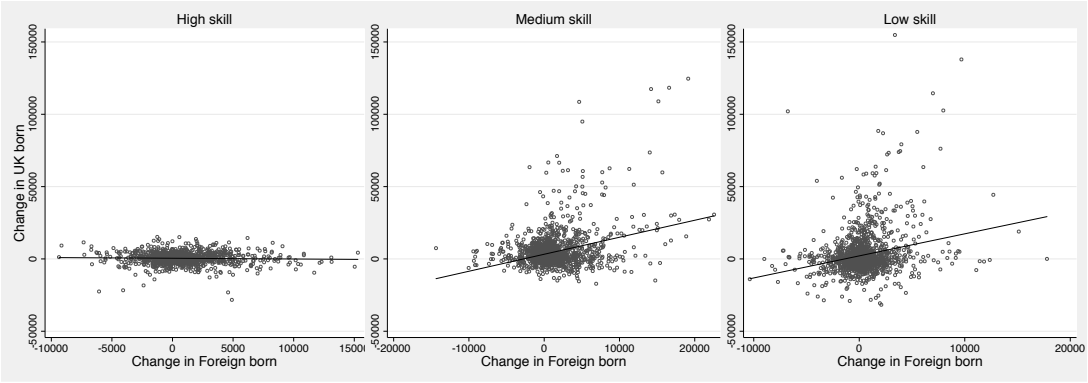
a positive correlation between the change in immigrants and the change in natives, with no correlation between the change in high skilled immigrants and natives in the highest education group. Figure 3.6 shows that there is a positive correlation between the first difference in immigrants and natives in all four of the skill groups defined by the probabilistic allocation to wage quartiles.

Figure 3.4: Change in Immigrants vs change in UK born by Occupation Group



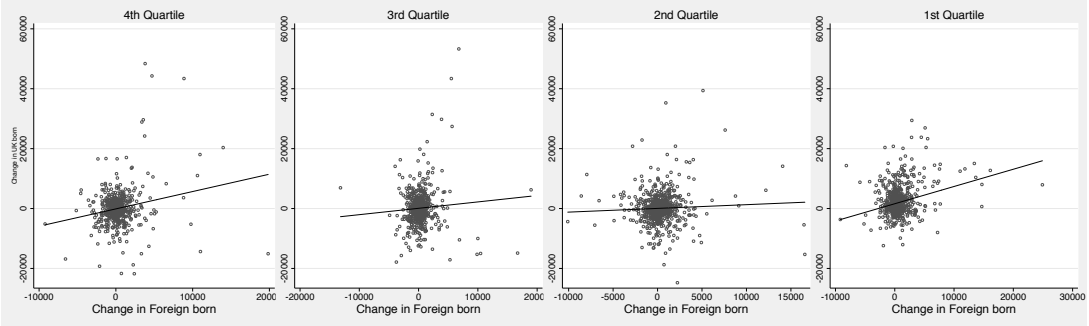
Note: This figure graphs the change in the UK born population (working age), against the change in the foreign born population in three occupation groups. Authors' calculations from the APS.

Figure 3.5: Change in Immigrants vs change in UK born by Education Group



Note: This figure graphs the change in the UK born population (working age), against the change in the foreign born population in three education groups. Authors' calculations from the APS.

Figure 3.6: Change in Immigrants vs change in UK born by Skill Cell



Note: This figure graphs the change in the UK born population (working age), against the change in the foreign born population in four skill groups. Authors' calculations from the APS.

Table 3.7: Estimates of the Effect of Immigrant Inflows on Net Native Outflows (Local Authority)

	Total Population		Working Age Population	
	(1)	(2)	(3)	(4)
A. OLS				
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.262**	-0.196**	-0.408**	-0.318*
	(0.101)	(0.072)	(0.127)	(0.145)
Δ Local demand shock		-0.003		-0.028
		(0.137)		(0.142)
Δ Log real house price		0.110*		0.152**
		(0.052)		(0.053)
Δ Log housing stock		0.013		0.078
		(0.062)		(0.065)
adj. R^2	0.86	0.88	0.83	0.86
B. IV				
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.781***	-0.706***	-0.866***	-0.910***
	(0.132)	(0.194)	(0.156)	(0.227)
Δ Local demand shock		-0.038		-0.041
		(0.066)		(0.083)
Δ Log real house price		0.001		-0.007
		(0.015)		(0.019)
Δ Log housing stock		0.029		0.034
		(0.022)		(0.023)
First stage coeff.	0.636	0.519	0.682	0.511
	(0.179)	(0.163)	(0.218)	(0.209)
F-stat	12.67	10.11	9.82	8.96
N	1800	1800	1800	1800
Local Authorities	200	200	200	200

Note: Authors' estimation of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

3.4 Effect of immigrant inflows on native population growth

The key question I wish to examine in this paper is whether net changes in the UK born offset changes in Immigrants. That is, do natives move out of an area as

immigrants arrive? An immigrant entering a particular local authority adds one to the population unless natives or those from earlier cohorts of immigrants move out of that local authority.[13]

Table 3.7 presents OLS and IV estimates of Equation 3.1.[14] The table presents the results for both the total population in columns (1) - (4) and the working age population (16-65 years) in columns (5) - (8). Various specifications are reported, including with and without local authority specific time trends, and with and without controls (house prices, housing stock, and the labour demand shock). All specifications include year fixed effects and local authority fixed effects. The local authority specific time trend controls for unobserved, non-linear fluctuations in population that could be caused by birth rate shocks for example.

Both the OLS and IV estimates of the effect of immigrant inflows on net native outflows are negative and statistically significant. The OLS estimates range from -0.20 to -0.33 for the total population, and between -0.32 to -0.45 for the working age population. The IV estimates presented in panel B are approximately three times the size of the IV estimates and range from -0.71 to -0.78 for the total population. These results indicate a substantial effect that is close to one-to-one native displacement.[15]

It is possible that the relationship between changes in the the native and immigrant population could be different depending on the geographic scale, clearly larger areas such as regions will mask many movements between smaller spatial units such

[13]The Annual Population Survey data used in this study is not available at other geographic definitions such as travel-to-work areas, which arguably represent more economically meaningful areas.

[14]Tables produced using 'estout' and associated Stata commands written by Jann (2005, 2007).

[15]Table B5 in Appendix B presents the equivalent results using the unweighted data, and shows a much smaller degree of displacement, with IV estimates of approximately -0.2 (significant at 0.1%).

as local authorities. I therefore re-estimate Equation 3.1 using three different geographic definitions; districts (407 areas), counties (140), and regions (11). Table 3.8 presents the OLS and IV estimates for both the total population and the working age population. For both the total and working age populations there is a consistent negative correlation between the the change in immigrants and change in the native population across the different areas, and this is robust to the use of an instrument, with the exception of the district are results.

Table 3.8: Estimates of the Effect of Immigrant Inflows on Net Native Outflows

	Total Population	Working Age
	(1)	(2)
A. District		
OLS		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.643**	-0.697***
	(0.216)	(0.150)
adj. R^2	-0.01	-0.07
IV		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.371	-0.435
	(0.307)	(0.505)
F-stat	28.58	23.21
N	3663	3663
Districts	407	407
B. County		
OLS		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.874***	-0.859***
	(0.036)	(0.036)
adj. R^2	0.67	0.61
IV		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.764***	-0.828***
	(0.118)	(0.129)
F-stat	16.82	11.56
N	1120	1120
Counties	140	140
C. Region		
OLS		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.839***	-0.901***
	(0.071)	(0.049)
adj. R^2	0.96	0.94
IV		
$(\Delta$ FB$)/\text{Pop}_{t-1})$	-0.548***	-0.715***
	(0.107)	(0.099)
F-stat	58.89	35.86
N	99	99
Regions	11	11

Note: Authors' estimation of Equation 3.1. All estimates includes year and area fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

3.5 Effect of immigration on local skill composition

This section focuses on the effect of immigrant inflows on the skill composition of local areas. Rather than treating immigrants and the UK born as two separate factors I define skill groups within which immigrants and natives are more obviously substitutes. As discussed above I define skill groups in three different ways; two deterministically - occupation, and education groups, and one probabilistically, based on wage data. I start by estimating Equation 3.4 by pooling the three occupation groups and these results are shown in Table 3.9. I do not present results including the other controls as these do not vary by skill group, and the instrument is too weak when these controls are included. The OLS estimates suggest a large negative correlation between the change in immigrants and change in natives, with estimates of -1.0 to -1.2. The corresponding IV estimates also show a significant negative relationship between the inflow of immigrants and native outflows, of a similar magnitude.

An alternate deterministic skill classification is to use the year that each person left full-time education; before the age of 16 years, between 17 and 21, and after 21 years. Table 3.10 shows the results of pooling these three education groups, and in contrast to the occupation cell results, they show a positive correlation between the change in immigrants and the change in the UK born population. The estimates using OLS range from 0.65 - 0.67, a strong degree of attraction. The corresponding IV estimates range from 1.6 - 18, suggesting attraction of almost two natives for every immigrant arrival in a local authority.

Table 3.9: Estimates of the Effect of Immigrant Inflows on Net Native Outflows (Pooled Occupation Groups)

	Total Population	Working Age
	(1)	(2)
A. OLS		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-1.030***	-0.670**
	(0.066)	(0.238)
adj. R^2	0.26	0.25
B. IV		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-1.050*	-0.644**
	(0.454)	(0.221)
First stage coeff.	0.669	0.603
	(0.166)	(0.108)
F-stat	16.08	31.16
Occupation fixed effects	Yes	Yes
N	5400	5400
Local Authorities	200	200

Note: Authors' estimation of Equation 3.4. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

In terms of the sign of the relationship between the change in immigrants and the change in natives, the results using my third skill definition - four skill groups based on a probabilistic assignment on wages - are most similar to the results using the education groups. As shown in Table 3.11, the OLS estimates range from 1.1 - 1.2, suggesting a strong degree of attraction between similar natives and immigrants, defined by skill. However, the IV estimates are negative and insignificant.

3.6 Mechanisms

In aggregate the estimates of the relationship between natives and immigrants appears to be negative (Table 3.7) - consistent with a model of labour market dis-

Table 3.10: Estimates of the Effect of Immigrant Inflows on Net Native Outflows (Pooled Education Groups)

	Total Population	Working Age
	(1)	(2)
A. OLS		
(Δ FB) / pop. (t-1)	0.668***	0.662***
	(0.090)	(0.097)
adj. R^2	0.15	0.15
B. IV		
(Δ FB) / pop. (t-1)	1.599**	1.704**
	(0.570)	(0.634)
First stage coeff.	0.414	0.382
	(0.067)	(0.064)
F-stat	14.85	12.64
Education fixed effects	Yes	Yes
N	5400	5400
Local Authorities	200	200

Note: Authors' estimation of Equation 3.4. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

Table 3.11: Estimates of the Effect of Immigrant Inflows on Net Native Outflows (Pooled Skill Groups)

	Total Population	Working Age
	(1)	(2)
A. OLS		
(Δ FB)/Pop$_{t-1}$	1.117***	1.088***
	(0.227)	(0.222)
adj. R^2	0.54	0.53
B. IV		
(Δ FB)/Pop$_{t-1}$	-0.397	-0.405
	(1.253)	(1.260)
First stage coeff.	0.348	0.352
	(0.070)	(0.067)
F-stat	14.52	14.72
Skill fixed effects	Yes	Yes
N	7200	7200
Local Authorities	200	200

Note: Authors' estimation of Equation 3.4. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

placement - however disaggregating by various definitions of skill groups suggests that the relationship is more complicated. The pooled occupation group results also indicate a high degree of displacement (Table 3.9), yet this contrasts with the evidence in favour of attraction shown in Tables 3.10 - 3.11, when using education, or a probabilistic allocation of individuals to skill groups based on observable characteristics. In this section I explore further the mechanisms that may lie behind the results presented so far. First, I examine whether the *total* immigrant inflow has a differential effect on particular native skill groups. Second, I examine whether the *composition* of the immigrant inflow has a differential effect on natives in different skill groups.

3.6.1 Effect of immigrant inflow on native skill composition

I first examine whether the *total* immigrant inflow has a differential effect on natives in different skill groups, focusing on the lowest and highest native skill groups using each of my three skill definitions. I estimate the following equation:

$$\Delta UK_{ijt}/Pop_{t-1} = \beta_1 \Delta FB_{it}/Pop_{t-1} + \varphi_t + \lambda_i + \epsilon_{it} \tag{3.6}$$

where the dependent variable is either the lowest or highest native skill group, and the main explanatory variable is the *total* immigrant inflow. Table 3.12 presents the results of regressing the total change in the immigrant population on the lowest and and highest occupation groups. Each cell in Table 3.12 represents the results of a

Table 3.12: Estimates of the Effect of Total Immigrant Inflows on Net Native Outflows by Occupation

	Total Population	Working Age
	(1)	(2)
A. OLS		
Low skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.749***	-0.108***
	(0.120)	(0.025)
High skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-1.085***	-0.364***
	(0.112)	(0.038)
B. IV		
Low skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.425	-0.121
	(0.607)	(0.125)
High skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.864	-0.334
	(0.504)	(0.184)
Local Authorities	200	200

Note: Authors' estimation of Equation 3.6. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

separate regression, and the first stage instrumental variables results are the same as those reported in Table 3.7. The OLS estimates suggest that the total immigrant inflow has a negative effect on both the lowest and highest occupation groups. However, there is no evidence of a causal relationship between the total immigrant inflow and natives in either the lowest or highest occupation groups, as indicated by the insignificant IV estimates in panel B of Table 3.12.

Table 3.13: Estimates of the Effect of total Immigrant Inflows on Net Native Outflows by Education

	Total Population	Working Age
	(1)	(2)
A. OLS		
Low skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.197	-0.190
	(0.150)	(0.142)
High skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.261	-0.261
	(0.224)	(0.226)
B. IV		
Low skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.654**	-0.668*
	(0.253)	(0.288)
High skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.378	-0.417
	(0.536)	(0.561)
Local Authorities	200	200

Note: Authors' estimation of Equation 3.6. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

In Table 3.13 I present the equivalent results where I estimate the effect of total immigrant inflows on the top and bottom education skill groups. The OLS results are significant, but the IV estimates indicate a displacement of approximately seven

low-educated (less than 16 years full time education) natives for every ten immigrants. For high-skilled natives the sign on the coefficient is also negative but there estimates are not statistically significant.

Table 3.14: Estimates of the Effect of total Immigrant Inflows on Net Native Outflows by Skill

	Total Population	Working Age
	(1)	(2)
A. OLS		
Low skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	0.929**	0.880**
	(0.325)	(0.316)
High skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	1.507***	1.493***
	(0.331)	(0.320)
B. IV		
Low skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	0.409	0.439
	(0.508)	(0.550)
High skill natives		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	0.728	0.703
	(0.570)	(0.526)
Local Authorities	200	200

Note: Authors' estimation of Equation 3.6. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

Finally, in Table 3.14, I present the results using the probabilistically determined skill cells. In contrast with the results using occupation or education cells, the OLS estimates are consistently significant and positive, ranging from 0.93 - 0.99 for low skilled natives, and 1.51 - 1.59 for high skilled natives. However, none of these estimates are significant when using instrumental variables.

3.6.2 Effect of Immigrant composition on natives

In this section I disaggregate the immigrant supply shock by the three skill groups (occupation, education, and wage group) used previously, and I examine the effect of immigrant inflow in the lowest and highest cell on the corresponding native cells. I also estimate the effect of immigrant inflows in each of the lowest skill cells on each of the highest native skills cells, and vice versa, while controlling for the combined remaining immigrant groups. I thus estimate the following equation:

$$\Delta UK_{i,j,t}/Pop_{t-1} = \beta_1 \Delta FB_{i,k,t}/Pop_{t-1} + \beta_2 \Delta FB_{i,-k,t}/Pop_{t-1} + \varphi_t + \lambda_i + \epsilon_{i,t} \quad (3.7)$$

where j and k are either the highest or lowest cell in each of the three definitions, and I estimate every pairwise combination. I focus on β_1 in the following tables and do not report β_2, but I report the Angrist-Pischke F-statistics for each instrument. This is of particular interest given that immigrants who are highly skilled for various reasons, such as language issues, or lack of work experience in the UK, end up working in areas for which they are overqualified. Therefore it is perhaps not competition between natives and immigrants with similar skills that is of most concern, but between low-skilled natives and high-skilled immigrants, or conversely, between high-skilled natives and low-skilled immigrants.

I report the results using the occupation group definition first, restricting attention to the 'high' occupation group (professional) and the 'low' occupation group (routine workers). Table 3.15 presents the OLS and IV results for both the total population and the working age population. Focusing on the IV estimates, there is no

statistically significant evidence of any affect of either low or high skilled immigrants on either low or high-skilled natives. In columns (5) to (8) there is weak evidence of a negative effect of low-skilled immigrants on high-skilled natives (significant at 5%, and not robust to the inclusion of a local authority time trend), and slightly stronger evidence of a positive effect of high-skilled immigrants on high-skilled, the coefficients suggesting an attraction of close to one native for every immigrant.

Table 3.15: Estimates of the Effect Immigrant Inflows on Native Occupation groups

	Δ Low UK		Δ High UK	
	Total Population	Working Age	Total Population	Working Age
	(1)	(2)	(3)	(4)
A. OLS				
(Δ High FB)/Pop$_{t-1}$	-0.207*	-0.173	-0.212*	0.501***
	(0.096)	(0.093)	(0.092)	(0.070)
(Δ Low FB)/Pop$_{t-1}$	-0.129	-0.129	-0.145***	-0.141***
	(0.073)	(0.070)	(0.043)	(0.039)
B. IV				
(Δ High FB)/Pop$_{t-1}$	-0.729	-0.754	0.892*	1.002*
	(0.535)	(0.626)	(0.433)	(0.467)
(Δ Low FB)/Pop$_{t-1}$	0.586	0.504	-1.027*	-1.028*
	(0.492)	(0.432)	(0.457)	(0.412)
F-stat	9.37	9.37	9.37	9.37
F-stat	10.55	10.55	10.55	10.55
N	1600	1600	1600	1600
Local Authorities	200	200	200	200

Note: Authors' estimation of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

In Table 3.16 I present the results using the highest and lowest categories of the education cells. These results suggest there is little significant relationship between

change in immigrants and change in the native population for either the low or high-skilled. Finally, Table 3.17 presents the equivalent results using the 1st and 4th quartiles of the skill measure, and the IV estimates indicate a positive relationship between high-skilled immigrants and natives, similar to that found using the occupation groups.

Table 3.16: Estimates of the Effect Immigrant Inflows on Native Education groups

	Δ Low UK		Δ High UK	
	Total Population	Working Age	Total Population	Working Age
	(1)	(2)	(3)	(4)
A. OLS				
(Δ High FB)/Pop$_{t-1}$	-0.078*	-0.081*	0.093	0.108
	(0.038)	(0.037)	(0.158)	(0.154)
(Δ Low FB)/Pop$_{t-1}$	-0.080	-0.023	-0.261	-0.243
	(0.076)	(0.075)	(0.151)	(0.140)
B. IV				
(Δ High FB)/Pop$_{t-1}$	-0.663	-0.593	-0.663	-0.676
	(0.545)	(0.643)	(0.610)	(0.626)
(Δ Low FB)/Pop$_{t-1}$	-1.752	-1.855	-3.646	-3.950
	(0.955)	(1.031)	(2.149)	(2.361)
F-stat	15.68	22.88	15.68	22.88
F-stat	6.81	32.17	6.81	32.17
N	1800	1800	1800	1800
Local Authorities	200	200	200	200

Note: Authors' estimation of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

Table 3.17: Estimates of the Effect Immigrant Inflows on Native Skill groups

	Δ Low UK		Δ High UK	
	Total Population	Working Age	Total Population	Working Age
	(1)	(2)	(3)	(4)
A. OLS				
(Δ High FB)/Pop$_{t-1}$	1.008	0.948	1.507***	1.493***
	(0.564)	(0.608)	(0.331)	(0.320)
(Δ Low FB)/Pop$_{t-1}$	0.929**	0.880**	0.050	0.047
	(0.325)	(0.316)	(0.164)	(0.152)
B. IV				
(Δ High FB)/Pop$_{t-1}$	-0.154	-0.159	0.779*	0.766*
	(0.117)	(0.123)	(0.343)	(0.342)
(Δ Low FB)/Pop$_{t-1}$	0.953	0.956	-1.396	-1.404
	(0.981)	(0.969)	(1.194)	(0.378)
F-stat	12.23	12.51	12.25	12.29
F-stat	11.06	10.07	11.42	10.20
N	1800	1800	1800	1800
Local Authorities	200	200	200	200

Note: Authors' estimation of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

Table 3.18: Estimates of the Effect of Immigrant Cohorts on Natives

	Total Population	Working Age
	(1)	(2)
A. OLS		
2 year cutoff		
$<$ 2 years	-0.928***	-0.881***
	(0.041)	(0.036)
$>$ 2 years	-0.855***	-0.907***
	(0.037)	(0.033)
5 year cutoff		
$<$ 5 years	-0.916***	-0.912***
	(0.038)	(0.034)
$>$ 5 years	-0.833***	-0.888***
	(0.039)	(0.036)
B. IV		
2 year cutoff		
$<$ 2 years	-1.039***	-0.819***
	(0.301)	(0.247)
$>$ 2 years	-0.771***	-0.920***
	(0.180)	(0.181)
F-stat	3.68	5.52
F-stat	10.57	10.14
5 year cutoff		
$<$ 5 years	-1.091**	-0.808**
	(0.410)	(0.271)
$>$ 5 years	-0.732**	-0.942***
	(0.232)	(0.238)
AP F-stat	5.10	5.01
AP F-stat	9.04	9.20
Local Authorities	200	200
N	1800	1800

Note: Authors' estimation of Equation 3.8. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

3.6.3 Cohort effects

Immigrants have been defined up until this point as all those who were born outside of the UK, however it is well known that immigrants tend to to become more

like natives over time and therefore one might expect more recent migrants to have a more pronounced effect on the local labour market than earlier waves of immigrants who have become relatively more assimilated. There is also evidence (Manacorda et al. (2012)), that more recent immigrants put more competitive pressure on older immigrant cohorts than natives. For these reasons I estimate the following equation, splitting the total immigrant population into two groups recent and earlier arrivals:

$$\Delta UK_{it}/Pop_{t-1} = \beta_1 \Delta FB/Pop_{t-1} \ (\leq 2yrs)_{it} + \beta_2 \Delta FB/Pop_{t-1} \ (> 2yrs)_{it} + \varphi_t + \lambda_i + \epsilon_{it} \tag{3.8}$$

I use two cutoffs to define recent arrivals, those who arrived within the last two years, and those that arrived within the last five years.[16] The results are presented in Table 3.18. Similarly to the main results presented in Table 3.7, the OLS estimates suggest a strong negative association between change in the UK population and both older and more recent immigrants. These results also hold when using the instrument as shown in panel B. However, the Angrist-Pischke first stage F-statistics are often quite low, particularly for the instrumented recent arrivals, so these results should be treated with caution. It should also be noted that although I see an arrival year, I do not know in which local authority an immigrant first lived in, only where they live when observed in the current survey year.

The next question I address is whether there is any evidence of a displacement effect of recent immigrant arrivals on earlier cohorts of immigrants. To do this I

[16]Using a cutoff of three years gives almost identical results to that using two years, and using four years gives very similar results to the five year cutoff.

estimate the following equation:

$$\Delta FB/Pop_{t-1}\ (>\ 2yrs)_{it} = \beta_1 \Delta FB/Pop_{t-1}\ (\leq\ 2yrs)_{it} + \beta_2 \Delta UK_{it}/Pop_{t-1} + \varphi_t + \lambda_i + \epsilon_{it} \tag{3.9}$$

where again, the cutoff is either two or five years, and I also control for the change in the native population on the right-hand side. These results are presented in Table 3.19. The OLS estimates suggest a degree of displacement between recent immigrant arrivals and earlier immigrant cohorts, with estimates of β_1 in Equation 3.9 of around -0.5 for the total population and -0.22 to -0.55 for the working age population. However the IV estimates (panel B) indicate that there is no significant relationship between new and older arrivals.

Given that recent immigrants are more dissimilar to older cohorts of immigrants and natives in their labour market characteristics it is also of interest to examine the effect of recent immigrants on the sum of natives and earlier immigrants, as this is where most of the variation is coming from. I therefore estimate one further variation of Equation 3.1 by estimating the following equation:

$$\Delta(UK\ +\ FB\ (>\ 2yrs))/Pop_{t-1} = \beta_1 \Delta FB/Pop_{t-1}\ (\leq\ 2yrs)_{it} + \varphi_t + \lambda_i + \epsilon_{it} \tag{3.10}$$

As before the cutoff for recent immigrants is those that arrived within either the last two or five years, and the results are presented in Table 3.20. The OLS results show a consistent negative correlation between recent arrivals and the change in the combined stock of natives and older immigrants, with estimates, with estimates

of displacement close to 1. These results also hold using an instrument for recent immigrant arrivals with estimates of β_1 ranging from -1.04 to -1.23 for the total population, and between -0.84 to -1.15 for the working age population.

Table 3.19: Estimates of the Effect of Recent Immigrants on Earlier Immigrant Arrivals

	Total Population	Working Age
	(1)	(2)
A. OLS		
2 year cutoff		
(Δ FB)/Pop$_{t-1}$	-0.548***	-0.224***
	(0.046)	(0.029)
(Δ UK)/Pop$_{t-1}$	-0.505***	-0.518***
	(0.029)	(0.028)
5 year cutoff		
(Δ FB)/Pop$_{t-1}$	-0.501***	-0.210***
	(0.040)	(0.027)
(Δ UK)/Pop$_{t-1}$	-0.427***	-0.422***
	(0.031)	(0.033)
B. IV		
2 year cutoff		
Δ FB)/Pop$_{t-1}$	-0.074	-0.290
	(0.288)	(0.305)
(Δ UK)/Pop$_{t-1}$	-0.082	-0.051
	(0.113)	(0.132)
F-stat	13.03	13.03
F-stat	4.93	7.52
5 year cutoff		
Δ FB)/Pop$_{t-1}$	0.083	-0.163
	(0.308)	(0.262)
(Δ UK)/Pop$_{t-1}$	-0.080	-0.019
	(0.116)	(0.124)
F-stat	13.03	13.03
F-stat	4.05	4.90
Local Authorities	200	200
N	1800	1800

Note: Authors' estimation of Equation 3.9. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

Table 3.20: OLS Estimates of the Effect of recent Immigrants on Natives and Earlier Immigrants

	Total Population	Working Age
	(1)	(2)
A. OLS		
2 year cutoff		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.948***	-0.896***
	(0.041)	(0.036)
5 year cutoff		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.944***	-0.935***
	(0.036)	(0.031)
B. IV		
2 year cutoff		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-1.036***	-0.839**
	(0.295)	(0.262)
F-stat	7.25	11.06
5 year cutoff		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-1.137***	1.027***
	(0.231)	(0.203)
F-stat	6.59	9.56
Local Authorities	200	200
N	1800	1800

Note: Authors' estimation of Equation 3.10. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

3.7 Further robustness checks

This section presents some additional robustness checks. I first present some results using data from an alternative source, and second I report some results excluding London and other large urban areas. Some previous work in this area have used data collected from National Insurance Number (NINo) registrations, for example Paolo et al. (2012). In this section I use NINo and NHS data (as used by Hatton and Tani (2005) for example) as a comparison. The major disadvantage of this data is that it is not possible to disaggregate by any kind of skill group. Table 3.21 presents the OLS and IV estimates of Equation 3.1, where the dependent variable is now the normalised change in the total population from the NHS data, and the main independent variable is the normalised change in the foreign born as defined by NINo registration data. I find a significant negative coefficient in both the OLS and IV estimates, the IV estimates suggest an immigrant inflow of 100, leads to a reduction in natives of between 17 to 38.

To further understand the results I re-estimate Equation 3.1, with the addition of interacting immigrant inflow with area characteristics - specifically the size and growth of local authorities. I first interact the immigrant inflow with a dummy variable for the most populous local authorities including all of the London boroughs,[17] and the results are presented in Table 3.22. As in Table 3.7, the sign on the immigrant inflow is always negative, but only significant when the data is restricted to the working age population (columns (5)-(8)). The sign on the interaction between

[17]Large local authorities are listed in Table B3.

Table 3.21: Estimates of the Effect of Immigrant Inflows on the Native Population

	OLS		IV	
	Native inflow (NHS)		Native inflow (NHS)	
	(1)	(2)	(3)	(4)
Δ Foreign born (NINo) / total pop. (t-1)	-0.227**	-0.264***	-0.098	-0.168**
	(0.069)	(0.074)	(0.050)	(0.055)
F-stat			250.54	228.96
LA fixed effects	no	yes	no	yes
N	2415	2415	2415	2415
Local Authorities	345	345	345	345

Note: Authors' estimation of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. $^{*}p$ <0.05, $^{**}p$ <0.01, $^{***}p$ <0.001.
Source: Annual Population Survey.

the large area dummy and the immigrant inflow is negative, but never significant (which would indicate a greater displacement effect in more populous areas). None of the coefficients are significant when using an instrument.

A similar pattern emerges when I interact immigrant growth with the fastest growing local authorities.[18] I define fastest growing in terms of population growth, as I lack data on economic growth at the local authority level. I use the 90th percentile as the cutoff for determining the fastest growing local authorities, although using the 75th percentile gives similar results. Table 3.23 presents the results and the OLS estimates indicate that there is a stronger displacement effect in faster growing areas.

[18]The local authorities are listed in Table B4.

Table 3.22: Effect of Immigrant inflows on Native Population - Area size effects

	Total population		Working age	
	(1)	(2)	(3)	(4)
A. OLS				
Δ FB/Pop$_{t-1}$	-0.104	-0.256	-1.002**	-1.597**
	(0.228)	(0.312)	(0.374)	(0.540)
Large area * Δ FB/Pop$_{t-1}$	-0.489	-0.501	-0.468	-0.441
	(0.322)	(0.373)	(0.259)	(0.294)
Large area	0.024***	-0.019***	0.029***	0.006
	(0.003)	(0.004)	(0.003)	(0.003)
Δ Local demand shock		-0.031		-0.048
		(0.158)		(0.162)
Δ Log real house price		0.092		0.132*
		(0.059)		(0.059)
Δ Log housing stock		0.015		0.075
		(0.066)		(0.071)
R^2	0.88	0.90	0.86	0.89
B. IV				
Δ FB/Pop$_{t-1}$	-1.246	3.284	0.265	0.244
	(2.427)	(43.933)	(0.154)	(0.154)
Large area * Δ FB/Pop$_{t-1}$	0.369	-4.131	0.949	4.601
	(2.413)	(43.376)	(2.098)	(16.748)
Large area	-0.002	0.025	-0.000	0.007
	(0.006)	(0.125)	(0.008)	(0.056)
Δ Local demand shock		-0.336		0.351
		(3.928)		(1.610)
Δ Log real house price		-0.076		0.057
		(0.834)		(0.241)
Δ Log housing stock		-0.010		0.097
		(0.341)		(0.243)
AP F-stat	12.67	10.11	9.82	5.96
AP F-stat (interaction)	13.32	11.48	10.76	6.19
N	1800	1800	1800	1800
Local Authorities	200	200	200	200

Note: Authors' estimation of a variant of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

Table 3.23: Effect of Immigrant inflows on Native Population - Area growth interaction

	Total Population		Prime Age Population	
	(1)	(2)	(3)	(4)
A. OLS				
Δ FB/Pop$_{t-1}$	-0.177	-0.088	-0.326*	-0.252
	(0.226)	(0.262)	(0.154)	(0.178)
Fast growing area * Δ FB/Pop$_{t-1}$	-0.689**	-0.652*	-0.321	-0.940*
	(0.235)	(0.266)	(0.199)	(0.226)
Fast growing area	0.034***	-0.021***	0.040***	0.005
	(0.002)	(0.003)	(0.002)	(0.004)
Δ Local demand shock		0.006		-0.030
		(0.138)		(0.152)
Δ Log real house price		0.097		0.147*
		(0.057)		(0.057)
Δ Log housing stock		0.004		0.072
		(0.065)		(0.069)
R^2	0.58	0.60	0.57	0.59
B. IV				
Δ FB/Pop$_{t-1}$	-0.923***	-0.872***	-1.019***	-1.121***
	(0.140)	(0.169)	(0.155)	(0.198)
Fast growing area * Δ FB/Pop$_{t-1}$	0.145	0.151	0.150	0.302
	(0.146)	(0.177)	(0.159)	(0.205)
Fast growing area	0.005***	0.006***	0.011***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)
Δ Local demand shock		-0.007		-0.009
		(0.050)		(0.069)
Δ Log real house price		0.003		-0.007
		(0.015)		(0.020)
Δ Log housing stock		0.024		0.031
		(0.021)		(0.023)
AP F-stat	12.67	10.11	9.82	5.96
AP F-stat (interaction)	12.32	11.96	11.56	7.73
N	1800	1800	1800	1800
Local Authorities	200	200	200	200

Note: Authors' estimation of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

3.7.1 Native mobility

The analysis so far has been an analysis of *net* flows, in this section I analyse *gross* flows using data from the labour force survey, which records the information on the local authority of residence one year ago, enabling an analysis of the in-migration, out-migration, and net-migration rates for the native population.[19] If a native lived in local authority i in year $t-1$, and lives in a different local authority in year t, then s/he is defined as having moved out, and the out-migration rate is defined as the number of natives who moved out of local authority i between years $t-1$ and t, divided by the native population of local authority i in year $t-1$. Similarly, a native moves into a local authority if s/he lived there in year t and lived in a different local authority in $t-1$, and the in-migration rate is therefore the number of natives who moved into local authority i divided by the population of i in $t-1$. The net migration rate is the difference between the in-migration rate and the out-migration rate. Summary statistics for native mobility rates are shown in Table 3.24.

I use the following model to estimate the effect of immigrant inflows on native in-migration, out-migration, and net-migration rates:

$$native\ mobility_{it} = \beta_{it}\frac{FB_{it}}{Pop_{it-1}} + \varphi_i + \rho_t + \epsilon_{it} \tag{3.11}$$

The dependent variable is now either in the in-migration, out-migration, or net-migration rates, and the coefficient of interest, β is the response in these mobility rates from the normalised inflow of immigrants. Table 3.25 presents the OLS and

[19]Data are not available at the smaller district level, and these data are not available in the Annual Population Survey, and therefore the following results are based on a smaller sample than the boosted APS data.

IV estimates of Equation 3.11. The IV estimates suggest that an immigrant inflow equal to 1% of the local initial population increases the native out-migration rate by approximately 0.12 percentage points (columns 3 and 4), which is reasonably large considering the average out-migration rate for the UK is 1.55%. The results also imply that an immigrant inflow is associated with a smaller inflow of natives, and that the net result is an increase in the net outflow of natives of between 0.06 to 0.08 percentage points (last row), which is consistent with the results found for the net flows in the previous sections.

Table 3.24: Average mobility rates for the UK born

	Total Population		Working Age	
	Mean	S.D.	Mean	S.D.
Native in-migration rate	0.069	0.035	0.067	0.040
Native out-migration rate	0.015	0.02	0.018	0.025
Native net migration rate	-0.054	0.041	-0.049	0.049

Note: Table shows the average (over the period 2003-2012) in-, out-, and net-migration rsates between local authorities for the UK born. Authors' calculations from the Annual Population Survey.

Table 3.25: Effect of Immigrant inflows on Native Movers

	OLS		IV	
	Total Population	Working Age	Total Population	Working Age
	(1)	(2)	(3)	(4)
Native in-migration rate				
Δ FB/Pop$_{t-1}$	0.027**	0.048**	0.042*	0.064***
	(0.010)	(0.016)	(0.017)	(0.019)
Native out-migration rate				
Δ FB/Pop$_{t-1}$	0.092***	0.108***	0.122***	0.124***
	(0.014)	(0.019)	(0.029)	(0.034)
Native net out-migration rate				
Δ FB/Pop$_{t-1}$	0.065***	0.061***	0.080*	0.061*
	(0.016)	(0.018)	(0.038)	(0.031)
N	1800	1800	1800	1800
Local Authorities	200	200	200	200
F-stat			79.74	56.94

Note: Authors' estimation of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.
Source: Annual Population Survey.

3.8 Conclusion

This chapter provides the first comprehensive analysis of the effect of immigration on local labour markets in the UK using data from the Annual Population Survey for the period 2003-2012. The results indicate that when considering the aggregate, total or working age population, there is significant evidence of native displacement from local areas as a result of immigrant inflows. The IV estimates suggest displacement of between 20-30 people in response to an immigrant inflow of 100 people, an economically significant decrease.

Immigrants and natives are heterogenous, and it therefore makes sense to split natives and immigrants into skill groups to allow competition between arguably more similar subgroups. Although previous studies of labour market adjustment to immigration also consider heterogeneity in skill, most tend to focus on only one particular definition of skill, whereas I consider three alternatives. The first two are based on direct observation of the characteristics of immigrants and natives, while the first takes a probabilistic approach, following for example Card (2001, 2007), to allocate natives and immigrants to skill groups based on where their observed characteristics would place them in the wage distribution.

The overall negative relationship between immigrant inflows and native growth is also apparent when pooling by occupation groups. Both OLS and IV estimates suggest displacement of between -0.6 to -1.1, suggesting that within three broadly defined occupation groups (routine, intermediate, and professional) natives in similar occupations to immigrant are displaced. However, if skill groups are defined by either age of leaving full-time education, or a probabilistic assignment into the wage

structure, there is some evidence of attraction between similarly skilled natives and immigrants. These results are not driven by differences in the sample, and therefore this is an important finding. Most previous studies in the migration literature have used only one definition of skill, but there are different dimensions to skill, and this may explain the results presented here, although further investigation may be warranted.

To further understand what might be driving these results I estimate the effect of *total* immigration on low skilled and high-skilled natives separately (for each of the three skill definitions). Using an instrument I don't find any statistically significant effect of immigrant inflows on either low-skilled or high-skilled native outflows, for either the occupation or wage based skill definitions. Defining skill be education groups there is evidence (using an instrument) that immigrant inflows displace low skilled natives, with an estimated coefficient of around -0.7.

I show that immigrants often work in occupations that are below what their education might otherwise suggest, and because of this occupational down-grading it is interesting to examine whether the *composition* of the immigrant inflow has a differential effect on low and high-skilled natives. I therefore split the immigrant inflow into low-skilled and high-skilled groups, and estimate the effect on both low skilled and high-skilled natives. Using the occupation based skill definition I find evidence of a positive association between both high skilled immigrants and high-skilled natives. I also find a negative association between low skilled immigrants and high-skilled natives. These first effect suggests that there might be a degree of complementarity between the high-skilled of either type. There is are significant

effects evident when defining skill groups by education groups, but the positive relationship between high-skilled immigrants and high-skilled natives is also found using probabilistic wage groups.

Although immigrants may face significant occupational down-grading on arrival, it is also the case that they become more similar to the native population over time, and therefore when looking for any effects of immigration in the labour market it is important to consider the length of time that immigrants have been in the UK. The APS allows me to see the year of arrival of an immigrant, and so I first split immigrants into those that arrived recently (within either the last two or five years), and those that arrived earlier, and estimate the effect of each group on the total native population. Here I find that the sign on the coefficients for both recent and earlier immigrants arrivals is always negative and significant, and the two are not statistically significantly difference from each other. These results should be treated with caution due to the relatively weak instruments, but it does suggest that even if immigrants do become more assimilated over time, they are still 'different' in some sense.

Previous studies such as Manacorda et al. (2012), have shown that the effect of recent immigrants is most strongly felt by earlier immigrants, I therefore estimate the effect of recent immigrants (while controlling for the change in the native population) on earlier immigrants. The OLS estimates indicate that recent immigrants do displace older immigrants, but this effect is not robust to the use of an instrument.

Finally, when considering the length of time in the UK, I estimate the effect of recent immigrant arrivals on the net outflows of the sum of natives and earlier

immigrants. Given that recent immigrants are the most dissimilar, it is here that there is maximum variation between immigrants and natives/earlier immigrants, and therefore if there was any displacement effect I would expect it to be evident here. The IV estimates show a consistent negative effect of recent immigrants on natives/earlier immigrants.

The evidence presented in this chapter provides some support for the idea that an inflow of high-skilled immigrants attracts high-skilled natives, perhaps because of skill complementarities, which at least for the high-skilled runs counter to the standard labour market model of displacement.

Chapter 4

Do housing wealth shocks affect voting behaviour? Evidence from the UK

4.1 Introduction

Whether to vote and for whom, are two of the most important actions taken in a democracy.[1] While there is a large literature studying the effect of a host of factors on voter turnout, relatively little attention has been paid to economic factors such as income, wealth, and employment. Further, despite a long literature on "economic voting" (Downs, 1957), no previous studies have sought to examine the effect of changing household wealth on partisan choice. The consequences of increasing income and wealth inequality are of great interest to social scientists, and the relationship between economic conditions and politics has come under increasing scrutiny in the wake of the Great Recession. Piketty and Saez (2003) and Atkinson et al. (2011), for example, show that the share of income accruing to the top one percent has grown over time. Rajan (2010) has argued that this growing inequality in the US put pressure on politicians to ease the supply of credit. More recently, Stiglitz (2012) among others, has emphasised the links between economic inequality and political inequality.

In this chapter, I use household variation in wealth determined by the housing market to identify how household wealth shocks affect political preferences and voter turnout. The analysis makes several contributions to the literature, First, my use of house price variation allows me to overcome the endogeneity of house price growth and voting behaviour, and other biases associated with cross sectional data. It could

[1]British Household Panel Survey and Understanding Society data were made available through the UK Data Service. Richard Topf of the the British Election Studies Information System kindly provided data on British election results by Parliamentary constituency. I thank Jonathan Wadsworth, Daniel Hamermesh, and Andrew Oswald for helpful comments on this chapter.

be, for example that those who vote for the Conservative Party are more likely to live in more expensive houses and in areas that experience more rapid house price growth (a 'selection' effect). Alternatively, this chapter argues that exposure to rapid house price growth causes individuals' to adopt certain attitudes and vote in a particular way (a 'treatment' effect). Furthermore, this chapter is the first to examine how voting behaviour responds to the wealth of the household rather than simply its income. Excluding wealth may be problematic as it results in the mischaracterisation of the financial resources of the household. Third, while I do not directly examine the effect of housing wealth on the political economy of housing supply, the analysis does indicate how housing wealth affects partisan choice which does have implications for *inter alia* housing regulations. Fourth, I provide some evidence suggesting that wealth shocks may lead people to change their attitudes to a wide variety of economic and social issues, and this provides some evidence for the underlying mechanisms driving political preferences determined by shocks to housing wealth. Finally, this chapter contributes to the literature on housing wealth and household behaviour.[2] There is debate over the extent to which housing wealth has any effect on consumption, savings, labour supply decisions, and education, partly because it has historically been difficult to realise gains without selling the house.

The period under examination spans five elections (1992, 1997, 2001, 2005, and 2010) for the Westminster Parliament elected by voters in England, Scotland and

[2]The rapid increase in house prices from the mid-1990s has led to many papers studying the effect of this on various aspects of welfare, including fertility (Lovenheim and Mumford, 2013), educational choices (Lovenheim, 2011), divorce (Dettling and Kearney, 2014; Farnham et al., 2011), health (Gathergood and Fichera, 2012), consumption (Attanasio et al., 2009; Campbell and Cocco, 2007; Disney et al., 2010), and indebtedness (Disney et al., 2009; Hurst and Stafford, 2004).

Wales.[3] Using nationally representative longitudinal data, I show that unanticipated positive wealth shocks make people more likely to vote for right-wing political parties. Negative wealth shocks lead people to favour left-wing parties. Using restricted access British Household Panel Survey (BHPS) and Understanding Society data from 1991 to 2011 that contain geographic identifiers, I use short-run variation in house prices within 403 local authority districts over time to examine whether people are more or less likely to vote for a particular political party, or more broadly, vote for "left" or the "right", in areas with high-growth in house prices versus areas of low-growth, controlling for detailed demographic characteristics and area fixed effects.

There are at least three problems with the existing literature, the first is that existing studies (discussed below) all rely on aggregate cross-sectional data which make identifying casual effects difficult.[4] This study focuses on the voting decisions of individuals by making use of representative longitudinal data. Second, the criticism of George Stigler that all voters want good economic conditions, and nobody wants a bad economy, therefore voters may vote for the incumbent if they see prosperity, and otherwise not, is perhaps too simple. For most economic and social issues a distribution of opinions will exist, within which a voter will hold a particular position. For example, it's reasonable to expect that voters will have different positions on issues such as redistributing income, regulating the economy, funding healthcare, changing welfare payments, and so on. Where such opinions come from and how they effect voting behaviour is beyond the scope of this chapter, but some analysis of

[3]Northern Ireland is not included in the analysis.

[4]Some, such as Charles and Stephens (2013) do use instrumental variables techniques, but these papers are focused on turnout which is not the main focus of this study.

attitudes will be undertaken below. It should be noted that these early cross-sectional studies all focus on the choice between the incumbent versus the alternative, rather than on the left/right division.

Finally, to the best of my knowledge no previous studies have considered the influence that wealth might have in changing individuals' political preferences, yet it is quite reasonable to assume that the position a person occupies in the distribution of wealth (both financial and non-financial) might alter their political preferences. Powdthavee and Oswald (2014) is the most similar paper to the current chapter, but they use lottery wins instead of house prices, finding that lottery winners are more likely to vote right-wing. My measure of wealth is better than theirs given that over 70% of the population own a house, and is therefore affected by changing house prices in contrast to the relatively small proportion of people who gamble (and the relatively small sums involved). Bartels (2008) among others, emphasise the link between income and voting, finding that on average, the real incomes of middle-class families grew twice as fast under Democrats as they did under Republicans, while the real incomes of working poor families grew six times as fast under Democrats as they did under Republicans. However, measures of income, or more broadly class, do not fully capture the role of property ownership. Those who have a greater accumulation of wealth, whether financial or property, are more likely to favour different political parties, and advocate different policies.

I use housing wealth as a measure of household wealth for several reasons. First, about 73% of people in the BHPS own a house. Second, for these, and people in Great Britain as a whole, housing wealth represents the largest share of total household

wealth.[5] Third, I argue that housing market changes are exogenous to households, which allows me to overcome the inherent endogeneity between wealth accumulation and voting decisions.[6] The housing boom that began in the late 1990s provides the main identifying variation in the analysis. This period was characterised by a large boom and two busts in house prices, and the boom was associated with increases in home equity withdrawal.[7] Between 1991 and 1995, average real house prices fell by 9.5%, and then increased by 183.6% between 1995 and 2007, and subsequently fell in the Great Recession by 6% between 2007 and 2013.[8] Home owners who lived in high-growth areas experienced a large increase in their liquid wealth relative to those in low-growth areas and renters. Importantly, the house price boom was not confined to solely high income people, as many relatively low-income people who happened to live in high-growth areas also experienced an increase in housing wealth.

Figure 4.1 shows that parliamentary constituencies that have higher house prices have a higher proportion of people voting for the Conservative Party. Of course those that are more likely to vote for the Conservative Party may self-select into areas that have higher house price growth, and this chapter seeks to argue that there is a treatment effect of higher house prices, and not purely a selection effect.

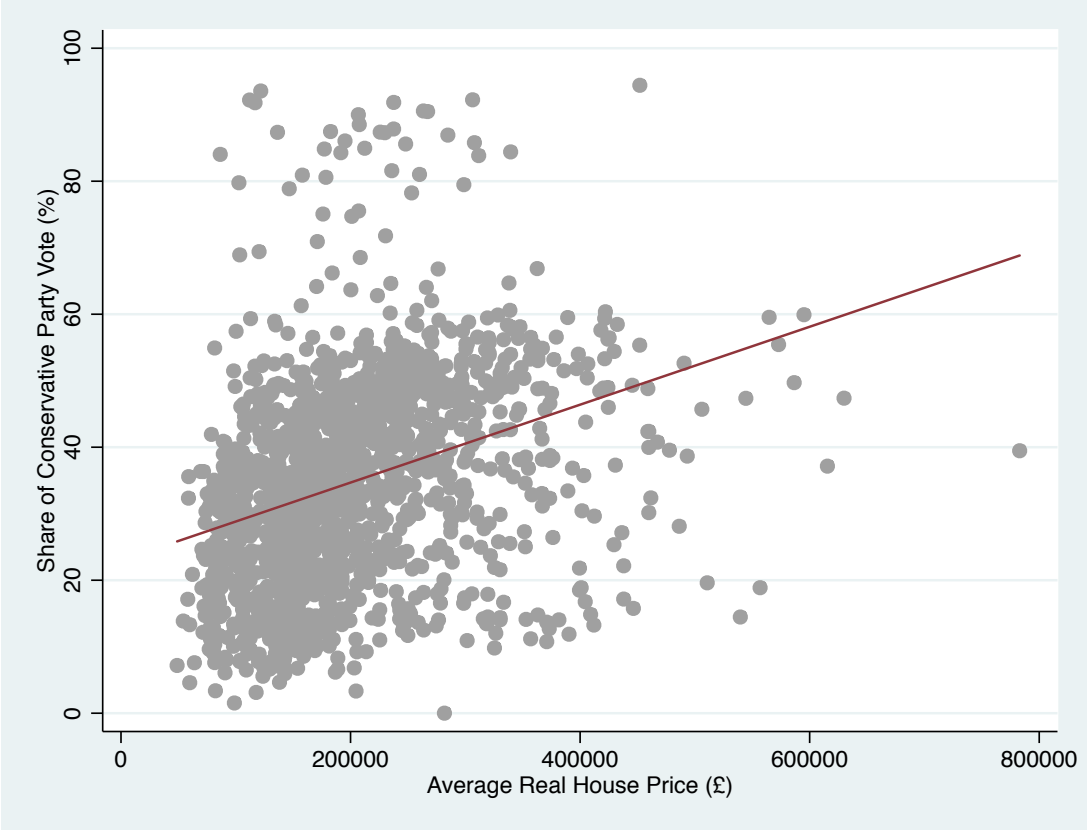
[5]See for example Banks et al. (2003), who find that the value of home equity accounts for 60% of household financial wealth in the UK.

[6]To the extent to which house price movements are determined by local economic conditions, these could influence voting behaviour through routes other than house prices, and I therefore include area and time dummies in the econometric models.

[7]Reinold (2011).

[8]Authors' calculations from Land Registry data. In London average prices increased by an average of 261.8% between 1995 and 2007, and rose the least in the North East by 140.0%.

Figure 4.1: Cross-Sectional Relationship between Share of Party Vote for the Conservatives and Real House Prices by Parliamentary Constituency



Source: The proportion of the party vote for the Conservatives comes from British Election Studies Information System (BESIS) data which collates the results of each election by parliamentary constituency. House price data comes from the Land Registry, and I calculate the average house price for each constituency. Data are for the 1997, 2001, 2005 and 2010 Westminster elections in 650 constituencies.

4.2 Voting and wealth

Despite the importance of partisan choice in determining which party holds political office and therefore holds power over a myriad of decisions relating to economic growth, social policies, and income distribution to name just a few, there is remarkably little attention paid by economists to understanding the differences between political parties and why voters choose one over the other. The classic model of voting in economics is due to Downs (1957). However, Downs (1957), and the subsequent literature largely focus on the reasons for voting as a trade-off between costs and benefits, with most of the literature focused on how various variables affect voting costs. These variables have included the role of demographic variables such as household size, the media, information, campaign spending, voter dissatisfaction, and registration requirements. Very little attention has been paid to the role of economic factors such as employment and income.

Research on "economic voting" suggests that features of the labour market should affect voting behaviour.[9] These studies typically use state-level data and relate the votes received by a particular candidate to the state of the labour market, generally finding a positive association between votes received by the incumbent and economic conditions. A seminal paper by Kramer (1971) helped spark a debate over the role of economic events in influencing voting behaviour, finding that behaviour in Congressional elections in the United States from 1896 to 1964 was influenced by economic fluctuations. A conclusion Stigler (1973) refuted, finding no relationship

[9]See Duch and Stevenson (2008), Blais (2006), Hibbs, Douglas A. (2005), and Lewis-Beck and Stegmaier (2000) for reviews of the economic voting literature.

between either the past average income performance, or the unemployment rate and the share of votes received. He argues that this is not unusual as there is no difference between the two parties with respect to their pursuit of economic prosperity, and that in fact the idea that economic activity affects voters' views about candidate quality is inconsistent with rational behaviour on the part of voters (Stigler, 1973, 1975). Fair (1978) points out that many of the disagreements are due to statistical procedures and interpretation, and attempts to narrow the range of disagreement by providing a more general model of voting that can incorporate a range of theories.[10] Fair (1978) finds that votes for president are affected by the change in real economic activity (either the change in the unemployment rate or real per capita GDP), but that voters do not look very far back, considering only the events within a year of the election, and not considering the past performance of the non-incumbent party.

Consistent with Stigler (1973), using repeated cross-sectional data, Leigh (2005) finds no evidence that macroeconomic factors affect partisan choice in his study of the affect of individual, local, and national characteristics on partisan choice in ten Australian elections between 1966 and 2001. He does, however, find demographic differences, and that the partisan gap has widened along three dimensions: young and old; between rich and poor; and between native-born and foreign-born.

An advance on these aggregate studies is provided by Gelman (2007) and Gelman et al. (2010), who uses both individual and aggregate data to better understand the relationship between income and and voting behaviour in the US; in particular explaining the observed pattern of rich people in poor states being much more likely

[10]Fair has updated his original 1978 study following subsequent presidential elections. See also Fair (1996) for an overview.

to vote for Republicans than rich people in more prosperous US states. Gelman (2007) finds that in rich states there is almost no correlation between income and voter preferences. Glaeser and Sacerdote (2007) also study the apparent "aggregation reversal" of voting behaviour in the US, arguing that it is due to the social formation of beliefs. For example, although higher incomes might be associated with a belief for lower taxes, it might also be associated with more liberal social views. The first effect might lead people to prefer Republicans, but the second may push them away from Republicans. In their model if beliefs are a reflection of social learning which exhibits a social multiplier, it is possible for the aggregate relationship between beliefs and income to be much stronger than the individual relationship between these two variables.

There is also a literature on the effects of economic factors on voter turnout. For example Rosenstone (1982) uses individuals data from the 1974 Current Population survey, and finds that unemployment, poverty, and a reduction in financial wellbeing all reduce voter turnout. A pattern supported in aggregate data on Presidential and mid-term elections between 1896 to 1980. More recently, Charles and Stephens (2013) finds that higher local wages and employment lower turnout in elections for governor, senator, US Congress and state House of Representatives, but have no effect on presidential turnout. A large number of aggregate-level studies find no effect at all (Blais, 2006). More closely related to the present analysis, a few papers have explored the role of housing tenure on voting, for example DiPasquale and Glaeser (1999), using data from the United States and Germany, find that homeowners are more likely to vote and participate politically; while Holian (2011), also using data

from the United States, does not find a significant effect of homeownership on turnout when controlling for basic demographics, or using instrumental variables. In the UK, Huberty (2011) also fails to find evidence of a 'homeowner' effect, when analysing the results of the 1997 and 2001 elections.

4.3 Analytical framework

There are two basic questions to be addressed in this chapter, first, whether or not you vote, and second, which party ("left" or "right") do you vote for. Housing tenure and the cost of housing might affect both decisions. Previous literature, such as DiPasquale and Glaeser (1999), finds that homeowners are more likely to vote than renters, while research in the political economy of housing supply (Ortalo-Magne and Prat, 2007) might suggest that homeowners propensity to vote is increasing in the value of their house. We might also expect voting participation to be non-linear in wealth. House price changes could affect the partisan choice of owners and renters differentially through a mix of wealth effects and changing attitudes. For home owners, a price increase represents a positive wealth shock, while for renters, to the extent to which house prices and rents are positively correlated, an increase in house prices represents a negative financial shock. The following simple analytics build on Oswald and Powdthavee (2010) and provide a framework for thinking about the results that follow.

People earn real income y, and also hold wealth, which could be both financial and non-financial wealth, however I simplify, and assume that individuals' only hold

housing wealth, h, a private good. The government provides public services, P, such as public education, health services, or the police force for example, which are funded from the collection of income taxes, levied at rate t, and taxes on housing wealth. In the UK there is no capital gains tax on the sale of the family home[11] I assume that There is a left-right political spectrum, where r represents the degree of "red" of the government, a higher r, the more "red" a government or society. And I assume that housing wealth is a function of the degree of "redness" of society, and is decreasing in r.

There is a monotonic relationship $P(t)$ between the supply of the public good and the tax rate, and this is increasing and differentiable; greater income taxes lead to a larger supply of the public good. A left-wing society, with a high r, provides a relatively large amount of the public good, funded by a relatively high tax rate. In contrast right-wing societies have relatively low P and low t. Let the income tax rate be $t = t(r)$, and assume $t(r)$ is increasing, monotonic, and differentiable. The amount of the public good can be written

$$P = P(t(r)) = p(r) \tag{4.1}$$

as a reduced-form function of the political shade of the society.

An individual who rents has the separable utility function

$$V = (1 + \alpha)v(P) + y(1 - t) \tag{4.2}$$

[11]But there are exceptions, for example if it is not your main residence, or you have not lived in it for all of the time that you have owned it, you have let part of it out, used part of it for a business, or bought it just to make a gain (HMRC, 2014). There is also stamp duty paid on the purchase of property, and this is also a tax on housing assets.

where the function $v(P)$ captures the utility from the public good, and $v(.)$ is differentiable, increasing, and strictly concave. The parameter α captures the degree of importance that an individual places on the supply of public services, and an individual chooses the optimal political colour of society, r, by balancing a desire for low taxes with a desire for the public good. The utility maximisation decision is the choice of the level of r that maximises

$$V = (1 + \alpha)v(p(r)) + y(1 - t(r)) \tag{4.3}$$

so that

$$\frac{\partial V}{\partial r} = (1 + \alpha)v'(p(r))p'(r) - yt'(r) = 0 \tag{4.4}$$

Now consider a homeowner who in addition to receiving utility from the public good, also receives wealth, h, from owning a house. The utility function takes the form[12]

$$U = (1 + \alpha)v(p(r)) + y(1 - t(r)) + h(r) \tag{4.5}$$

so that

$$\frac{\partial U}{\partial r} = (1 + \alpha)v'(p(r))p'(r) - yt'(r) + h'(r) = 0 \tag{4.6}$$

where $h'(r) < 0$ is assumed. which can be rewritten as

$$\frac{\partial U}{\partial r} = (1 + \alpha)v'(p(r))p'(r) - yt'(r) = h'(r) \tag{4.7}$$

[12]Treating the existing capital gains taxes and stamp duty as taxes on housing wealth, Equation (4.5) becomes $U = (1 + \alpha)v(p(r)) + y(1 - t(r)) + h(1 - \tau(r))$ and (4.6) and (4.7) follow.

and contrasted with the condition in the renter equation in equation 4.4. This leads to:

Proposition 1. *The voting preferences of homeowners lie strictly to the right of renters.*

The function U is increasing and concave; the right-hand-side term of equation (4.7) is positive; hence the optimal political shade of red, $r*$, is lower among homeowners than renters.

Proposition 2. *The greater is their income, y, the less left wing are individuals (of either tenure).*

Consider income, y. The sign of the cross-partial of the maximand with respect to r and y is given by the term

$$-t'(r) < 0 \tag{4.8}$$

which establishes the proposition.

Proposition 3. *The greater is the weight on P, the more left wing are voters.*

The sign of the cross-partial of the maximand with respect to r and α is given by the term

$$v'(p(r))p'(r) > 0 \tag{4.9}$$

which establishes the proposition.

Proposition 4. *The greater the value of a person's house, the more he or she votes to the right. The lower the value of a person's house, the more he or she votes to the left.*

The sign of the cross-partial of the maximand with respect to r and h is given by the term

$$-\tau'(r) < 0 \tag{4.10}$$

which establishes the proposition.

4.4 Data

To explore these questions further, I use micro-data from Understanding Society (also known as the UK Household Longitudinal Study, UKHLS), and its forerunner the British Household Panel Survey (BHPS), a nationally representative panel survey covering the period 1991-2011.[13] The BHPS began with a representative sample of 5,500 households and 10,300 individuals in 1991, and since that time has followed these respondents and their descendants continually. The advantage of the BHPS over other survey data is that it allows me to track changes in the family's house price prior to voting in an election. The data contain a rich set of individual and family characteristics that are important for controlling for selection of individuals and families into areas with different housing growth rates. The sample consists of all

[13]From hereafter, 'the BHPS.' The BHPS ended in 2008, when Understanding Society began with a larger sample of 40,000 households. The original BHPS sample is incorporated in Understanding Society from Wave 2 onwards, and thus there is a gap of one year (2009) when tracking the BHPS sample from 1991 through to 2011.

males and females aged over 18 years, the age of voting in the UK. I use restricted-use data files containing local authority district codes in which each person lives, allowing control for cross-area selection that might be correlated with the unobserved political preferences of individuals.

Table 4.1: Voter Preferences - selected years

Political Party	1991	1993	1998	2002	2006	2011
Conservative	46.3	39.5	31.0	27.6	30.9	34.8
Labour	40.2	41.7	53.9	50.0	44.6	43.4
Liberal Democrats	10.5	16.4	12.0	12.8	13.5	10.6
Scottish National Party	1.3	1.2	1.9	5.1	4.8	6.9
Plaid Cymru	0.1	0.1	0.2	2.4	2.3	2.4
Green Party	1.1	0.8	0.7	1.0	1.8	1.7
Other parties	0.3	0.3	0.2	0.8	1.9	0
Other answer	0.1	0.05	0.02	0.07	0.05	0
Don't know/no answer	0.03	0.08	0.05	0.2	0.3	0
Total	100	100	100	100	100	100

Note: Tabulation from Question: "Which Party do you regard yourself as being closer to than others?"
Source: BHPS and Understanding Society.

The primary focus in this chapter is on which political party an individual supports, and I make use of three survey questions in the BHPS to form the dependent variables in the regression analysis that follows. The first question asks "Which party do you regard yourself as being closer to than the others?" Table 4.1 presents the answers for all individuals aged over the age of 18 for selected years. Clearly the political preferences of individuals' are complex, and cannot easily be reduced to a left-right scale, despite this, there is broad agreement that Labour is to the left (it has traditionally promoted socialist ideas), and the Conservatives are to the right (it has traditionally promoted the free market).

The second question I use to form a dependent variable ask "Which political party did you vote for in the last general election?" This question has not been asked every year,[14] and I tabulate the results for the most recent available year following a general election in Table 4.2. There were general elections in 1987, 1992, 1997, 2001, 2005, and 2010. I also show in parentheses data from the British Election Studies Information System showing the national share of the vote for each election. Comparing the two sources, shows that the proportions are similar in magnitude, but it does appear that a slightly higher proportion of BHPS respondents claim to have voted for the Labour Party, and slightly fewer for the Conservative Party, than that shown by the actual election results.

Table 4.2: Voter Choices in last general election

Political Party	1992	1995	1998	2002	2006	2011
Conservative	43.8 *(43.2)*	40.4 *(42.5)*	28.8 *(32.1)*	24.7 *(32.9)*	26.1 *(32.2)*	33.9 *(37.3)*
Labour	37.4 *(29.4)*	41.3 *(33.2)*	52.5 *(40.7)*	49.4 *(37.9)*	42.7 *(39.4)*	35.7 *(28.4)*
Liberal Democrats	16.2 *(22.0)*	15.5 *(17.9)*	14.9 *(17.5)*	15.9 *(18.5)*	20.0 *(22.0)*	24.4 *(23.5)*
Scottish National Party	1.6 *(0.6)*	1.6 *(0.8)*	1.8 *(0.8)*	5.0 *(0.7)*	4.6 *(1.7)*	3.3 *(1.7)*
Plaid Cymru	0.1 *(0.3)*	0.2 *(0.3)*	0.2 *(0.5)*	3.1 *(0.8)*	3.0 *(0.6)*	0.3 *(0.6)*
Green Party	0.6 *(0.3)*	0.7 *(0.5)*	0.5 *(0.2)*	0.5 *(0.6)*	1.4 *(0.9)*	2.5 *(0.8)*
Other parties	0.2 *(4.3)*	0.3 *(4.8)*	1.3 *(8.2)*	1.3 *(8.6)*	2.3 *(7.5)*	0 *(7.8)*
Total	100 *100*	100 *100*	100 *100*	100 *100*	100 *100*	100 *100*

Note: Tabulation from Question: "Which political party did you vote for in the last general election?" The national share of the party vote from BESIS (British Election Studies Information System) data is in parentheses.
Source: BHPS/Understanding Society, and BESIS.

The previous two questions are used to form a dummy variable equal equal to one if an individual voted for the Conservative Party, and zero otherwise. I also use question one above, and a question that asks about the strength of support for a particular party to form a categorical variable. The strength of support variable asks: "Would you call yourself a very strong supporter of (named party), fairly strong or

[14]This question was asked in 1992, 1995, and 1997-2011.

not very strong?" This contains more information than the binary variables, and is defined as follows: 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). I tabulate the responses to this question in Table 4.3, and separately for home owners and renters in Table 4.4.

Table 4.3: Strength of Political support for Conservatives and Labour

Strength of party support (%)	1992	1995	1998	2002	2006	2011
Labour (very strong support)	4.5	5.4	3.8	3.6	2.8	3.9
Labour (fairly strong)	16.8	22.6	19.1	17.9	13.4	13.7
Labour (not very strong)	18.4	23.3	30.6	28.5	28.3	25.9
Other parties (including Lib. Dems.)	13.8	14.4	15.7	22.4	24.6	21.7
Conservative (not very strong)	26.1	22.1	19.3	17.1	18.9	21.8
Conservative (fairly strong)	16.8	10.3	9.5	8.4	10.2	11.0
Conservative (very strong)	3.6	1.9	2.1	2.0	1.8	2.0
Total	100	100	100	100	100	100

Note: Tabulation based on the question: "Would you call yourself a very strong supporter of (named party), fairly strong or not very strong?" and "Which Party do you regard yourself as being closer to than others?"
Source: BHPS and Understanding Society.

I make use of both the market value of the house reported by each household in the BHPS, and market data from the Land Registry. Self-reported data have the drawback that they may contain measurement error because households misreport the price of their house; they simply do not know accurately what it is worth, or the data is contaminated by the value of renovation work.[15] Figure 4.2 compares

[15]Data are available in the BHPS about additions and improvements to housing that are financed through an additional mortgage or loan, and so to the extent possible I remove this from the data.

Table 4.4: Strength of Political support for Conservatives and Labour, by Home Ownership Status

	Home Owners					
Strength of party support (%)	1992	1995	1998	2002	2006	2011
Labour (very strong support)	3.1	4.6	2.9	3.2	2.4	3.4
Labour (fairly strong)	14.3	19.6	16.7	17.1	12.9	13.0
Labour (not very strong)	15.8	21.8	29.1	27.1	27.0	24.1
Other parties (including Lib. Dems.)	14.1	14.5	15.2	21.8	23.6	21.7
Conservative (not very strong)	29.5	26.0	23.1	19.3	21.0	23.6
Conservative (fairly strong)	19.2	11.5	10.5	9.3	11.2	12.1
Conservative (very strong)	4.0	2.1	2.3	2.2	2.0	2.1
Total	100	100	100	100	100	100
	Renters					
Strength of party support (%)	1992	1995	1998	2002	2006	2011
Labour (very strong support)	8.4	7.8	5.9	5.3	4.0	5.8
Labour (fairly strong)	23.5	30.6	24.6	20.5	15.5	16.3
Labour (not very strong)	25.5	27.7	34.5	33.3	33.5	33.5
Other parties (including Lib. Dems.)	13.0	14.3	16.7	24.9	28.6	21.6
Conservative (not very strong)	16.7	11.1	9.9	9.4	11.0	14.4
Conservative (fairly strong)	10.4	7.0	6.9	5.2	6.5	6.7
Conservative (very strong)	2.5	1.5	1.5	1.4	0.9	1.7
Total	100	100	100	100	100	100

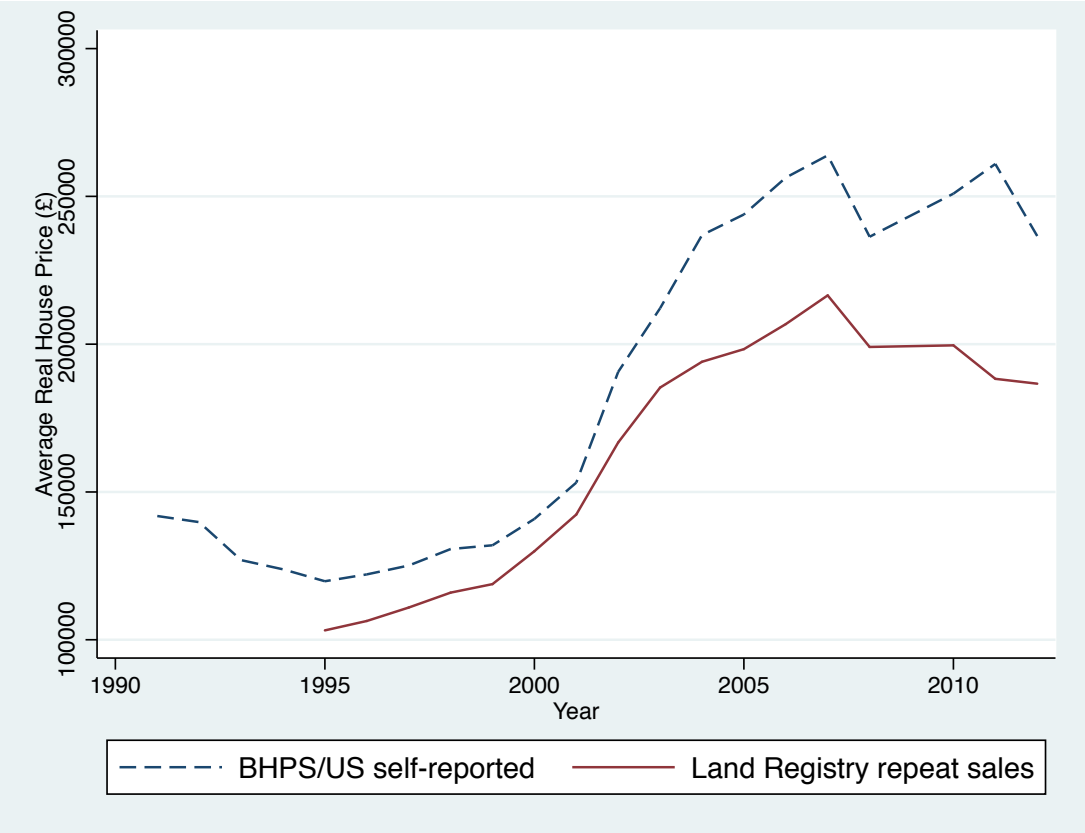
Note: Tabulation based on the question: "Would you call yourself a very strong supporter of (named party), fairly strong or not very strong?" and "Which Party do you regard yourself as being closer to than others?"
Source: BHPS and Understanding Society.

the self-reported data from the BHPS to average repeat sales data from the Land Registry, demonstrating that there appears to fairly close relationship between the two series, although, there appears to be an increasing upward bias in individuals' estimates in the BHPS in the later part of the period.[16] I use Land Registry data on monthly individual house sales covering over 18 million observations, allowing me to restrict the sample to only those for which there are at least two sales. Repeat sales data controls for any changes in the composition of the housing stock. Due to the possible correlation between house prices and local macroeconomic conditions, I also control for the regional average unemployment rate and real per capita income, using data from the Labour Force Survey for the period 1991-2011, for the regional unemployment rate, and the ONS series 'Gross Disposable Household Income', as a measure of regional income fluctuations.

Table 4.5 contains summary statistics of the BHPS data I use, separately for home owners and renters. The table shows that relatively equal proportions of home owners exhibit a preference for the Conservative Party (22.3%) and the Labour Party (27.5%), in contrast to renters, of whom only 11.0% feel close to the Conservative Party, and 33.1% feel close to the Labour Party. Renters are also less likely to be employed, or married, are younger, and less educated. The average self-reported house price among home owners is £186,000, with a standard deviation of £247,600. From the Land Registry data, the average real house price is £166,100, with a smaller standard deviation of £77,400. I assign renters a house price based on the average

[16]The close relationship between the two data series also appears to hold at the local authority level.

Figure 4.2: Comparison of BHPS and Land Registry House Price Data



Source: Authors' calculations from the BHPS/US and Land Registry data.

market house price in the local authority district in which they live, for which the average is £160,800, with a standard deviation of £84,400. The average house price shock based on the Land Registry data for homeowners is £3,100, with a standard deviation of £182,500. The corresponding shock for renters is £1,800, with a standard deviation of £34,700. The average shock for homeowners based on the self-reported data is £2,800, with a standard deviation of £282,100.

House price increases were not just limited to London and the South East, or to wealthy homeowners. Many historically lower-price cities and many lower-income people also experienced large wealth increases from the house price boom. Figure 4.3 presents the geography of changes in house prices. In the 2000-2011 BHPS sample, the average four-year increase that home owners experienced in the lower half of the income distribution was 13%, and it was 15% among the top half of the income distribution.

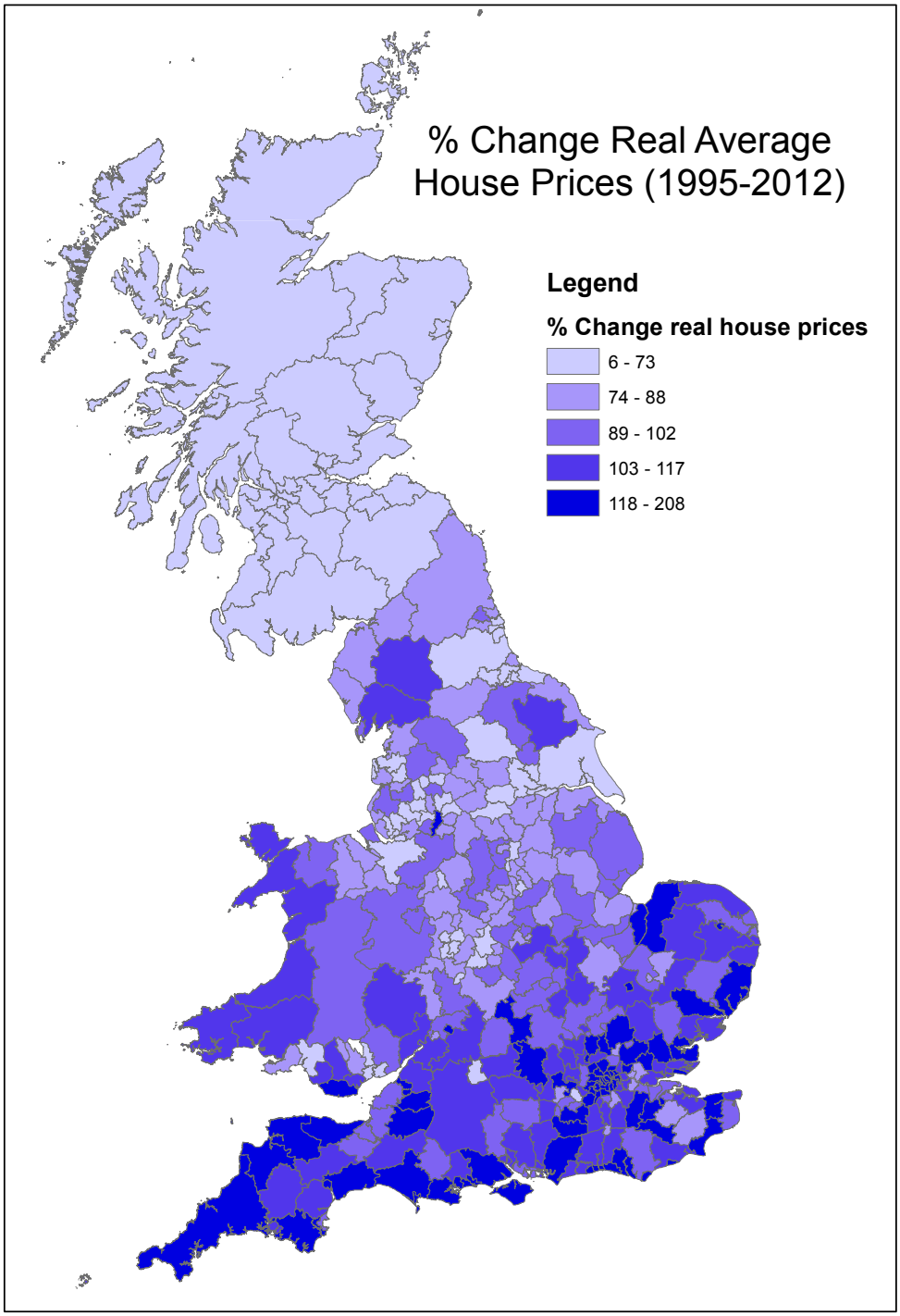
To the extent that individuals' foresee the future path of the price of their house, it is more appropriate to consider the portion of house prices that is unanticipated. I therefore create two house price shock variables based on the residuals of a AR(2) house price equation. I create one shock using data from the Land Registry, and another using the self-reported BHPS data. The advantage to using the self-reported BHPS house price data is that there is a longer time series available with data available from 1991 to 2011. However, this is arguably more endogenous than the data from the Land Registry, but this data is only available from 1995. In both cases four years of data is lost due to the lags used in estimating the AR(2) process. The shock based on the Land Registry data is my preferred measure due to it being more

Table 4.5: Summary Statistics for Home Owners and Renters

	Home Owners		Renters	
Variable	Mean	S.D.	Mean	S.D.
Closer to the Conservative Party	0.233	0.423	0.110	0.312
Closer to the Labour Party	0.275	0.447	0.331	0.471
Closer to the Liberal Democrats	0.080	0.272	0.062	0.242
Voted for the Conservative Party	0.176	0.381	0.077	0.267
Voted for the Labour Party	0.242	0.429	0.264	0.441
Voted for the Liberal Democrats	0.096	0.294	0.065	0.246
Strength of Political Support	3.877	1.450	3.342	1.386
Self-reported house price (£100,000)	1.860	2.476		
Average house price (£100,000)	1.661	0.774	1.608	0.844
House price shock (Land Registry) (£100,000)	0.039	1.250	0.012	0.328
Log house price shock	0.099	1.158	0.011	0.166
Real household income (£10,000)	4.296	3.045	2.502	2.004
Log real interest rate expectations (3year MA)	1.801	0.822	1.872	0.788
Age	47.311	17.157	44.597	20.163
Female	0.528	0.499	0.566	0.496
Children	0.551	0.917	0.609	1.035
Married	0.727	0.446	0.491	0.500
Employed	0.563	0.496	0.394	0.489
Degree	0.146	0.353	0.077	0.267
A levels	0.122	0.327	0.111	0.315
GCSE	0.181	0.385	0.170	0.376
Other qualifications	0.358	0.479	0.268	0.443
No qualifications	0.193	0.395	0.373	0.484

Note: For homeowners the number of observations is 157,794, and house prices are self-reported values. For renters the number of observations is 58,631. The self-reported house price is from home-owners as reported in the BHPS/Understanding Society. The average house price is the average for the local authority district (403) from Land Registry data, and the house price shock is derived from Equation 4.12. Strength of support represents strength of support for Conservatives relative to Labour: 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All monetary values are in 2011 pounds.
Source: BHPS and Understanding Society.

Figure 4.3: Percentage Change in Average Real House Prices (1995-2011)



Source: Authors' calculations from Land Registry data.

exogenous than that based on the self-reported data. I therefore approximate house prices with a second order autoregressive process with year and local authority fixed effects, as shown in Equation 4.11.

$$P_{ijt} = \alpha_1 + \alpha_2 P_{ij,t-1} + \alpha_3 P_{ij,t-2} + \gamma_i + \mu_t + u_{ijt} \tag{4.11}$$

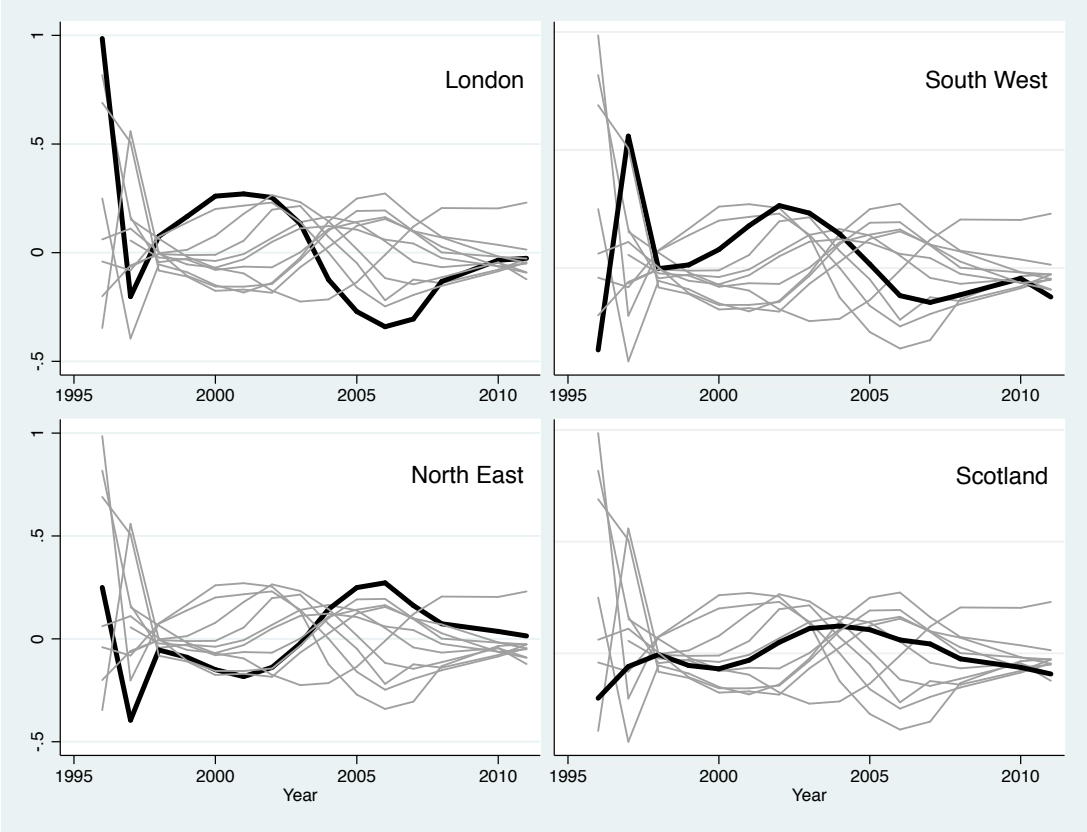
where i is the local authority, t is time, j is the individual. I estimate this AR(2) process using both the self-reported data from the BHPS, and the local authority average data from the land registry. The residuals are taken to represent the unanticipated change in house prices. To create an unanticipated house price shock I use the cumulative sum of the residuals from Equation 4.11 for the past 3 years. The house price shock is then defined as:

$$shock_{ijt} = \hat{u}_{ijt} + \hat{u}_{ij,t-1} + \hat{u}_{ij,t-2} + \hat{u}_{ij,t-3} \tag{4.12}$$

where $\hat{u}_{ijt}$ is the residual from the AR(2) process in Equation 4.11. This gives provides indication of the extent to which house prices deviate from the long-run national trend.

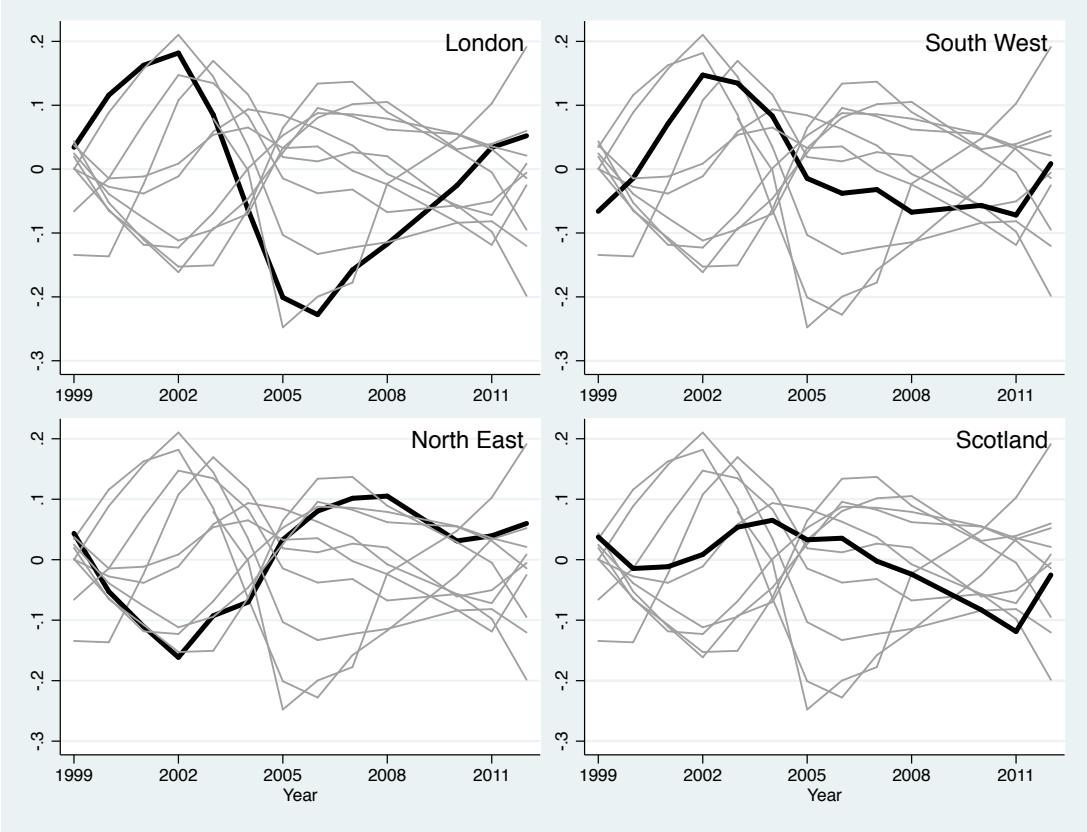
Figure 4.4 shows the regional average of the path of the annual real house price shock based on the BHPS data, estimated from Equation 4.12, and Figure 4.5 shows the regional averages using the Land Registry data.

Figure 4.4: Annual Average Real House Price Shocks by Region



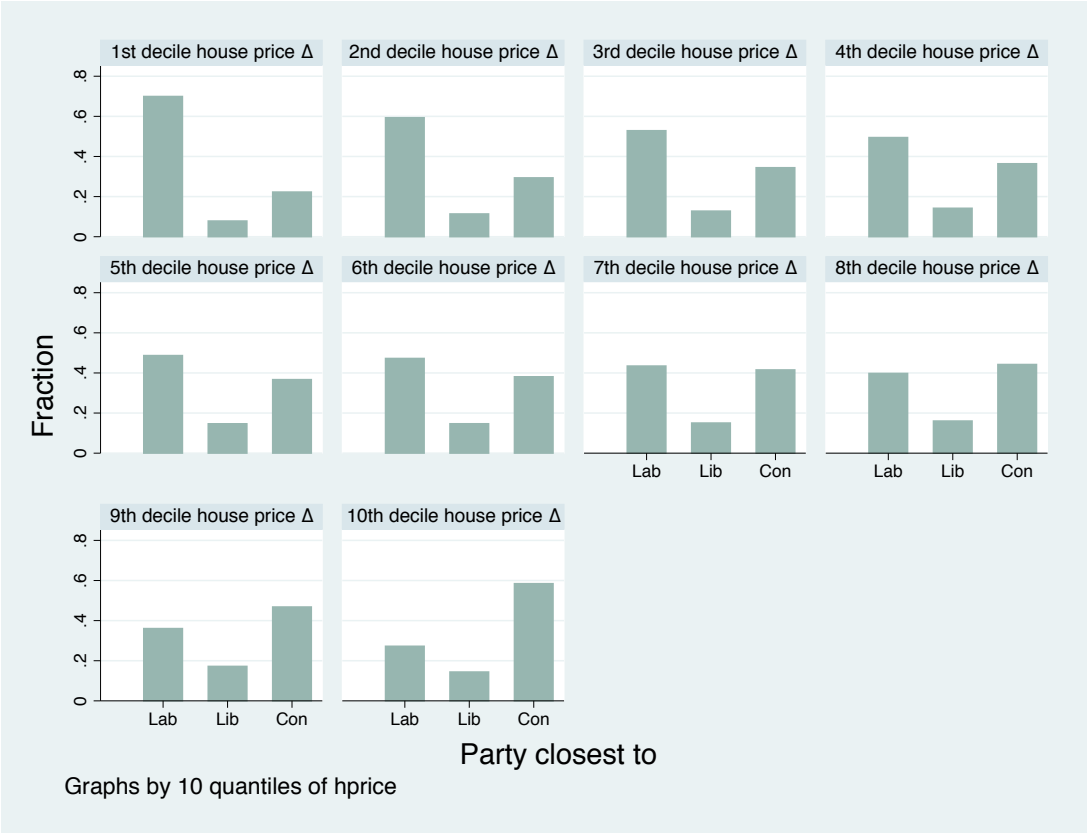
The figure shows the evolution of the average house price shock estimated from Equation 4.12 for 11 regions, highlighting London, the South West, North East, and Scotland. *Source:* Authors' calculations from BHPS data.

Figure 4.5: Annual Average Real House Price Shocks by Region



The figure shows the evolution of the average house price shock estimated from Equation 4.12 for 11 regions, highlighting London, the South West, North East, and Scotland. *Source:* Authors' calculations from Land Registry data.

Figure 4.6: Distribution of Average Real House Price Change and Party Identification



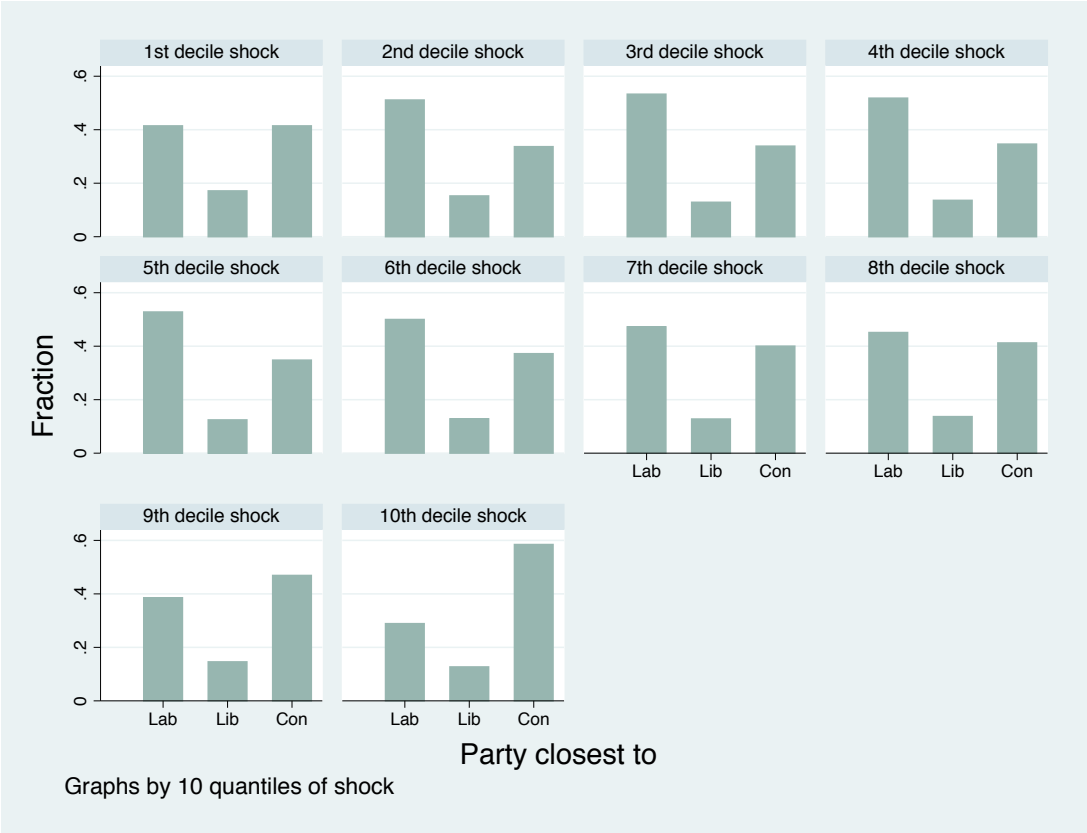
The figure shows the distribution of real average house price changes over 1995-2011 and the political party individuals most closely identity with. *Source:* Authors' calculations from the BHPS and Land Registry data.

4.5 Empirical testing

Before turning to the regression analysis I first present some further summary data. Figure 4.6 shows the distribution of the average real house price change based on the Land Registry data (for both owners and renters), and the three main political parties that individuals most closely associate with - Labour, Liberal Democrats, and the Conservatives. This cross-sectional data suggests that overall, those that have experienced a change in house value in the lower deciles have a much stronger affinity with the Labour Party (approximately 70% in the first decile), in comparison with the Conservative Party (just over 20%). In deciles 6-8, there is a more equal association between the Labour and Conservative parties, with both receiving around 40% support. In deciles 9 and 10, there is a stronger identification with the Conservative Party, almost 50% and 60% support respectively, in comparison with 38% and 23% support for the Labour Party. Figure 4.7 presents a similar graph, showing the distribution of the house price shock, and shows a similar pattern in party identification.

Figure 4.8 shows the average size of the house price shock for those who switched from not voting Labour at time $t-1$ to voting Labour at time t, and similarly the average house price shock for those who switched from not voting Conservative at time $t-1$ to voting Labour at time t. For those who switched to voting Labour, the shock was negative, and averaged £8,000, in contrast to those who switched to voting Conservative for which the average shock was approximately £32,000. In Figure 4.9 I give an indication of the proportion of 'switchers', along the distribution of the house price shock. The figure shows that for those who switched to voting

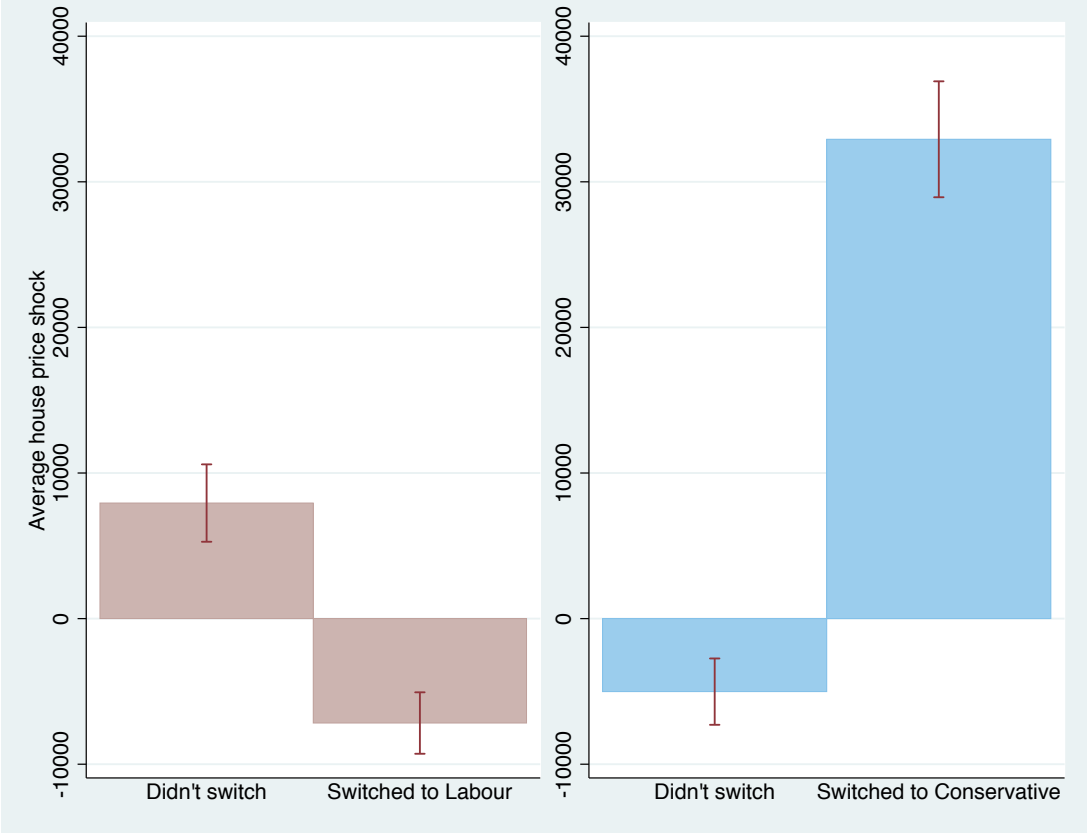
Figure 4.7: Distribution of Average House Price Shock and Party Identification



The figure shows the distribution of the average house price shock over 1999-2011 and the political party individuals most closely identity with. *Source:* Authors' calculations from the BHPS and Land Registry data.

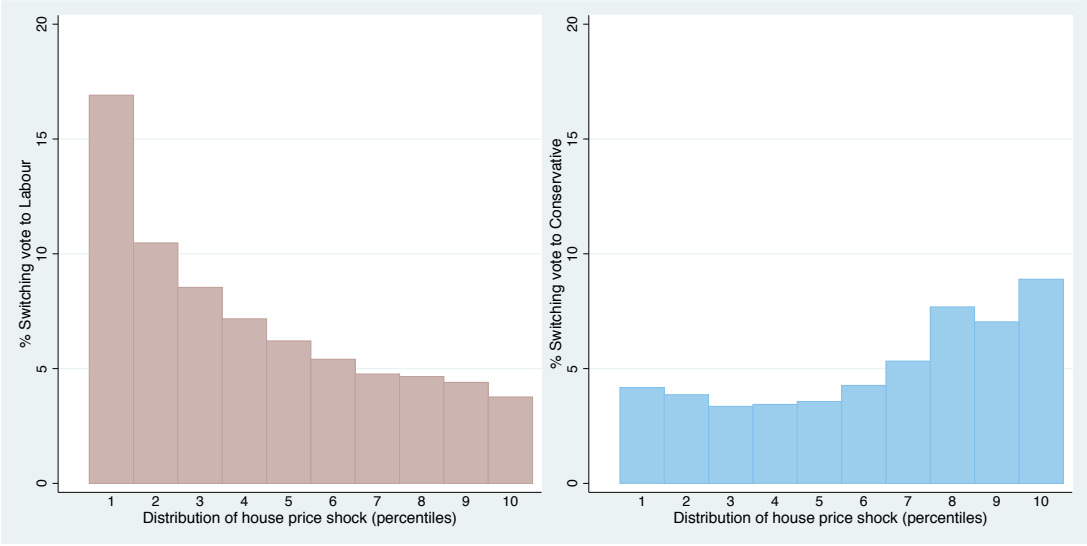
Labour at time t, from not voting Labour at time $t-1$, approximately 15% of all Labour switchers experienced a house price shock in the 1st decile, and about 4% experienced a shock in the 10th decile. Amongst those who switched to voting Conservative, approximately 9% switched and had a house price shock in the 10th decile, while just over 4.5% switched and had a house price shock in the 1st decile.

Figure 4.8: Distribution of Average House Price Shock and Switchers



The figure shows the average shock (as defined by Equation 4.12) at $t-1$ for those who switched from not voting Labour at $t-1$ to voting Labour at t (versus those that did not switch). Similarly, the right-hand side shows the average shock at $t-1$ for those who switched from not voting Conservative at $t-1$ to voting Conservative at t (versus those that did not switch).

Figure 4.9: Distribution of Average House Price Shock and Percentage of Switchers



The figure shows the percentage of those who switched from not voting Labour at $t-1$ to voting Labour at t, by the distribution of the average house price shock (as defined by Equation 4.12. Similarly, the right-hand side shows the percentage of those who switched from not voting Conservative at $t-1$ to voting Conservative at t, by the distribution of the average house price shock.

In the regression analysis I first explore the relationship between party preference and a basic set of demographic variables, by estimating linear probability models of the following form:

$$Party\ preference_{ijt} = \beta_0 + \beta_1 \Delta P_{ijt} + \gamma_1 X_{ijt} + \rho_i + \zeta_j + \phi_t + \epsilon_{ijt} \tag{4.13}$$

where i indexes the individual, j indexes the local authority, and t indexes the survey year. I use three alternative measures to capture political support for the right-wing. The first dependent variable is a dummy that is equal to 1 if the person said that he or she were closer to the Conservative Party, and 0 otherwise. The second dependent variable takes seven values and measures the strength of political support for the Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). The third measure is a dummy variable equal to 1 if the individual responded that they voted for the Conservative Party in the last election. The variable P is the real house price, and X is the set of observable characteristics shown in Table 4.5, as well as local authority-by-year average unemployment and log real per capita income. The ρ_i are individual fixed effects, the ζ_j are local authority fixed effects, ϕ_t are year fixed effects, and ϵ_{ijt} is an iid error term. The main coefficient of interest in equation 4.13 is β_1, the coefficient on the unanticipated house price shock, the coefficient shows how the likelihood of voting for a particular political party or bloc is associated with recent house price changes. Reported standard errors are clustered at the local authority level, given that house prices exhibit strong

geographical correlation, such that errors are unlikely to be independent within local authorities. Clustering at the household level produces similar results. I estimate the results for all members of a household, and separately for the household reference person only.

The identification assumption underlying equation 4.13 is that house price changes are conditionally exogenous to the voting decision. In other words, apart from the fact that house prices increase household wealth, house price changes and voting behaviour should be uncorrelated conditional on the observables in the model. A possible threat to this assumption is a positive correlation between housing prices and local macroeconomic conditions. If voting for a particular party, or voter turnout responds positively to macroeconomic variation, this relationship may be picked up, rather than identifying the effect of housing wealth changes on voting behaviour. To this end, I control for the regional unemployment rate and real income per capita, as measures of regional-level macroeconomic conditions. In addition, I also estimate the model for renters using average house prices in their local authority. Given that renters experience the same macroeconomic shocks as home owners but without the corresponding gain in wealth, these estimates give an indication of any bias that might be driven by unobserved macroeconomic trends.

4.6 Results

4.6.1 The effect of wealth shocks on political preferences

The results of estimating equation 4.13 are shown in Table 4.6. Each column of the table presents results from a separate regression, and all estimates include the full set of control variables shown in Table 4.5 as well as regional macroeconomic controls.[17] Panel A presents the estimates for home owners using the three alternative dummy variables described above. And the coefficient on the house price shock enters positively in each case. A £100,000 change in the housing shock leads to a 2.7 percentage point increase in the probability of voting for the Conservatives, based on the estimates in column (5). The percentage voting for the Conservative party is 23.3%, implying a 11.6% increase in the probability of voting Conservative from a £100,000 increase in the housing shock. However the average housing shock among home-owners is £3,900, which these estimates suggest would lead to an increase in the probability of voting Conservative of 0.45%. In Table C4 I report the corresponding logit and ordered logit estimates, which also show a positive and significant effect of house price shocks on preferences for the Conservative Party. In Table 4.7, I present the corresponding results using the log house price shock. The result in column (5) suggests that a 10% increase in the housing shock increases the probability of voting for the Conservative party by 0.047 percentage points.

An underlying assumption of identification of β_1 in equation 4.13 is that households with a higher underlying propensity to vote Conservative, for example, are

[17] I report the full results for homeowners in Table C2 and for renters in Table C3 in Appendix A.

Table 4.6: Linear Probability Model Estimates of the Effect of Housing Prices on Political Preferences

	Feel closest to the Right		Strength of support for Right		Voted for the Right	
	All	HRP	All	HRP	All	HRP
	(1)	(2)	(3)	(4)	(5)	(6)
A. Home owners						
House price shock	0.031***	0.025*	0.036***	0.033***	0.027*	0.031*
	(0.007)	(0.010)	(0.007)	(0.010)	(0.012)	(0.015)
Log household income	0.032*	0.033*	0.032*	0.035*	0.044*	0.048*
	(0.014)	(0.019)	(0.015)	(0.015)	(0.019)	(0.016)
N	33178	18394	19474	10938	21532	12002
Within R^2	0.04	0.04	0.06	0.06	0.07	0.06
B. Renters						
House price shock	0.007	0.017	0.006	0.017	0.063	0.062
	(0.009)	(0.014)	(0.009)	(0.014)	(0.054)	(0.073)
Log household income	-0.001	-0.010*	-0.000	-0.010*	-0.003	-0.020
	(0.006)	(0.005)	(0.007)	(0.005)	(0.015)	(0.017)
N	5857	3952	5857	3952	2797	1939
Within R^2	0.00	0.06	0.04	0.06	0.05	0.06

Note: Authors' estimation of equation 4.13. Data on house prices used to derive the house price shock are based on market values from the Land Registry. Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample in Panel B, housing price measures are calculated using home owners within each local authority and year as described in the text.
Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

Table 4.7: Linear Probability Model Estimates of the Effect of Housing Prices on Political Preferences

	Feel closest to the Right		Strength of support for Right		Voted for the Right	
	All	HRP	All	HRP	All	HRP
	(1)	(2)	(3)	(4)	(5)	(6)
A. Home owners						
Log House price shock	0.047***	0.057***	0.103**	0.169**	0.036*	0.036
	(0.013)	(0.016)	(0.039)	(0.053)	(0.017)	(0.024)
Log household income	0.292*	0.304	0.226	0.604	0.395	0.429
	(0.144)	(0.199)	(0.528)	(0.602)	(0.231)	(0.309)
N	33178	18394	19474	10938	21532	12002
Within R^2	0.03	0.03	0.04	0.05	0.06	0.05
B. Renters						
Log House price shock	0.011	0.012	0.009	0.012	-0.114	-0.106
	(0.022)	(0.034)	(0.023)	(0.034)	(0.113)	(0.131)
Log household income	-0.000	-0.011	0.000	-0.011	0.003	-0.005
	(0.007)	(0.006)	(0.008)	(0.006)	(0.015)	(0.018)
N	5857	3952	5857	3952	2797	1939
Within R^2	0.01	0.07	0.05	0.07	0.08	0.09

Note: Authors' estimation of equation 4.13. Data on house prices used to derive the log house price shock are based on market values from the Land Registry. Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample in Panel B, housing price measures are calculated using home owners within each local authority and year as described in the text.
Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

not sorting into regions in which housing prices are growing the fastest. The local authority fixed effects control for systematic differences among households across local authorities within regions in underlying political preferences. The estimates presented in panel B of Table 4.6 provide a way of testing that the effects I am estimating are due to wealth shocks, and not a local authority-level shock that is correlated with house prices and the direction of political preferences. An increase in house prices may increase rents, but does not provide a wealth increase. Panel B therefore presents estimates of equation 4.13 using local authority-by-year average house prices as the measure of housing prices for renters. All of the coefficients are insignificant, which gives some support to the causal interpretation of the estimates among home owners presented in panel A.

The estimates in columns (5) and (6) use a slightly different dependent variable, in this case, the dependent variable is a dummy equal to one when an individual claims to have voted for a particular political party in the previous election. This restricts the sample to the years in which elections were held in 1992, 1997, 2001, 2005, and 2010. The estimates for both home owners and renters are remarkably similar to the previous results, which provides reassurance that the question asked each year about an individuals' degree of 'closeness' to a particular political party is not divorced from their stated vote in an election year. In Table 4.8 I report the results for homeowners only where the house price shock is derived based on the self-reported house values of homeowners recorded in the BHPS. The overall pattern of the results is similar, in terms of sign, although the magnitude of the coefficients is smaller in columns (1) - (2), and (4)-(5), but larger when using the strength of

support for the right in columns (3)-(4).

As an additional robustness check I also estimate the main results using the percentage change in house prices over the pervious four years, and these results are presented in Table C6 and C7 in Appendix C.[18] Although the coefficients are positive the size of the effect is much weaker in Table C6 suggesting that the estimated shock variable used in the main results is capturing an unanticipated component of house price change that is arguably more exogenous than the four year change in actual house prices.

Table 4.8: Linear Probability Model Estimates of the Effect of Housing Prices on Political Preferences

	Feel closest to the Right		Strength of support for Right		Voted for the Right	
	All	HRP	All	HRP	All	HRP
	(1)	(2)	(3)	(4)	(5)	(6)
A. Homeowners						
House price shock	0.014**	0.019***	0.071***	0.066**	0.021***	0.024**
	(0.005)	(0.005)	(0.018)	(0.020)	(0.006)	(0.007)
Log household income	0.033***	0.036***	0.046***	0.033***	0.030**	0.024*
	(0.007)	(0.007)	(0.007)	(0.008)	(0.009)	(0.011)
N	39795	39795	22265	22265	26466	26466
Within R^2	0.01	0.01	0.02	0.02	0.02	0.01

Note: Authors' estimation of equation 4.13. Data on house prices used to derive the house price shock are based on self-reported values from the BHPS. Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

[18] Alternative specifications using 2, 3, 4 and 5 year changes are all broadly similar.

4.6.2 Wealth shocks and voter turnout

Table 4.9 presents estimates of a variant of equation 4.13, where the dependent variable is now a dummy variable equal to one if an individual voted in the last election. The results suggest that an increase in housing wealth has a positive effect on voter turnout. The final two columns in Table 4.9 suggest that a change in house prices in the area a renter lives has no effect on voter turnout.

Table 4.9: Linear Probability Model Estimates of the Effect of House Price Shocks on Voter Turnout

	Voter turnout: Owners		Voter turnout: Renters	
	All	HRP	All	HRP
	(1)	(2)	(3)	(4)
House price shock	0.015*	0.022*	0.015	0.022
	(0.007)	(0.010)	(0.015)	(0.017)
Log household income	0.011*	0.019***	0.014	0.007
	(0.005)	(0.005)	(0.015)	(0.017)
N	12288	12288	1287	1287
Within R^2	0.07	0.07	0.07	0.08

Note: Authors' estimation of equation 4.13. Dependent variable: Dummy = 1 if individual voted in the election in the previous year. All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample of Renters, housing price measures are calculated using home owners within each local authority and year as described in the text. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

4.6.3 Do wealth shocks affect the financial well-being of individuals?

The previous sections have established that changing housing wealth has a significant, both statistical and material, effect on the political preferences of voters, and the decision to vote or not. This, and the following sections turn attention towards trying to understand the mechanisms through which changing household wealth could lead individuals to change their political preference from left wing to right ring, or vice versa, in the presence of a shock to housing wealth. There is significant debate over the extent to which changing housing wealth affects household decisions such as consumption and savings choices, and it is therefore useful to consider any evidence that might indicate that individuals do actually feel wealthier from an increase in housing wealth.[19] Unfortunately, the BHPS lacks data on consumption, and has limited data on household savings and investments, however the following question is asked of survey respondents annually: 'How well would you say you yourself are managing financially these days?' Responses are coded in five categories, from 1 equal to "Living comfortably", to 5 equal to "finding it very difficult". For simplicity, cardinality is assumed here, and Table 4.10 presents GLS (with random effects) estimates of the effect of housing price changes on individuals' current financial situation. Both the two-year and four-year house price change appear negatively in the estimates for home owners in columns (1)-(4) implying that

[19] Among others, Mian and Sufi (2011), Campbell and Cocco (2007), Case et al. (2005), and Hurst and Stafford (2004) in the US, find that housing wealth affects consumption, although Attanasio et al. (2009) argue that the relationship is incidental. In the UK, Disney et al. (2010) find a small but significant affect of house price shocks on household consumption.

a positive house pice shock does improve the financial situation of individuals. The four-year house price change also enters negatively in column (6) in the estimate for renters, however it is significantly smaller than that for home owners, and is not significant when local authority fixed effects are included (column 8).

Table 4.10: Estimates of the Effect of House Price Shocks on Current Financial Situation

	Financial situation: Owners		Financial situation: Renters	
	(1) All	(2) HRP	(3) All	(4) HRP
House price shock	-0.025*	-0.021**	-0.006	-0.004
	(0.010)	(0.008)	(0.004)	(0.005)
Log household income	-0.128***	-0.166***	-0.107***	-0.120***
	(0.008)	(0.013)	(0.016)	(0.019)
N	46909	25547	11509	7275
Overall R^2	0.08	0.09	0.06	0.07

Note: Dependent variable responses are coded: 1 = living comfortably to 5 = finding it very difficult. All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample of Renters, housing price measures are calculated using home owners within each local authority and year as described in the text.
Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

4.6.4 How do wealth shocks affect attitudes?

In this section I explore whether house Price Shocks have have any influence on a range of economic, political, and social issues. These issues may feed into the decision of an individual to change their political preference in the voting booth. A significant literature examines the formation of beliefs, while a further literature examines links between beliefs and economic institutions. Di Tella et al. (2007) for example, finds that squatters in Buenos Aires who get legal title to land are more likely to report market beliefs than similar squatters who did not receive legal title to land. Alesina and La Ferrara (2005) examines how individual preferences for redistribution depend on future income prospects.

A variety of attitudinal questions are asked every second year in the BHPS and I group these for exploration under the broad headings of economic, political and social. The results shown in Tables 4.11 - 4.13 all use the Land Registry based house price shock, and all estimates include local authority fixed effects. All dependent variable responses are coded from 1 = strongly agree to 5 = strongly disagree.

Table 4.11 presents the results for homeowners in panel A, and renters in panel B. In column (1), the question asks whether "ordinary people share in the nations wealth." The four-year house price change enters negatively suggesting that home owners who experience an increase in house prices are more likely to agree with this proposition. However, interacting the house price change with the left-wing dummy variable suggests that those who identify with the left are less likely to agree with the proposition. This proposition, along with that in column (3), "private enterprise solves economic problems," can both be considered right-wing views, and

a positive shock to housing wealth enters negatively for those with right-wing views and, positively for those who feel closer to the left. In contrast agreement with the remaining questions in columns (2), and (4) - (7), can all be interpreted as being left-wing views. House prices enter positively in the "One law for the rich, and one for the poor" equation (column 2), although it is negative for those who identify more closely with the left, implying that a positive house price shock to those who are closer to the left leads them to hold more left-wing views. The results in columns (4)-(6) can be interpreted in a similar fashion. The only question for which changing house prices has no significant effect on is the proposition that there "should be a maximum limit on income," in column (7). Turning in panel B in Table 4.11, it is notable that changing house prices appear to have, in most cases, the opposite sign on individuals' economic attitudes to that for homeowners, however, none of the estimates for renters are statistically significant.

The effect of changes in housing prices on three questions about politics are shown in Table 4.12. The three questions are, "Government reflects people's wishes," People can't influence government policy," and "Government puts nation's interests first." These are more difficult to fit within the traditional left-right spectrum, and I therefore have no priors on how a change in house prices might affect these attitudes. However, as the estimates in Table 4.12 show, house prices do not have any effect on any of these questions for either home owners or renters. These results also act as a placebo test, showing that the housing price shocks I estimate are not simply correlated with any question one could ask.

Finally, I turn to the effect that changes in housing wealth have on a range of so-

cial attitudes. The literature on "economic voting" emphasises the role of economic conditions on voting behaviour, but political preferences are undoubtedly influenced by opinions on a range of social issues as well. Table 4.13 presents estimates for homeowners in panel A, and renters in panel B. In column (1), the question asks whether "the husband should earn while the wife stays at home," again the response for each question is on a five-point scale, where 1 = strongly agree. The four-year house price change enters negatively suggesting that home owners who experience an increase in house prices are more likely to agree with this proposition. However the interaction term suggests that those who identify with the left are less likely to agree with this proposition. In column (3), "employers should help with childcare," is arguably a more left-wing view, and a positive house price shock suggests that this view is more likely to be disagreed with, unless you identify more closely with the left, in which case the opposite holds. The remaining questions are arguably more contentious, with respect to where they lie on a traditional left-right spectrum. In the results for the questions "children need father as much as mother" (column 2), and "single parents are as good as couples" (4), the four-year house price change enters negatively and positively, respectively, suggesting that those who identify with the right are more likely to agree with the first statement, and disagree with the second. There is no evidence of any effect on house prices in the final two questions presented in columns (5) and (6). As with the results in the previous two tables, there is no evidence of any effect of changing housing wealth on the attitudes of renters to the various, economic, social and political questions considered.

Table 4.11: Estimates of the Effect of House Price Shocks on Attitudes to Economic Issues

	Voter attitudes			
	(1) Ordinary people share nations wealth	(2) One law for rich & one for poor	(3) Private enterprise solves econ. problems	(4) Public services should be state owned
A. House owners				
House price shock	-0.019*	0.026***	-0.028***	0.019***
	(0.007)	(0.005)	(0.004)	(0.005)
Close to left	0.080***	-0.110***	0.196***	-0.241***
	(0.016)	(0.016)	(0.016)	(0.016)
Close to left * house price shock	0.014	-0.015	0.023***	-0.026***
	(0.009)	(0.010)	(0.007)	(0.005)
Log household income	-0.031***	0.035***	-0.053***	0.032***
	(0.009)	(0.009)	(0.009)	(0.010)
N	22239	22345	21674	21843
Overall R^2	0.05	0.08	0.12	0.07
B. Renters				
House price shock	-0.005	0.003	0.004	0.001
	(0.007)	(0.007)	(0.006)	(0.007)
Close to left	-0.045	0.072	0.149**	-0.163**
	(0.058)	(0.054)	(0.046)	(0.061)
Close to left * house price shock	0.002	-0.011	-0.008	0.017
	(0.009)	(0.009)	(0.011)	(0.011)
Log household income	-0.006	0.001	-0.005	-0.004
	(0.022)	(0.018)	(0.020)	(0.021)
N	4084	4104	3832	3909
Overall R^2	0.13	0.18	0.13	0.12

Table 4.11: Estimates of the Effect of Housing Shocks on Attitudes to Economic Issues Continued

	Voter attitudes		
	(5) Govt. obligation to provide jobs	(6) Strong trade unions protect employees	(7) Should be max. limit on income
A. House owners			
House price shock	0.025***	0.010	0.019***
	(0.005)	(0.006)	(0.004)
Close to left	-0.150***	-0.285***	-0.176***
	(0.019)	(0.023)	(0.017)
Close to left * house price shock	-0.019**	-0.005	-0.008
	(0.007)	(0.007)	(0.008)
Log household income	0.056***	0.030***	0.061***
	(0.008)	(0.007)	(0.008)
N	22295	22209	22826
Overall R^2	0.13	0.13	0.11
B. Renters			
House price shock	0.003	-0.002	0.006
	(0.008)	(0.007)	(0.007)
Close to left	-0.028	-0.196***	-0.150**
	(0.052)	(0.055)	(0.052)
Close to left * house price shock	0.000	-0.002	0.013
	(0.009)	(0.010)	(0.009)
Log household income	0.052*	0.020	0.041
	(0.024)	(0.022)	(0.022)
N	4101	4073	4526
Overall R^2	0.18	0.16	0.15

Note: Dependent variable responses are coded: 1 = strongly agree to 5 = strongly disagree. All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample of Renters, housing price measures are calculated using home owners within each local authority and year as described in the text.
Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

Table 4.12: Estimates of the Effect of House Price Shocks on Attitudes to Political Issues

	Voter attitudes (Owners)			Voter attitudes (Renters)		
	(1) Government reflects people's wishes	(2) People can't influence govt. policy	(3) Govt. puts nation's interests first	(4) Government reflects people's wishes	(5) People can't influence govt. policy	(6) Govt. puts nation's interests first
House price shock	-0.007	0.015***	0.001	-0.001	-0.012	0.007
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)
Close to left	-0.318***	0.225***	-0.289***	-0.391***	0.162***	-0.341***
	(0.016)	(0.016)	(0.016)	(0.046)	(0.045)	(0.055)
Close to left * price shock	0.005	-0.010	-0.008	0.004	0.015	0.002
	(0.005)	(0.006)	(0.005)	(0.010)	(0.009)	(0.010)
Log household income	-0.027***	0.020*	0.010	-0.023	0.006	-0.028
	(0.008)	(0.008)	(0.008)	(0.017)	(0.018)	(0.018)
N	22794	22891	22751	4501	4572	4514
Overall R^2	0.14	0.08	0.09	0.18	0.14	0.15

Note: Dependent variable responses are coded: 1 = strongly agree to 5 = strongly disagree. All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample of Renters, housing price measures are calculated using home owners within each local authority and year as described in the text.
Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

Table 4.13: Estimates of the Effect of House Price Shocks on Attitudes to Social Issues

	Voter attitudes					
	(1) Husband should earn wife should stay at home	(2) Children need father as much as mother	(3) Employers should help with childcare	(4) Single parents are as good as couples	(5) Cohabiting is alright	(6) Homosexual relationships are wrong
A. House Owners						
House price shock	-0.013*	-0.011*	0.023***	0.031***	0.007*	-0.006
	(0.005)	(0.004)	(0.006)	(0.006)	(0.003)	(0.004)
Close to left	0.005	-0.016	-0.119***	-0.027	-0.046**	0.080***
	(0.018)	(0.016)	(0.019)	(0.023)	(0.015)	(0.020)
Close to left * price shock	0.023***	0.004	-0.007	-0.024*	-0.011*	0.016*
	(0.005)	(0.005)	(0.009)	(0.010)	(0.005)	(0.007)
Log household income	0.014	-0.009	0.010	0.037***	-0.019**	-0.004
	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.007)
N	24837	24844	24836	24834	25904	25888
Overall R^2	0.21	0.04	0.10	0.12	0.23	0.20
B. Renters						
House price shock	-0.001	-0.000	-0.002	0.010*	-0.006	0.002
	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Close to left	0.005	-0.030	-0.123***	-0.034	-0.062	0.043
	(0.032)	(0.035)	(0.031)	(0.035)	(0.036)	(0.046)
Close to left * price shock	0.002	-0.009	0.002	-0.011	0.008	0.005
	(0.006)	(0.006)	(0.005)	(0.006)	(0.007)	(0.006)
Log household income	-0.005	-0.004	-0.008	0.037*	-0.006	-0.011
	(0.012)	(0.013)	(0.014)	(0.015)	(0.011)	(0.016)
N	7275	7283	7277	7276	7057	7034
Overall R^2	0.30	0.11	0.11	0.18	0.27	0.25

Note: Dependent variable responses are coded: 1 = strongly agree to 5 = strongly disagree. All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample of Renters, housing price measures are calculated using home owners within each local authority and year as described in the text.
Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

4.7 Subsample estimates

In this section I consider a range of subsamples. I start by re-estimating Equation 4.13 for two subsamples, I split the sample spatially, to see whether or not the effect of housing shocks is driven primarily by London and the South East; the regions that have seen the largest growth in house prices over this period. The results in Table 4.14 indicate that if anything, the effect is stronger in the 'North', than in the 'South'. To the extent that capital gains from house price appreciation can be realised through selling and moving house,[20] this result might reflect the fact that the realised capital gain from those living in London and the South East is lower, because many typically migrate from London to other high-priced areas in the South East or South West. I also split the sample temporally. It is possible that during a boom there could be an advantage to the incumbent political party from people feeling wealthy. Given that the coefficients in Table 4.14 are actually higher for the period 2008-2011, this does not appear to be the case.

In Tables 4.15 - 4.16, I consider two further breakdowns of the data. I first look at whether there is a difference in the effect of a housing wealth shock between males and females. Table 4.15 presents the results, and indicates that the shock has a significant affect on males, but not females, as does income. This is also consistent with the results found by Powdthavee and Oswald (2014). In Table 4.16 I split the sample between those who have a degree and those that do not and the results show that there is no significant effect of a housing price shock on homeowners who hold a degree, while the positive effect on a preference for the Conservatives remains for

[20] Or through equity withdrawal.

those without a degree.

Table 4.14: Linear Probability Model Estimates of the Effect of House Price Shocks on Political Preferences - subsamples

	Feel closest to the Right				Strength of Right-wing support			
	(1) South	(2) North	(3) 1999-2007	(4) 2008-2011	(5) South	(6) North	(7) 1999-2007	(8) 2008-2011
A. House Owners								
House price shock	0.025**	0.053***	0.034***	0.045***	0.031	0.140***	0.065**	0.087***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.017)	(0.025)	(0.023)	(0.017)
Log household income	0.020**	0.012*	0.015**	0.020**	0.015	0.031	0.020	0.046
	(0.007)	(0.006)	(0.005)	(0.007)	(0.019)	(0.021)	(0.016)	(0.029)
N	13990	25576	31485	8081	8159	13549	17790	3918
Within R^2	0.11	0.15	0.14	0.17	0.15	0.19	0.17	0.18
B. Renters								
House price shock	0.001	-0.003	-0.001	0.000	0.001	-0.003	0.001	0.020
	(0.002)	(0.003)	(0.001)	(0.003)	(0.006)	(0.010)	(0.007)	(0.020)
Log household income	0.009	0.016*	0.011	0.021*	0.046	0.047	0.037	0.092
	(0.011)	(0.006)	(0.006)	(0.009)	(0.032)	(0.029)	(0.020)	(0.108)
N	3188	4838	6378	1648	1494	2001	2917	581
Within R^2	0.16	0.14	0.16	0.19	0.26	0.26	0.27	0.23

Note: Authors' estimation of equation 4.13. Dependent variable in columns (1)-(4): Dummy = 1 if feel closer to the left-wing or the right-wing. Dependent variable in columns (5)-(8): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample in Panel B, housing price measures are calculated using home owners within each local authority and year as described in the text. South is defined as London, the South East, and the South West. North refers to the remaining regions (East, East Midlands, West Midlands, Wales, North East, North West, Yorkshire and the Humber, Wales, and Scotland).
Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

Table 4.15: Linear Probability Model Estimates of the Effect of House Price Shocks on Political Preferences - by Sex

	Feel closest to the Right				Strength of Right-wing support			
	Male		Female		Male		Female	
	All	HRP	All	HRP	All	HRP	All	HRP
A. House Owners								
House price shock	0.052***	0.053**	0.012	0.022	0.095*	0.071*	0.026	0.028
	(0.015)	(0.019)	(0.016)	(0.021)	(0.037)	(0.033)	(0.065)	(0.074)
Log household income	0.038***	0.039***	0.002	0.001	0.101***	0.090**	-0.032	-0.043
	(0.007)	(0.008)	(0.008)	(0.011)	(0.030)	(0.033)	(0.037)	(0.069)
N	20174	14213	19613	7726	12614	9088	11344	4376
Within R^2	0.17	0.19	0.17	0.22	0.23	0.25	0.23	0.29
B. Renters								
House price shock	-0.000	-0.001	-0.001	-0.002	0.001	0.006	-0.013	-0.016
	(0.002)	(0.002)	(0.002)	(0.002)	(0.009)	(0.013)	(0.010)	(0.015)
Log household income	0.021**	0.012	0.004	0.004	0.057	0.039	0.030	0.049
	(0.008)	(0.011)	(0.008)	(0.012)	(0.030)	(0.035)	(0.036)	(0.043)
N	3726	2548	3752	2436	1867	1313	1719	1135
Within R^2	0.08	0.09	0.07	0.08	0.11	0.12	0.11	0.11

Note: Authors' estimation of equation 4.13. Dependent variable in columns (1)-(4): Dummy = 1 if feel closer to the left-wing or the right-wing. Dependent variable in columns (5)-(8): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample in Panel B, housing price measures are calculated using home owners within each local authority and year as described in the text. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

Table 4.16: Linear Probability Model Estimates of the Effect of House Price Shocks on Political Preferences - by Education

	Feel closest to the Right				Strength of Right-wing support			
	Degree		No degree		Degree		No degree	
	All	HRP	All	HRP	All	HRP	All	HRP
A. House Owners								
House price shock	0.028	0.036	0.030***	0.030***	0.070	0.109	0.049***	0.050***
	(0.021)	(0.028)	(0.008)	(0.009)	(0.088)	(0.115)	(0.015)	(0.016)
Log household income	0.039***	0.039**	0.021***	0.028***	0.095*	0.071	0.026	0.043
	(0.009)	(0.012)	(0.006)	(0.007)	(0.045)	(0.065)	(0.024)	(0.033)
N	6835	4001	26219	14336	4600	2707	14796	8192
Within R^2	0.07	0.09	0.08	0.08	0.09	0.11	0.11	0.12
B. Renters								
House price shock	-0.002	-0.001	-0.001	-0.002	-0.008	-0.006	-0.004	-0.007
	(0.002)	(0.004)	(0.002)	(0.002)	(0.010)	(0.015)	(0.009)	(0.011)
Log household income	-0.015	-0.027	0.018**	0.017	-0.103	-0.138	0.062*	0.081*
	(0.015)	(0.016)	(0.007)	(0.009)	(0.073)	(0.097)	(0.028)	(0.033)
N	1204	894	6274	4090	768	554	2818	1894
Within R^2	0.34	0.29	0.20	0.22	0.50	0.44	0.34	0.37

Note: Authors' estimation of equation 4.13. Dependent variable in columns (1)-(4): Dummy = 1 if feel closer to the left-wing or the right-wing. Dependent variable in columns (5)-(8): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample in Panel B, housing price measures are calculated using home owners within each local authority and year as described in the text. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

4.8 Conclusion

This chapter uses housing market variation to estimate the response of political preferences to changes in housing wealth using individual-level data from the BHPS for the period 1991-2011. The decisions of democratically elected representatives have a profound impact on a wide variety of public policies, from the distribution of income to economic growth, and understanding the influence that the characteristics of individuals, such as income, class, or wealth, have on the formation of their political preferences is of central importance in the study of political economy.

This chapter adds to the literature by being the first to examine the role of housing wealth on the partisan choice of individuals' and on the decision to vote. I find that an increase in housing wealth during the period 1991-2011 increases the likelihood of voting for the Conservative Party, although the effects are materially quite small. I do not find any evidence that housing wealth shocks have any impact on the voting preferences of renters, or on their perceived financial wellbeing, results that give credence to the causal interpretation of the results presented. While previous literature has found some evidence that home owners are more likely to vote than renters, I go beyond this and find that voting is actually increasing in the value of housing wealth. Finally, I present evidence to suggest that individual attitudes are affected by changes in housing wealth, but that these effects are asymmetric, depending on the individuals' identification with either the left or right-wing. Increases in housing wealth appear to lead people to hold more right-wing economic views, expressing for example, a smaller role for the government and a larger role for markets, and more conservative views on a range of social issues. However, the opposite holds

for increases in house prices amongst those who identify with the left. This paper also adds to the causal evidence on how people form political preferences, which are generally not well understood. Although the correlation between higher-income and right-ring voting preferences is widely observed, establishing cause-and-effect is more difficult. By making use of longitudinal data, and holding constant person fixed effects, it provides some causal evidence that suggests that people may make decisions in the ballot box that are driven by self-interest rather than because of a more idealistic view of how society should function and resources should be distributed.

Chapter 5

Conclusion

This thesis has examined how economic shocks, specifically exogenous shocks from immigration and developments in the housing market, affect the price people pay for housing, whether or not they move, and whether who they vote for in an election is affected.

Exogenous, unanticipated shocks are rarely observed, and this therefore makes efforts to identify their effects difficult. In this thesis I make use of two sources of exogenous shocks, one from a rapid increase in immigration to the UK since the mid-1990s, and the other from a rapid increase in average house prices, also from the mid-1990s. Although the rapid increase in immigration to the UK since the mid-1990s can be viewed as quite a sudden shock to the UK, where immigrants decide to live in the UK is potentially endogenous to the economic conditions in different parts of the UK, and this necessitates the use of an instrumental variable to estimate the causal effect of immigration on housing rents and prices, and on native mobility.

In chapter two I considered whether there is any evidence of a causal relationship between the increase in immigrants and the increase in house prices in the UK since the mid-1990s. Rising immigration has led to concern that this may put pressure on the housing market, leading to higher house prices and housing rents. In chapter three I examined whether the inflow of immigrants into local authorities across the UK has caused the displacement of natives, or the attraction of natives. Finally, in chapter four, I examined whether unanticipated housing wealth shocks have had any affect on the voting behaviour of individuals' in terms of a greater preference for left or right parties, and on whether it affects the decision to vote or not.

A significant literature in the economics of migration has explored the effect that immigrants have on local labour markets and generally economists have found relatively small, if any, effects of immigration on native wages or employment (see for example, Card (2001, 2007, 2005), Dustmann et al. (2005), Dustmann et al. (2012), Manacorda et al. (2012)). Or where significant effects have been found they have been at the lower end of the wage distribution (Dustmann et al., 2012). Chapter two argues that the housing market is an important arena in which to examine the effects of immigration, as an upward-sloping supply curve and new immigrant demand could be expected to push up house prices and rents in areas where immigrants settle. A key feature of the housing market that makes it different from the labour market is the durable nature of the housing stock - it can neither be built or removed quickly (Glaeser and Gyourko, 2005), therefore, the price response could be expected to be much greater in the housing market than in the labour market.

The analysis in Chapter two is the first to examine how immigration affects rents

across local authorities in the UK, and this is important because as immigrants are overwhelmingly likely to rent on first arrival in the UK, and given a relatively fixed supply of housing in the rental market in the short term, one might expect to see some affect on housing rents. I also replicate results on the affect of immigration on house prices from Sá (2014) for the period 2003-2010, and extend this to the period 1996-2002. To overcome problems of endogeneity and measurement error I construct an instrumental variable, making use of the historical location patterns of earlier waves of migrants. I find that immigration has a relatively small impact on average rents; an immigrant inflow equal to one percent of the local population over a three-year period increases average rents by 0.14-0.18% over the same three-year period. I also find statistically significant evidence of a reduction in house prices of about 1.6% following an increase in the immigrant population over a three-year period equivalent to 1% of the initial local population.

The evidence presented here does not suggest that immigration pushes up either house prices or rents to any great extent (and in fact reduces house prices), counter to views that are sometimes expressed by politicians or other individuals, or discussion in the media claiming that immigration is responsible for rising house prices. The period under examination here, from 1996-2010 represents a period of rapid migration to the UK, hence if any significant upward pressure on housing prices or rents was to be found, it could be expected to be found here. There is therefore no evidence provided here that immigration to the UK has an affect on housing markets in the UK that is detrimental to the UK born population.

The major strength of this work is that I am able to analyse the effect of im-

migration on housing markets at a local level as opposed to at a national level and can therefore control for local characteristics, and importantly, native mobility. The major weaknesses relate to the use of the instrument used in the empirical analysis. For identification I am assuming that recent economics conditions in local authorities are uncorrelated with the historical settlement patterns of immigrants. It could be however, that there are omitted variables that determined the location of immigrants in 1981 that are correlated with the determinants of contemporary house prices and rents.

There are a number of ways in which the current research could be extended. First, it would be useful to consider using alternative rent data, perhaps collected from commercial letting agencies. Second, it would be interesting to look more carefully at the sorting of different individuals into different neighbourhoods. Third, it would be useful to incorporate housing supply constraints in different localities to see what role these have in determining how demand shocks are transmitted into changes in price, and how this interacts with native out-migration. Are natives moving primarily to areas with elastic supply, such that this out-migration has little material affect on house prices, or are they moving to areas with inelastic supply? The evidence presented in Chapter three suggests that high-skilled immigrants and high-skilled natives are attracted to the same areas, therefore these areas could be expected to exhibit some degree of house price inflation. Fourth, it would be possible to incorporate a more explicit spatial model to examine how changes in local population spillover to house prices and rents in neighbouring, or even more distant parts of the country. Finally, there is relatively little empirical analysis of the the rental market

in the UK, and it would be useful to consider a more sophisticated model of the rental market, in particular the interaction of different markets, such as the private and social markets.

An important assumption underlying the results in chapter two, and many other studies of the labour market consequences of migration, is that the native population does not respond to immigrant inflows by moving out of an area that has experienced a high immigrant inflow. In chapter three I analysed this question in the context of local areas in the UK. Whether or not natives move in response to immigrant inflows also has important welfare consequences (negative if they did not otherwise plan to move), and has implications for the growth and decline of cities and regions, particularly if immigrants of particular skill types locate in similar areas, for example high skilled immigrants and high skilled natives in large cities such as London.

Standard labour market theory suggests that an immigrant shock to a local labour market may set in motion a process of spatial arbitrage, whereby immigrants increase the local labour supply, lowering wages relative to other markets, and creating an incentive for natives to move to higher wage areas. Alternatively, an immigrant inflow may attract natives if the economic return to locating near immigrants is higher because of externalities or skill complementarities, for example. Using the spatial correlation approach, and instrumenting for immigrant inflows, I examine the empirical evidence for displacement or attraction. In aggregate I find strong evidence in favour of displacement. My estimates suggest that between 70-80 natives move out in response to 100 immigrants moving in to a local area. This is consistent with the results in Chapter one where I find that immigrant inflows reduce house prices. If

there is significant displacement of the native population following immigrant inflows this could be expected to ameliorate any increase in housing costs. However, I also find results consistent with a high degree of sorting across space by different skill types. For example disaggregating by skill (based on position in the distribution of wages, or age of leaving full-time education), I find a degree of attraction between high-skilled immigrants and high-skilled natives. My results suggest that an inflow of 100 high-skilled immigrants attracts almost 90 similarly skilled natives, while an inflow of 100 low-skilled immigrants displaces 100 high-skilled natives.

The major strength of this work is to consider how immigration affects the native population at the local labour market level using a comprehensive dataset that covers the entire country, and the entire immigrant population (and not just subsections of the immigrant population). The major weakness is, as with chapter two, the use of instrumental variables and the possible threats to the identifying assumptions discussed above. The potential complementarity of the skills of natives and immigrants has received recent attention in the literature, for example by Peri and Sparber (2009) and Lewis (2011), and this area could be pushed further than in the current analysis by delving more deeply into different occupations and skills to examine the degree of complementarity or substitution, than with the broad categories used here. By revealed preference, it appears that high-skilled natives are attracted to areas with high-skilled immigrants, analysing the productivity benefits of this at a local level would be of interest. Part of this would be to analyse the effect of immigration on native wages and employment at the local area level.

The work presented in this chapter has implications for public policy; for exam-

ple if there are benefits to the co-location of high-skilled natives and high-skilled immigrants then government policy could accommodate this by making access to the UK easier. The analysis presented here also suggests that low-skilled immigrants crowd out high-skilled natives. Further analysis of the welfare consequences of this would be of interest, and if this leads to persistent patterns of sorting across space of high-income and low-income groups this also has implications for government policy if it results in large differences in poverty, unemployment, education and health for example.

In chapter four I consider a possible consequence of the rapid increase in house prices that has occurred across large parts of the UK since the mid-1990s. This increase in house prices represents a large increase in housing wealth, which to the extent that it is realisable through for example, equity withdrawal, moving house, or use as collateral represents a significant increase in wealth for many individuals and households. The major contribution of this chapter to the literature is being the first to estimate how wealth, and not just income, might influence peoples' voting behaviour and economic and social attitudes. The role of wealth in economic relations and society generally is coming under increasing scrutiny, particularly wealth inequality. In a democracy, voting for a particular political party is one of the most important decisions people can make, and while there is a significant literature on the effects of campaign financing for example, on electoral outcomes, relatively little attention has been paid to the role of economic factors in affecting people's choices in the ballot box. Among others, both Bartels (2008) and Stiglitz (2012), have emphasised the links between economic inequality and political inequality.

The main strength of this work is in using variation in wealth determined by the housing market to identity how household wealth shocks affect political preferences and voter turnout. Homeownership rates in the UK are high, and housing wealth represents the largest share of total household wealth for most people, so this gives a more comprehensive picture of individual wealth, in comparison to Powdthavee and Oswald (2014), for example, who use lottery wins that are much smaller in magnitude and affect far fewer people. The rapid increase in house prices occurred differentially across space, and the boom was not confined to solely high income people, as many relatively low-income people who happened to live in high-growth areas also experienced a significant increase in housing wealth, for this reason I argue that the changes in the housing market have been largely exogenous to households, allowing me to overcome the inherent endogeneity between wealth accumulation and voting decisions. However, the major weakness of this work is the extent to which the changes in housing wealth I observe are truly exogenous. I generate a shock variable that is represents the long-run deviation from trend in an attempt to create a measure that represents unanticipated housing wealth shocks, and I also primarily use local authority house price data that is more likely to overcome the potential endogeneity of self-reported house price valuations.

Using data from the British Household Panel Survey and Understanding Society for the period 1995-2012 and controlling for individual fixed effects, I show that an increase in the housing wealth of home owners causes a significant increase in the likelihood of voting for the Conservative Party. I find no evidence of an effect of housing price growth on the voting intentions of renters. In an attempt to explore

why increased housing wealth might alter the voting patterns of homeowners I also present evidence suggesting that growth in housing wealth leads homeowners to hold more conservative views on a variety of economic and social issues.

The fact that positive shocks to housing wealth lead people to be more likely to vote conservative and hold more economically and socially conservative views has consequences for the evolution of wealth inequality in the UK, given that the election of more right-wing governments could be expected to enact policies that further benefit those that are already wealthy. However this conclusion needs to be tempered by the fact that more highly educated people are not more likely to vote right-wing, so to the extent that overall education levels are increasing, this could act to moderate the wealth effect. If the fact that people are more likely to hold right-wing views is seen as a concern, policies that ameliorate house price growth, perhaps by building more houses, or more equitable taxation of housing and land wealth could be a solution. A comprehensive capital gains tax that covers all housing, instead of excluding the family home could be considered, along with a reform of the current regressive local council tax in favour of a progressive tax based on a percentage of the value of the land and structures.

There are a number of dimensions along which this work might be extended. First, an interesting line of inquiry for future research is to see whether any of these findings hold in other countries, particularly those that have also had a significant increase in house prices in recent decades such as the United States. Second, it would be interesting to explore in more detail the symmetry of housing wealth shocks, do periods of significant falling house prices lead to the opposite of what is presented

here, in addition to modelling in more detail the difference between anticipated versus unanticipated housing shocks. Third, it would be useful to see how these results might affect specific policies, for example national and local regulation of housing supply; are people who experience a positive shock to their housing wealth more likely to oppose local housing developments? Related to this, would be to examine whether increased housing wealth has any influence on any local government decision making, through influencing individual voting behaviour, or the priorities and voting behaviour of local councillors. Fourth, it would be interesting to examine how the behaviour of individual MPs is affected by their housing wealth, for example by looking at their voting patterns within Parliament. Finally, it might be possible to look in more depth at the intergenerational consequences of housing wealth and electoral preferences.

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Appendix A

Appendices for Chapter 1

A.1 Unit root tests

Table A1: Panel Unit Root Tests

Variable	LLC and IPS Unit Root Tests			
	LLC No Trend	LLC Trend	IPS No Trend	IPS Trend
Δ Log mean house price (repeat sales)	0.0000	0.0000	0.0055	0.0000
Δ Log mean weekly rent (all bedrooms)	0.0000	0.0000	0.0000	0.0000
Δ Log mean weekly rent (1+2 bedrooms)	0.0000	0.0000	0.0000	0.0000
Δ Log mean weekly rent (3+4 bedrooms)	0.0000	0.0000	0.0000	0.0000
Δ UK_i / $Pop_{i,t-1}$	0.0000	0.0000	0.0000	0.0000
Δ FB_i / $Pop_{i,t-1}$	0.0000	0.0000	0.0000	0.0000
Instrument	0.0000	0.0000	0.0000	0.0000
Δ Log number of dwellings	0.0000	0.0000	0.0000	0.0000
Δ Log unemployment rate	0.0000	0.0000	0.0000	0.0000
Δ Proportion with no qualification	0.0000	0.0000	0.0000	0.0000
Δ Log real gross weekly capital	0.0000	0.0000	0.0000	0.0000
Δ Log user cost of capital	0.0000	0.0000	0.0000	0.0000

Note: The figure presented for each unit root test is the p-value for the statistic under the null hypothesis of a unit root. LLC is the Levin, Lin and Chu test (which assumes a common unit root process across areas); IPS is the Im, Pesaran and Shin test (which assumes an individual unit root process across each area). Each statistic tests the first difference of the variable and includes an individual intercept; results are presented with and without inclusion of deterministic time trends.

A.2 Derivation of housing model

Consider an economy with N_t individuals in time t, where $N = FB + UK$, the sum of foreign born and UK born individuals.[1] Each individual derives utility from real non housing consumption (cx_t) and housing services (θh_t), where h_t is the individual's housing stock and θ is the ratio of the individual's housing services to housing stock. In each period the individual earns y_t; the individuals real wealth, w_t, can be allocated between h_t and real financial assets (f_t). The prices of the housing stock and nonhousing consumption are PH_t and PC_t, respectively; their ratio is denoted $g_t = PH_t/PC_t$, and $\dot{g}_t$ is the expected rate of change of g between t and $t+1$. The real after-tax return on f_t is r_t; the real return on h_t equals the real rate of capital gain ($\dot{g}_t$) less stamp duty (τ_t), less council tax (υ_t), less depreciation (κ_t) and less the foregone rate of earnings (or the after-tax cost of borrowing), r_t, on the real housing capital ($g_t h_t$). Thus the intertemporal constraint for the state variable, w_t, is given by (B.1):

$$w_{t+1} = (1 + r_t)(w_t + y_t - cx_t) + (\dot{g}_t - r_t - \tau_t - \upsilon_t - \kappa_t)g_t h_t. \tag{A.1}$$

In each period the individual has a constant relative risk-aversion utility function that is separable in nonhousing consumption and housing services; thus the individuals value function in t (with ρ being the discount factor) is given by

$$V_t = \{[(cx_t^{1-\delta} + (\theta {h_t}^{1-\delta})/(1-\delta)] + \rho V_{t+1}(w_{t+1})\} \tag{A.2}$$

Taking the ratio of the first order conditions for (B.2) with respect to cx_t and h_t, respectively, yields the optimum ratio of housing stock to consumption for the individual:

$$\frac{h_t}{cx_t} = \theta^{(1-\delta)/\delta} U C_t^{-1/\delta} g_t^{-1/\delta}, \tag{A.3}$$

where $UC_t \equiv (r_t + \tau_t + \upsilon_t + \kappa_t - \dot{g}_t)/(1 + r_t)$ is the real user cost of capital for housing. Aggregating (B.3) over all N individuals and solving for g_t, I obtain:

$$g_t = \theta^{1-\delta} \left(\frac{{N_t}^{\delta}}{H_t} \right) C X_t^{\delta} U C_t^{-1}. \tag{A.4}$$

Expressing g_t as PH_t/PC_t, adding local authority subscripts to relevant variables and taking logs yields equation (B.5) for the equilibrium house price in the main body of the article (Equation 3.1):

[1] This section follows Grimes and Aitken (2010).

$$\left(\frac{PH_{it}}{PC_t}\right) = (1-\delta)\ln\theta - \delta\ln\left(\frac{H_{it}}{N_{it}}\right) + \delta\ln CX_{it} - \ln UC_{it}. \qquad \text{(A.5)}$$

A.3 Levels vs differences for house price regressions

Table A2: Change in Foreign Born Population and House Prices (OLS)

	Levels		First differences	
	(1)	(2)	(3)	(4)
FB/Pop_{t-1}	-0.981***	-0.282***		
	(0.068)	(0.074)		
$(\Delta$ FB$)/Pop_{t-1}$			-0.317***	-0.317***
			(0.061)	(0.070)
LA fixed effects	No	Yes	No	Yes
N	1359	1359	1359	1359
adj. R^2	0.38	0.98	0.79	0.79
Local Authorities	170	170	170	170

Note: All estimates includes year fixed effects. Δ Indicates the first difference. Standard errors clustered at the local authority district level are in parentheses. $^*p$ <0.05, $^{**}p$ <0.01, $^{***}p$ <0.001.

Appendix B

Appendices for Chapter 2

B.1 Ordered probit estimates

Table B1: Ordered Probit Estimates of the Effect of Individual Characteristics on Wage Quartile

	UK born	Foreign born
	(1)	(2)
Age	0.036*	0.067*
	(0.014)	(0.034)
Age-squared /100	-0.099***	-0.118**
	(0.017)	(0.044)
Female	0.482***	0.349*
	(0.017)	(0.160)
Single, never married	-0.112	0.033
	(0.068)	(0.275)
Married, living with husband/wife	-0.116	0.016
	(0.065)	(0.265)
Married, separated from husband/wife	-0.041	0.021
	(0.081)	(0.312)
Divorced	-0.036	0.070
	(0.068)	(0.281)
Degree or equivalent	0.582***	1.114*
	(0.129)	(0.441)
Higher education	0.852***	1.427**
	(0.129)	(0.440)
GCE A Level or equiv	0.951***	1.420**
	(0.127)	(0.441)
GCSE grades A-C or equiv	1.046***	1.585***
	(0.126)	(0.446)
Other qualifications	1.095***	1.157**
	(0.126)	(0.444)
No qualifications	1.008***	1.466***
	(0.123)	(0.441)
Higher managerial and professional	-0.658***	-1.261***
	(0.099)	(0.211)
Lower managerial and professional	-0.167	-0.556**
	(0.093)	(0.204)
Intermediate occupations	0.265**	-0.091
	(0.094)	(0.228)

Table B1: Ordered Probit Estimates Continued

	UK born	Foreign born
	(1)	(2)
Small employers and own account workers	-6.273***	-6.362***
	(0.097)	(0.234)
Lower supervisory and technical	0.428***	-0.085
	(0.094)	(0.217)
Semi-routine occupations	0.646***	0.219
	(0.097)	(0.223)
Routine occupations	0.685***	0.219
	(0.098)	(0.218)
Years of experience	-0.035***	-0.036*
	(0.008)	(0.017)
Years of experience squared /100	0.146***	0.138***
	(0.015)	(0.039)
Employed	0.696***	0.671***
	(0.039)	(0.044)
Unemployed	-0.043***	-0.074
	(0.019)	(0.323)
Years in the UK		0.006
		(0.009)
Years in the UK squared /100		-0.029
		(0.016)
N	31276	2992
Log-likelihood	-25235.57	-1863.61

Note: Ordered probit estimates of the effect of native (column 1) and immigrant (column 2) characteristics on wage quartiles. The estimates for immigrants also includes interactions between region of birth and age, sex, and years in the UK. Local authority fixed effects are also included. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

B.2 Summary statistics: Unnormalised data

Table B2: Summary Statistics: Unnormalised Data

	Total Population		Working Age	
Variable	Mean	S.D.	Mean	S.D.
Aggregate population				
Δ UK	9,332	33,886	5,777	21,964
Δ FB	2,252	5,825	1,906	4,900
Δ Local demand shock	-0.003	0.036	-0.003	0.036
Δ Log real house price	0.011	0.071	0.011	0.071
Δ Log housing stock	0.037	1.442	0.037	1.442
Occupation groups				
Δ UK (professional)	742	4,699	560	4,506
Δ UK (intermediate)	34	3,680	-47	3,568
Δ UK (routine)	-274	3,524	-381	3,390
Δ FB (professional)	397	2,079	372	2,045
Δ FB (intermediate)	194	1,319	191	1,319
Δ FB (routine)	354	1,914	351	1,879
Education groups				
Δ UK (highest)	430	3,344	351	3,285
Δ UK	4,473	11,328	4,213	11,196
Δ UK (lowest)	2,557	13,421	1,677	12,813
Δ FB (highest)	619	2,304	597	2,288
Δ FB	1,054	3,158	1,022	3,126
Δ FB (lowest)	294	2,055	251	2,011
Skill (wage) groups				
Δ UK (4th quartile)	1,483	6,271	1,469	6,247
Δ UK (3rd quartile)	1,454	5,911	1,434	5,884
Δ UK (2nd quartile)	1,420	5,859	1,391	5,816
Δ UK (1st quartile)	1,814	3,639	1,772	3,572
Δ FB (4th quartile)	282	1,407	279	1,404
Δ FB (3rd quartile)	218	1,216	217	1,203
Δ FB (2nd quartile)	224	1,232	221	1,226
Δ FB (1st quartile)	350	1,199	348	1,204

Note: Cells for skill groups (occupation, education-experience, and wage) all refer to working age population only (aged 16-65).
Source: Authors' calculations from the Annual Population Survey.

B.3 25 largest local authorities in 2003

Table B3: 25 Largest Local Authorities in 2003

Local authority	Population (2003)	UK born (2003)	Foreign born (2003)	% Foreign born	Share of UK immigrant pop in 2003
Birmingham	959,611	810,038	149,573	0.156	0.029
Leeds	719,811	653,312	66,499	0.092	0.013
Glasgow	560,004	517,592	42,412	0.076	0.008
Sheffield	502,878	468,433	34,445	0.068	0.007
Bradford	469,851	404,309	65,542	0.139	0.013
Buckinghamshire	466,341	424,542	41,799	0.090	0.008
Edinburgh	445,180	405,833	39,347	0.088	0.008
Liverpool	427,931	409,109	18,822	0.044	0.004
Manchester	423,682	349,805	73,877	0.174	0.015
Bristol	387,000	358,389	28,611	0.074	0.006
Croydon	329,525	256,334	73,191	0.222	0.014
Barnet	321,375	217,357	104,018	0.324	0.020
Coventry	292,708	249,753	42,955	0.147	0.008
Ealing	288,161	173,268	114,893	0.399	0.023
Bromley	286,809	258,361	28,448	0.099	0.006
Leicester	276,928	207,953	68,975	0.249	0.014
Nottingham	270,932	238,817	32,115	0.119	0.006
Lambeth	266,551	167,334	99,217	0.372	0.020
Enfield	264,221	195,594	68,627	0.260	0.013
Wandsworth	260,327	179,414	80,913	0.311	0.016
Brent	256,944	137,621	119,323	0.464	0.023
Southwark	250,314	169,705	80,609	0.322	0.016
Lewisham	248,507	183,519	64,988	0.262	0.013
Kingston upon Hull	245,302	236,246	9,056	0.037	0.002
Newham	243,494	141,599	101,895	0.418	0.020

Note: Data are for the largest 25 local authorities in 2003.
Source: Authors' calculations from Annual Population Survey.

B.4 Fastest growing local authorities, 2003-2012

Table B4: Fastest growing Local Authorities, 2003-2012

Local authority	% Change Population	Population (2012)	UK born (2012)	Foreign born (2012)	% Foreign born	Share of UK immigrant pop in 2012
Manchester	22.2	470,780	368,850	101,930	0.213	0.016
Westminster	20.7	243,113	118,628	124,484	0.511	0.020
Tower Hamlets	19.5	225,903	129,636	96,267	0.424	0.015
Reading	18.7	145,609	112,066	33,542	0.226	0.005
Camden	17.3	219,596	129,160	90,436	0.410	0.014
Newcastle upon Tyne	16.8	277,868	245,593	32,275	0.115	0.005
Bristol	16.6	419,185	375,071	44,114	0.103	0.007
Cardiff	16.2	324,327	291,092	33,234	0.101	0.005
Milton Keynes	16.1	230,200	194,938	35,262	0.151	0.005
Slough	16.0	126,244	82,852	43,392	0.339	0.007
Southwark	15.7	269,903	177,420	92,483	0.341	0.015
Luton	15.4	191,681	142,418	49,264	0.255	0.008
Nottingham	15.2	291,586	243,338	48,248	0.162	0.007
Redbridge	14.8	257,028	174,220	82,808	0.319	0.013
York	14.5	193,136	183,232	9,904	0.050	0.002
Barking and Dagenham	14.3	174,066	131,203	42,862	0.243	0.007
North Somerset	14.3	200,034	189,152	10,883	0.054	0.002
Windsor and Maidenhead	13.7	139,021	117,733	21,288	0.152	0.003
Southampton	13.7	228,816	197,435	31,380	0.134	0.005

Note: Data are for the top 10% fastest growing local authorities.
Source: Authors' calculations from Annual Population Survey.

B.5 Sample weights

The LFS assigns weights to each individual in the survey, and these weights represent the number of people in the total population that have similar characteristics to the individual that is actually surveyed. According to Office for National Statistics (2011) the weighting serves two main purposes; it ensures that cases that have a lower probability of selection get a higher weight, and it also ensures compensation for differential non-response amongst sub-groups in the population.

The weights are calibrated so that, for example, the weights of all 25-year old males in an LFS dataset equal the total number of 25-year old males in the UK at that time. The weights are calibrated primarily to recent census data, augmented by other sources such as the NHS Central Register for internal migration, the International Passenger for international migration flows and the registration data for births and deaths. Three different calibration groups or partitions are used, and within each partition the weights sum to the population Office for National Statistics (2011). The first partition is local authority districts, of which there are 433. Partition 2 consists of 44 calibration groups; 12 age groups, for 2 sexes, and two countries (Northern Ireland and Great Britain). And the third partition consists of 612 calibration categories, being age-bands (17) within regions (18) and sexes.

ONS uses the sample weights when reporting data on immigration from the LFS in official publications and Nicholas Palmer at ONS also recommends that they be used for area analysis at local authority level. Given that country of birth is just one of many individual characteristics which are not taken into account in the weighting (only age, sex, local authority and region), then unless the overall age, sex and location distribution of immigrants is radically different to the UK born distribution of age, sex and location, then the weights are as appropriate to use for immigrants versus natives as any other possible division of the population on any other particular characteristic. If there was a sudden influx of immigrants to an area that had previously had few immigrants and the age and sex of these immigrants was vastly different from the local native population, the weights would be less appropriate, however, the age, sex and location of immigrants are already factored into the total population used to calibrate the weights given that immigrants are recorded in the census and factored into the annual population estimates.

B.6 Unweighted results

Table B5: Estimates of the Effect of Immigrant Inflows on Net Native Outflows - Unweighted Data

	Total Population		Working Age Population	
	(1)	(2)	(3)	(4)
A. OLS				
$(\Delta$ FB$)/\text{Pop}_{t-1}$	0.018	0.541	-0.523	0.148
	(0.731)	(0.554)	(0.529)	(0.435)
Δ Local demand shock		3.651		3.821
		(2.690)		(2.562)
Δ Log real house price		6.255***		6.522***
		(1.567)		(1.524)
Δ Log housing stock		2.275		2.370
		(1.240)		(1.245)
adj. R^2	0.64	0.70	0.64	0.69
B. IV				
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.213***	-0.218**	-0.169***	-0.147*
	(0.063)	(0.071)	(0.046)	(0.080)
Δ Local demand shock		-1.843		-1.656
		(1.306)		(1.136)
Δ Log real house price		-1.780		-1.408
		(1.243)		(0.995)
Δ Log housing stock		-0.433		-0.304
		(0.638)		(0.561)
First stage coeff.	0.535	0.558	0.672	0.518
	(0.199)	(0.207)	(0.239)	(0.250)
F-stat	7.42	7.21	7.79	7.93
N	1800	1800	1800	1800
Local Authorities	200	200	200	200

Note: Authors' estimation of Equation 3.1. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

Table B6: Estimates of the Effect of Immigrant Inflows on Net Native Outflows (Pooled Occupation Groups) - Unweighted Data

	Total Population	Working Age
	(1)	(2)
A. OLS		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	0.541***	0.474***
	(0.071)	(0.060)
adj. R^2	0.12	0.10
B. IV		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.648	-0.585
	(0.564)	(0.575)
First stage coeff.	0.402	0.398
	(0.151)	(0.164)
F-stat	7.03	5.88
Occupation fixed effects	Yes	Yes
N	5400	5400
Local Authorities	200	200

Note: Authors' estimation of Equation 3.4. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. $^*p$ <0.05, $^{**}p$ <0.01, $^{***}p$ <0.001.

Table B7: Estimates of the Effect of Immigrant Inflows on Net Native Outflows (Pooled Education Groups) - Unweighted Data

	Total Population	Working Age
	(1)	(2)
A. OLS		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.385	-0.420
	(0.551)	(0.557)
adj. R^2	0.53	0.53
B. IV		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.672***	-0.679***
	(0.144)	(0.146)
First stage coeff.	0.589	0.581
	(0.082)	(0.081)
F-stat	51.35	51.72
Education fixed effects	Yes	Yes
N	5400	5400
Local Authorities	200	200

Note: Authors' estimation of Equation 3.4. All estimates includes year and local authority fixed effects. Standard errors clustered at the local authority district level are in parentheses. $^*p$ <0.05, $^{**}p$ <0.01, $^{***}p$ <0.001.

Table B8: Estimates of the Effect of Immigrant Inflows on Net Native Outflows (Pooled Skill Groups) - Unweighted Data

	Total Population	Working Age
	(1)	(2)
A. OLS		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	0.411***	0.402***
	(0.098)	(0.099)
adj. R^2	0.52	0.52
B. IV		
$(\Delta$ FB$)/\text{Pop}_{t-1}$	-0.569	-0.718
	(0.903)	(0.915)
First stage coeff.	0.137	0.114
	(0.010)	(0.087)
F-stat	15.70	14.73
Skill fixed effects	Yes	Yes
N	7200	7200
Local Authorities	200	200

Note: Authors' estimation of Equation 3.4. All estimates includes year and local authority fixed effects.
Standard errors clustered at the local authority district level are in parentheses. *p <0.05, **p <0.01, ***p <0.001.

Appendix C

Appendices for Chapter 3

C.1 Testing interest rate expectations and house prices

Table C1: Linear Probability Model Estimates of the Effect of Housing Prices on Political Preferences

	Strength of Right-wing support			
	(1)	(2)	(3)	(4)
House price shock	0.036***	0.032***	0.036***	0.035***
	(0.007)	(0.007)	(0.008)	(0.008)
Log household income	0.032*	0.032*	0.033*	0.033*
	(0.014)	(0.016)	(0.013)	(0.014)
Log regional GDP	0.002	0.002	0.002	0.002
	(0.009)	(0.009)	(0.009)	(0.009)
Log house price	0.017		0.017	
	(0.028)		(0.028)	
Interest rate expectations	0.011	0.009		
	(0.074)	(0.074)		
N	19474	19474	19474	19474
Within R^2	0.06	0.06	0.06	0.06

Note: Authors' estimation of equation 4.13. Data on house prices used to derive the house price shock are based on market values from the Land Registry. The dependent variable is defined as: Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

C.2 Full results - linear models

Table C2: Linear Probability Model Estimates of the Effect of Housing Prices on Political Preferences - Home owners

	Feel closest to the Right		Strength of support for Right		Voted for the Right	
	All (1)	HRP (2)	All (3)	HRP (4)	All (5)	HRP (6)
A. Home owners						
House price shock	0.031***	0.025*	0.036***	0.033***	0.027*	0.031*
	(0.007)	(0.010)	(0.007)	(0.010)	(0.012)	(0.015)
Log household income	0.032*	0.033*	0.032*	0.035*	0.044*	0.048*
	(0.014)	(0.019)	(0.015)	(0.015)	(0.019)	(0.016)
Log regional GDP	-0.001	-0.001	0.002	0.002	-0.002	0.002
	(0.002)	(0.003)	(0.009)	(0.013)	(0.002)	(0.003)
Log house price	-0.004	-0.008	0.017	0.041	-0.035**	-0.040*
	(0.009)	(0.012)	(0.028)	(0.036)	(0.013)	(0.017)
Interest rate expectations	0.015	0.022	0.011	0.106	0.005	0.030
	(0.027)	(0.037)	(0.074)	(0.098)	(0.030)	(0.038)
Regional unemployment rate	0.001	0.002	0.007	0.012	0.002	0.000
	(0.002)	(0.003)	(0.006)	(0.008)	(0.002)	(0.003)
Age	0.011	0.012	0.028	0.019	-0.004	0.007
	(0.007)	(0.010)	(0.022)	(0.033)	(0.011)	(0.014)
Age-squared	0.000	0.000	-0.000**	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Children	0.007	0.013**	0.016	0.035*	-0.001	0.008
	(0.004)	(0.005)	(0.013)	(0.017)	(0.005)	(0.006)
Married	0.019*	0.021	0.048	-0.011	-0.014	-0.038*
	(0.008)	(0.013)	(0.033)	(0.049)	(0.012)	(0.017)
Degree	-0.014	-0.014	0.020	0.095	0.029	0.012
	(0.027)	(0.040)	(0.088)	(0.123)	(0.053)	(0.089)
A levels	-0.001	-0.022	0.081	0.056	0.032	0.011
	(0.019)	(0.029)	(0.066)	(0.091)	(0.038)	(0.077)
GCSEs	0.005	-0.005	0.074	-0.012	0.026	0.008
	(0.018)	(0.029)	(0.059)	(0.088)	(0.038)	(0.072)
Other qual.	0.003	0.006	0.068	0.021	0.033	0.033
	(0.016)	(0.027)	(0.054)	(0.077)	(0.036)	(0.073)
Employed	0.001	-0.002	-0.000	-0.099	-0.020	0.015
	(0.016)	(0.022)	(0.068)	(0.085)	(0.023)	(0.029)
Self-employed	-0.000	0.002	0.002	-0.093	-0.018	0.004
	(0.019)	(0.024)	(0.074)	(0.090)	(0.023)	(0.031)
Unemployed	-0.028	-0.021	-0.121	-0.321	-0.073	-0.002
	(0.037)	(0.052)	(0.162)	(0.188)	(0.059)	(0.085)
Retired	0.023	0.051	0.083	-0.091	-0.060	0.003
	(0.030)	(0.032)	(0.105)	(0.118)	(0.033)	(0.029)
Family care	-0.011	-0.058	0.060	-0.132	-0.036	0.037
	(0.022)	(0.032)	(0.079)	(0.123)	(0.027)	(0.040)
N	33178	18394	19474	10938	21532	12002
Within R^2	0.04	0.04	0.06	0.06	0.07	0.06

Note: Authors' estimation of equation 4.13. Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour/; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, and occupational dummies (25). Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table C3: Linear Probability Model Estimates of the Effect of Housing Prices on Political Preferences - Renters

	Feel closest to the Right		Strength of support for Right		Voted for the Right	
	All (1)	HRP (2)	All (3)	HRP (4)	All (5)	HRP (6)
A. Renters						
House price shock	0.007	0.017	0.006	0.017	0.063	0.062
	(0.009)	(0.014)	(0.009)	(0.014)	(0.054)	(0.073)
Log household income	-0.001	-0.010*	-0.000	-0.010*	-0.003	-0.020
	(0.006)	(0.005)	(0.007)	(0.005)	(0.015)	(0.017)
Interest rate expectations	-0.018	-0.016	-0.006	-0.016	-0.117	-0.038
	(0.054)	(0.081)	(0.063)	(0.081)	(0.238)	(0.293)
Regional unemployment rate	-0.004	-0.001	-0.003	-0.001	0.004	0.007
	(0.004)	(0.004)	(0.004)	(0.004)	(0.019)	(0.022)
Log regional GDP	-0.224	-0.419	-0.248	-0.419	-0.058	0.111
	(0.270)	(0.403)	(0.294)	(0.403)	(1.348)	(1.705)
Age	0.015	0.014	0.013	0.014	0.144	0.099
	(0.013)	(0.018)	(0.013)	(0.018)	(0.080)	(0.108)
Age-squared	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Children	0.009	-0.002	0.013	-0.002	0.001	-0.008
	(0.007)	(0.009)	(0.008)	(0.009)	(0.035)	(0.042)
Married	0.005	0.020	0.005	0.020	0.049	0.053
	(0.015)	(0.019)	(0.015)	(0.019)	(0.061)	(0.063)
Degree	-0.049	-0.077	-0.080	-0.077	-0.095	0.201
	(0.035)	(0.055)	(0.043)	(0.055)	(0.287)	(0.345)
A levels	-0.005	-0.017	0.001	-0.017	-0.205	-0.048
	(0.027)	(0.038)	(0.027)	(0.038)	(0.133)	(0.135)
GCSEs	0.007	-0.018	-0.000	-0.018	-0.194	-0.043
	(0.023)	(0.029)	(0.023)	(0.029)	(0.123)	(0.122)
Other qual.	-0.004	-0.014	-0.001	-0.014	-0.171	-0.096
	(0.021)	(0.026)	(0.022)	(0.026)	(0.128)	(0.098)
Employed	-0.019	-0.029	-0.014	-0.029	-0.001	0.048
	(0.012)	(0.019)	(0.012)	(0.019)	(0.154)	(0.200)
Self-employed	-0.030	-0.058	-0.033	-0.058	-0.054	-0.084
	(0.020)	(0.032)	(0.021)	(0.032)	(0.188)	(0.253)
Unemployed	-0.025	-0.019	-0.044	-0.019	0.232	0.268
	(0.028)	(0.027)	(0.028)	(0.027)	(0.189)	(0.238)
Retired	-0.064*	-0.102**	-0.065*	-0.102**	-0.026	-0.298
	(0.025)	(0.038)	(0.026)	(0.038)	(0.272)	(0.450)
Family care	-0.025	-0.043	-0.022	-0.043	0.096	0.335
	(0.013)	(0.023)	(0.014)	(0.023)	(0.195)	(0.242)
N	5857	3952	5857	3952	2797	1939
Within R^2	0.00	0.06	0.04	0.06	0.05	0.06

Note: Authors' estimation of equation 4.13. Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, and occupational dummies (25). The house price shock measure is calculated using home owners within each local authority and year as described in the text. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

C.3 Logit models

Table C4: Logit Estimates of the Effect of Housing Prices on Political Preferences

	Feel closest to the Right		Voted for the Right		Strength of Right support	
	All	HRP	All	HRP	All	HRP
	(1)	(2)	(3)	(4)	(5)	(6)
A. Home owners						
House price shock	0.034***	0.035***	0.047***	0.046***	0.174***	0.177***
	(0.005)	(0.005)	(0.009)	(0.008)	(0.033)	(0.032)
Log household income	0.018***	0.023***	0.013*	0.020**	0.028	0.041
	(0.005)	(0.007)	(0.006)	(0.008)	(0.027)	(0.040)
N	37945	21025	24646	13711	22364	12571
B. Renters						
House price shock	-0.000	-0.001	0.001	0.009	-0.001	-0.007
	(0.002)	(0.002)	(0.003)	(0.005)	(0.012)	(0.015)
Log household income	0.015	0.011	0.007	0.015	0.057	0.083
	(0.008)	(0.010)	(0.011)	(0.013)	(0.044)	(0.053)
N	5490	3293	2845	1717	3593	2454

Note: Authors' estimation of equation 4.13. Marginal effects reported in columns (1)-(4). Odds ratios for ordered logits reported in columns (5)-(6). Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample in Panel B, housing price measures are calculated using home owners within each local authority and year as described in the text. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table C5: Logit Estimates of the Effect of Housing Prices on Political Preferences

	Feel closest to the Right		Voted for the Right		Strength of Right support	
	All	HRP	All	HRP	All	HRP
	(1)	(2)	(3)	(4)	(5)	(6)
A. Home owners						
Log House price shock	0.112***	0.117***	0.151***	0.147***	0.616***	0.640***
	(0.010)	(0.011)	(0.016)	(0.017)	(0.064)	(0.069)
Log household income	0.016***	0.019**	0.009	0.016*	0.014	0.019
	(0.005)	(0.006)	(0.005)	(0.008)	(0.028)	(0.041)
N	37945	21025	24646	13711	22364	12571
B. Renters						
Log House price shock	-0.001	-0.003	0.008	0.031	0.053	0.015
	(0.010)	(0.012)	(0.018)	(0.024)	(0.067)	(0.082)
Log household income	0.017	0.013	0.008	0.016	0.073	0.098
	(0.009)	(0.012)	(0.011)	(0.013)	(0.047)	(0.057)
N	5490	3293	2845	1717	3593	2454

Note: Authors' estimation of equation 4.13. Marginal effects reported in columns (1)-(4). Odds ratios for ordered logits reported in columns (5)-(6). Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, labour force status dummies, occupational dummies (25), educational attainment dummies, and controls for age, number of children, marital status, regional unemployment rate, regional real income per capita, interest rate expectations, and current self-reported house values. For the sample in Panel B, housing price measures are calculated using home owners within each local authority and year as described in the text. Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

C.4 Alternative models: Four year change in house prices

Table C6: Linear Probability Model Estimates of the Effect of Housing Prices on Political Preferences

	Feel closest to the Right		Voted for the Right		Strength of Right support	
	All (1)	HRP (2)	All (3)	HRP (4)	All (5)	HRP (6)
A. Home owners						
4-year House price change	0.011***	0.012***	0.013**	0.011	0.008**	0.007*
	(0.003)	(0.003)	(0.005)	(0.007)	(0.003)	(0.003)
Log household income	0.284*	0.344	0.395	0.069	0.222	0.358
	(0.140)	(0.177)	(0.464)	(0.535)	(0.209)	(0.262)
Log regional GDP	0.005*	0.007*	0.002	0.004	0.002	0.006*
	(0.002)	(0.003)	(0.008)	(0.012)	(0.002)	(0.003)
Log house price	0.011	0.005	0.053*	0.040	-0.019	-0.025*
	(0.007)	(0.009)	(0.022)	(0.026)	(0.010)	(0.011)
Interest rate expectations	0.026	0.019	0.027	0.086	0.004	0.009
	(0.023)	(0.034)	(0.069)	(0.086)	(0.029)	(0.036)
Regional unemployment rate	0.000	0.003	0.003	0.011	0.001	0.003
	(0.002)	(0.003)	(0.006)	(0.008)	(0.002)	(0.003)
Age	0.002	0.000	0.013	-0.001	-0.001	-0.005
	(0.002)	(0.003)	(0.007)	(0.011)	(0.003)	(0.004)
Age-squared	0.000	0.000	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Children	0.000	0.002	0.006	0.012	-0.002	0.002
	(0.003)	(0.004)	(0.011)	(0.014)	(0.004)	(0.005)
Married	0.015*	0.014	0.004	-0.045	-0.009	-0.020
	(0.007)	(0.009)	(0.025)	(0.035)	(0.011)	(0.014)
Degree	0.012	0.025	0.011	0.072	-0.025	-0.037
	(0.014)	(0.019)	(0.054)	(0.069)	(0.025)	(0.036)
A levels	0.024	0.030	0.143**	0.189**	0.035	0.044
	(0.013)	(0.018)	(0.049)	(0.062)	(0.025)	(0.038)
GCSEs	0.029*	0.037*	0.133**	0.108	0.033	0.015
	(0.012)	(0.016)	(0.044)	(0.061)	(0.024)	(0.034)
Other qual.	0.030**	0.044**	0.131**	0.146**	0.042	0.037
	(0.012)	(0.015)	(0.041)	(0.056)	(0.022)	(0.034)
Employed	-0.000	-0.019	0.023	-0.103	-0.009	0.011
	(0.016)	(0.025)	(0.060)	(0.078)	(0.019)	(0.028)
Self-employed	0.015	0.006	0.085	-0.033	0.008	0.024
	(0.018)	(0.028)	(0.066)	(0.082)	(0.020)	(0.030)
Unemployed	-0.007	-0.041	-0.109	-0.417*	-0.039	0.010
	(0.031)	(0.047)	(0.139)	(0.181)	(0.045)	(0.070)
Retired	0.049	0.051	0.022	-0.214*	-0.029	0.010
	(0.033)	(0.037)	(0.086)	(0.107)	(0.028)	(0.030)
Family care	-0.016	-0.045	0.058	-0.133	-0.028	0.012
	(0.021)	(0.034)	(0.072)	(0.113)	(0.023)	(0.034)
N	36102	19688	21431	11893	23782	13080
Within R^2	0.03	0.04	0.06	0.06	0.07	0.06

Note: Authors' estimation of equation 4.13. Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour/; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, and occupational dummies (25). Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.

Table C7: Linear Probability Model Estimates of the Effect of Housing Prices on Political Preferences

	Feel closest to the Right		Voted for the Right		Strength of Right support	
	All (1)	HRP (2)	All (3)	HRP (4)	All (5)	HRP (6)
A. Home owners						
Log 4-year House price change	0.035***	0.039***	0.080***	0.067**	0.044***	0.039***
	(0.006)	(0.008)	(0.017)	(0.023)	(0.008)	(0.010)
Log household income	0.320*	0.376*	0.433	0.094	0.246	0.374
	(0.147)	(0.182)	(0.469)	(0.538)	(0.214)	(0.266)
Log regional GDP	0.005*	0.007*	0.002	0.003	0.002	0.006*
	(0.002)	(0.003)	(0.008)	(0.012)	(0.002)	(0.003)
Log house price	0.016*	0.009	0.061**	0.044	-0.014	-0.021
	(0.007)	(0.009)	(0.023)	(0.025)	(0.010)	(0.011)
Interest rate expectations	0.025	0.018	0.024	0.080	0.002	0.007
	(0.023)	(0.034)	(0.069)	(0.086)	(0.029)	(0.036)
Regional unemployment rate	0.001	0.003	0.003	0.011	0.001	0.003
	(0.002)	(0.003)	(0.006)	(0.008)	(0.002)	(0.003)
Age	0.001	-0.001	0.010	-0.004	-0.003	-0.007
	(0.002)	(0.003)	(0.008)	(0.011)	(0.003)	(0.004)
Age-squared	0.000	0.000	-0.000	0.000	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Children	0.000	0.002	0.005	0.011	-0.003	0.001
	(0.003)	(0.004)	(0.011)	(0.014)	(0.004)	(0.006)
Married	0.016*	0.014	0.007	-0.044	-0.008	-0.020
	(0.006)	(0.009)	(0.025)	(0.034)	(0.011)	(0.014)
Degree	0.009	0.021	0.001	0.062	-0.030	-0.043
	(0.014)	(0.019)	(0.055)	(0.069)	(0.025)	(0.036)
A levels	0.022	0.028	0.138**	0.182**	0.032	0.041
	(0.013)	(0.018)	(0.049)	(0.062)	(0.025)	(0.038)
GCSEs	0.028*	0.035*	0.129**	0.104	0.030	0.012
	(0.012)	(0.016)	(0.044)	(0.061)	(0.024)	(0.034)
Other qual.	0.028*	0.041**	0.127**	0.141*	0.039	0.033
	(0.012)	(0.015)	(0.041)	(0.056)	(0.022)	(0.034)
Employed	0.001	-0.019	0.027	-0.102	-0.008	0.011
	(0.016)	(0.025)	(0.060)	(0.078)	(0.019)	(0.028)
Self-employed	0.016	0.007	0.088	-0.033	0.009	0.024
	(0.018)	(0.028)	(0.066)	(0.082)	(0.020)	(0.030)
Unemployed	-0.006	-0.039	-0.107	-0.416*	-0.039	0.010
	(0.031)	(0.047)	(0.139)	(0.182)	(0.045)	(0.070)
Retired	0.051	0.053	0.028	-0.210	-0.028	0.011
	(0.033)	(0.037)	(0.087)	(0.108)	(0.028)	(0.030)
Family care	-0.015	-0.046	0.062	-0.132	-0.027	0.009
	(0.021)	(0.034)	(0.073)	(0.113)	(0.023)	(0.034)
N	36102	19688	21431	11893	23782	13080
Within R^2	0.03	0.04	0.06	0.06	0.07	0.06

Note: Authors' estimation of equation 4.13. Dependent variable in columns (1)-(2) and (5)-(6): Dummy = 1 if feel closer to the right-wing. Dependent variable in columns (3)-(4): Represents strength of support for Conservatives relative to Labour/; 1 = Labour (very strong support), 2 = Labour (fairly strong), 3 = Labour (not very strong), 4 = Other parties (including Liberal Democrats) 5 = Conservative (not very strong), 6 = Conservative (fairly strong), 7 = Conservative (very strong). All estimates include individual, local authority, and year fixed effects, and occupational dummies (25). Standard errors clustered at the local authority district level are in parentheses.
*p <0.05, **p <0.01, ***p <0.001.