Institute for Fiscal Studies

Bee Boileau
Lucas Conwell
Peter Levell

Working paper

Who is helped by Help to Buy schemes?

26/27

Economic and Social Research Council

Who is helped by Help to Buy schemes?*

Bee Boileau† Lucas Conwell‡ Peter Levell§

April 13, 2026

Abstract

Demand-side policies which relax borrowing constraints for homebuyers, with the aim of increasing homeownership, are increasingly common. We propose a new approach to evaluating ex-ante how such policies would change individuals' opportunity sets according to their income, location and parental background. We estimate the maximum deposit each non-homeowner could plausibly raise based on their observable characteristics using stochastic frontier analysis, and map this onto local house price distributions to calculate the share of local properties that become newly affordable under the policy. We apply this method to assess the 2013 'Help to Buy' schemes introduced in the UK. Affordability gains under these schemes were concentrated among higher-income individuals, with those living in London and the South East seeing larger increases in maximum affordable price but smaller increases in the share of local properties they could afford. Our approach can be adapted to evaluate the likely distributional impacts of new schemes and alternative forms of support.

Keywords: homeownership, Help to Buy, credit constraints, stochastic frontier analysis, intergenerational mobility, housing policy

*The authors are grateful to David Sturrock, and the participants of our project steering group (Neal Hudson, Rory Coulter, Ken Gibb, Christine Whitehead, Alex Varadi, Stephen Aldridge, Amelia Lenanton, Jo Blanden, Hanna Szymborska, Chris Wilkinson and Andrew Wallis) for helpful comments. Any errors or omissions are our own. This research was supported by the Economic and Social Research Council through the Centre for the Microeconomic Analysis of Public Policy (grant number ES/T014334/1) as well as through funding generously provided by Homes England.

†Institute for Fiscal Studies. [bee.boileau@ifs.org.uk].

‡University College London.

§Institute for Fiscal Studies.

1 Introduction

Policies which relax borrowing constraints for homebuyers are an increasingly common way for governments to boost the affordability of homeownership. These demand-side policies include down-payment assistance, shared-equity schemes and programmes which underwrite the risks of high loan-to-value (LTV) mortgages. In the UK, the government introduced a package of schemes of this sort under the name 'Help to Buy' (HtB) in 2013. Australia and Ireland have since also introduced their own shared-equity HtB schemes, and in the US, presidential candidate Kamala Harris proposed a $25,000 down-payment assistance program for first-time buyers as part of her 2024 campaign (Wang and Abdul-Hakim 2024).

These homeownership assistance schemes have the potential to expand the opportunity sets and homeownership rates of targeted groups, but their likely impacts and distributional effects are nuanced and not well understood. In particular, the impact of HtB policies on an individual's ability to purchase a home depends jointly on their capacity to put down a deposit of a given size, the extent to which loan-to-income constraints on mortgage borrowing bind, and the distribution of local house prices and characteristics. As a result, policies that relax LTV constraints but not loan-to-income (LTI) constraints may do little to help lower income households in high-house-price areas. Moreover, the participants in such schemes may be 'inframarginal' buyers who make purchases they would have been able to afford anyway using savings or family support.

In this paper, we propose a new approach that uses household panel data to identify the distributional effects of homeownership assistance policies. Specifically, we use stochastic frontier analysis, a method usually employed to estimate firms' technical inefficiency, to estimate the maximum deposit individuals can afford as a function of their observable characteristics. We use observed deposits to measure potential deposit capacity, rather than using individuals' reported savings, which better accounts for any additional saving effort in the period immediately before house purchase, and for parental transfers received at the time of house purchase (which previous work finds to be common and substantial (Boileau and

Sturrock 2023)). Importantly, we correct for the positive selection into homeownership using a Heckman-style sample selection model adapted for stochastic frontier analysis (Greene 2010). We then apply these estimates to representative household survey data to quantify the changes in the housing opportunity sets of individuals according to their income, demographics, and parental background. We define our opportunity sets as either the maximum affordable house value or share of local property sales which an individual can afford. We implement this approach to analyse the distribution of affordability gains from the UK's 2013 'Help to Buy' policies. Our model of deposit affordability would however also allow policymakers to evaluate future homeownership assistance schemes.

The effects of these schemes on overall housing affordability will depend on their effect on the supply of houses for sale. Where supply is more constrained, they are likely to push prices up; where supply is less constrained, they may instead increase housing supply (Carozzi, Hilber, and Yu 2024). But, by targeting specific groups, they have an important *distributional* effect: making homeownership more affordable for some at the expense of others competing to buy homes in the same market. Our approach does not account for possible effects of Help to Buy on local house prices or characteristics; we might expect any price effects to undermine overall affordability gains, potentially more so in housing markets where supply is more constrained.

We find substantial inequalities in affordability gains across income groups, regions, and ages. When HtB relaxed borrowing constraints, the highest-income individuals in our sample saw both a larger increase in the share of local properties they could afford and a larger increase in the maximum affordable price. Regional inequalities equally stand out: those living in London and the South East saw a larger increase in the maximum affordable price, compared to those living in the North of England, but saw a *smaller* increase in the share of local properties they could afford, reflecting the higher price levels in these areas. Similarly, potential homebuyers in their 30s and 40s benefitted from a larger increase in the maximum affordable price than those in their 20s, but a smaller increase in the share of local properties

they could afford.

Our paper relates to a growing body of work evaluating demand-side housing policy, in particular the Help to Buy schemes themselves. Tracey and van Horen (2021) find that the relaxation of down-payment constraints under HtB increased home purchases, particularly among first-time buyers. Carozzi, Hilber, and Yu (2024) find that the equity loan scheme significantly increased house prices in more supply-constrained parts of the UK, in particular in Greater London, while it increased construction volumes in less supply-constrained areas. Benetton et al. (2022) show that households who used the equity loan scheme bought more expensive properties, rather than reducing their leverage. Most recently, Tracey and van Horen (2026) examine how easing mortgage borrowing constraints affects the composition of buyers and homeowners, finding that Help to Buy increased homeownership among households they argue are unlikely to have received financial transfers from family. Relative to this literature, we provide a systematic ex-ante evaluation of the distribution of affordability gains from HtB schemes across detailed demographic and socioeconomic groups. Our use of detailed survey data means we are able to say much more about the individual characteristics of those for whom HtB generated the largest affordability gains. Our approach also allows policymakers to predict the distributional impacts of alternative permutations of HtB or other future schemes.

We also contribute to the literature on intergenerational persistence in housing tenure. UK evidence consistently pinpoints parental homeownership as among the strongest predictors of children's housing outcomes (Blanden, Eyles, and Machin 2023; Harkness and Bedük 2024; Coulter 2017), due both to direct financial transfers (Boileau and Sturrock 2025; Suh 2020; Lee et al. 2020) and the broader transmission of socioeconomic advantage (Gregg and Kanabar 2023). Our distributional analysis speaks directly to the effect of demand-side policies on this intergenerational transmission of housing tenure. Namely, we ask not only whether the policy raised average affordability, but whether it did so for those whose parental background places them furthest from the threshold of homeownership.

Finally, we apply stochastic frontier analysis to a novel context, individual-specific deposit capacity, and then translate the estimates into affordability thresholds within local house-price distributions. Stochastic frontier methods, well established in applied econometrics (Madaleno and Moutinho 2023), have been applied to other housing-related questions, for example, to quantify information asymmetries between buyers and sellers or to estimate property values (Qiu, Tu, and Zhao 2020; Samaha and Kamakura 2008). To our knowledge, however, this framework has not previously been used to estimate individual-level deposit capacity and the affordability implications of housing policy. This methodological contribution allows us to move beyond average treatment effects and examine the distribution of gains from 'Help to Buy' across individuals facing different financial constraints and from different family backgrounds.

The remainder of the paper is structured as follows. In Section 2, we provide some background on the UK housing market and on the Help to Buy schemes. Section 3 describes our data sources and sample construction. Section 4 details our estimation of individual deposit capacity using stochastic frontier analysis. Section 5 maps deposit capacity to affordability gains and shows that our affordability measures predict homeownership. Section 6 concludes with a discussion of policy implications and directions for future research.

2 Institutional background

2.1 Homeownership in the UK

House prices in the UK have grown substantially in recent decades, doubling as a multiple of average incomes between the early 1990s to the 2010s, and growing particularly rapidly in London and its surroundings (Sturrock and Levell 2026). Over a similar period, since the early 2000s, homeownership in England has declined, particularly among younger adults (Department for Levelling Up, Housing and Communities 2023a). Among households headed by someone aged 25–34, the homeownership rate fell from 59 per cent in 2000 to 38 per

cent by 2020; among those headed by someone aged 35–44, the rate fell from 73 per cent to 59 per cent (Cribb 2024). Moreover, homeownership is strongly correlated with parental tenure: children of homeowners are substantially more likely to become owners themselves (Blanden, Eyles, and Machin 2023), a pattern that has strengthened over time (Boileau and Sturrock 2023; Bell, Blundell, and Machin 2023). These trends in housing tenure, particularly among younger adults, helped motivate the UK government's introduction of homeownership assistance schemes known as 'Help to Buy' in 2013.

2.2 The Help to Buy schemes

The UK government announced a suite of 'Help to Buy' policies in its March 2013 Budget, with the dual aims of increasing homeownership and stimulating housebuilding. Help to Buy consisted of two main components: an equity loan scheme and a mortgage guarantee scheme, both of which differed across UK nations. We concentrate on England; separate schemes were introduced in Scotland and Wales.

Help to Buy: Equity Loan. The equity loan scheme, launched in April 2013, provided government-backed equity loans of up to 20 per cent of a house's purchase price.[1] Only new-build properties, up to a price ceiling of £600,000, were eligible for the scheme. Both first-time buyers and existing homeowners could qualify for the scheme, although around 80 per cent of equity loan purchases in England between 2013 and 2021 were by first-time buyers.[2] The scheme enabled buyers to obtain a mortgage at a 75 per cent loan-to-value ratio with a cash deposit of only 5 per cent. The equity loan was interest-free for the first five years, after which point a rising annual fee was charged. By reducing the effective deposit requirement from 10 per cent (under typical lending conditions post-financial crisis) to 5 per cent, the scheme was intended to expand access to homeownership among buyers priced out

1. The loan share increased to 40 per cent for properties in London from February 2016.
2. The scheme in England made 346,656 equity loans from 2013-2021, of whom 287,805 were first time buyers (Department for Levelling Up, Housing and Communities 2022).

of the market by deposit constraints. As Figure 1 shows, the share of mortgages issued at LTVs above 90 per cent fell from around 15 per cent in 2007 to around 2 per cent in 2010, slowly increasing through the 2010s. At its peak, the equity loan scheme supported over 50,000 house purchases per year in England (Department for Levelling Up, Housing and Communities 2023b).

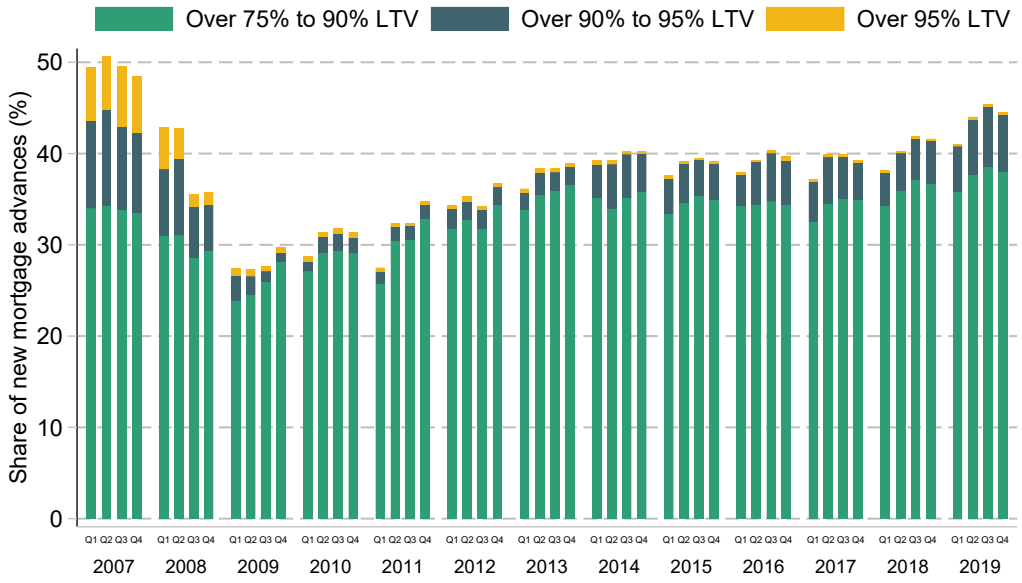


Figure 1: Distribution of new mortgage advances by loan-to-value ratio, 2007–2019

Notes: Each bar shows the share of gross mortgage advances in the given LTV band for one quarter. Source: Bank of England, Mortgage Lenders and Administrators Return (MLAR), Table 1.31.

Help to Buy: Mortgage Guarantee. Through the mortgage guarantee scheme, launched in October 2013, the government offered lenders a guarantee covering a portion of their losses in the event of mortgage default on loans with LTV ratios between 80 and 95 per cent. The government intended to encourage lenders who had withdrawn from the high-LTV market after the 2008 financial crisis to once again offer such loans. Like the equity loan scheme, the mortgage guarantee was open to both first-time buyers and existing homeowners, but like the equity loan scheme 80 per cent of mortgage guarantee purchases in England were made by first-time buyers (Department for Communities and Local Government 2017). The

mortgage guarantee similarly applied to properties up to £600,000, but unlike the equity loan scheme, purchasers of both new-build and existing properties qualified. In total, 82,000 house purchases in England using the mortgage guarantee scheme took place (Department for Communities and Local Government 2017) before it closed in December 2016 (HM Treasury 2016).

Figure 2 shows half-yearly house purchases in England made using both schemes between 2013–14 and 2019–20. As shown, purchases using the equity loan scheme rise over this period, while purchases using the mortgage guarantee scheme peak in 2014 and then decline until the scheme closed to new applications at the end of 2016. As a result, the equity loan scheme supported a larger number of purchases than the mortgage guarantee scheme, particularly in later years. At the schemes' combined peak, in 2014–15, they supported approximately a fifth of first-time buyer purchases in England.[3]

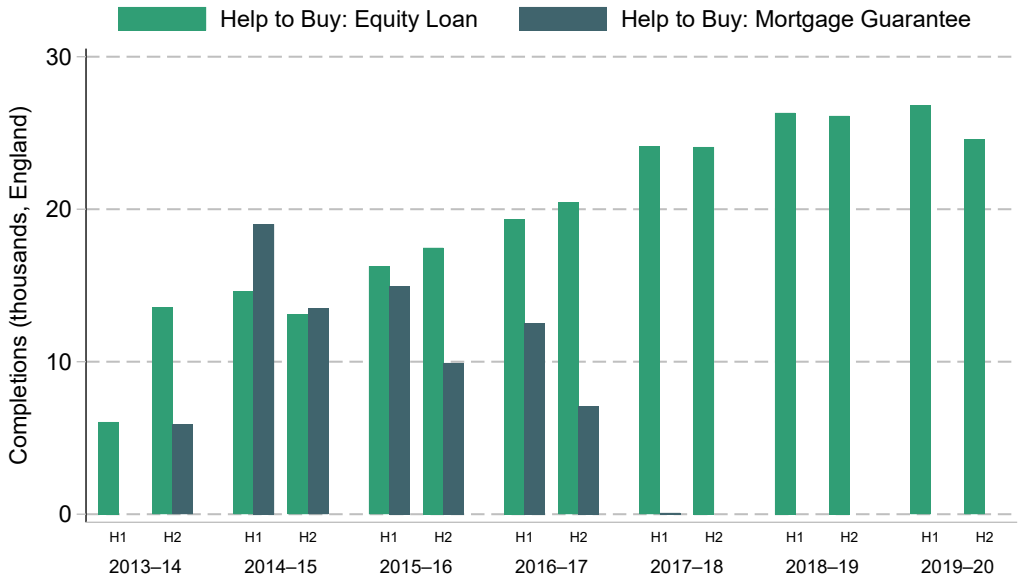
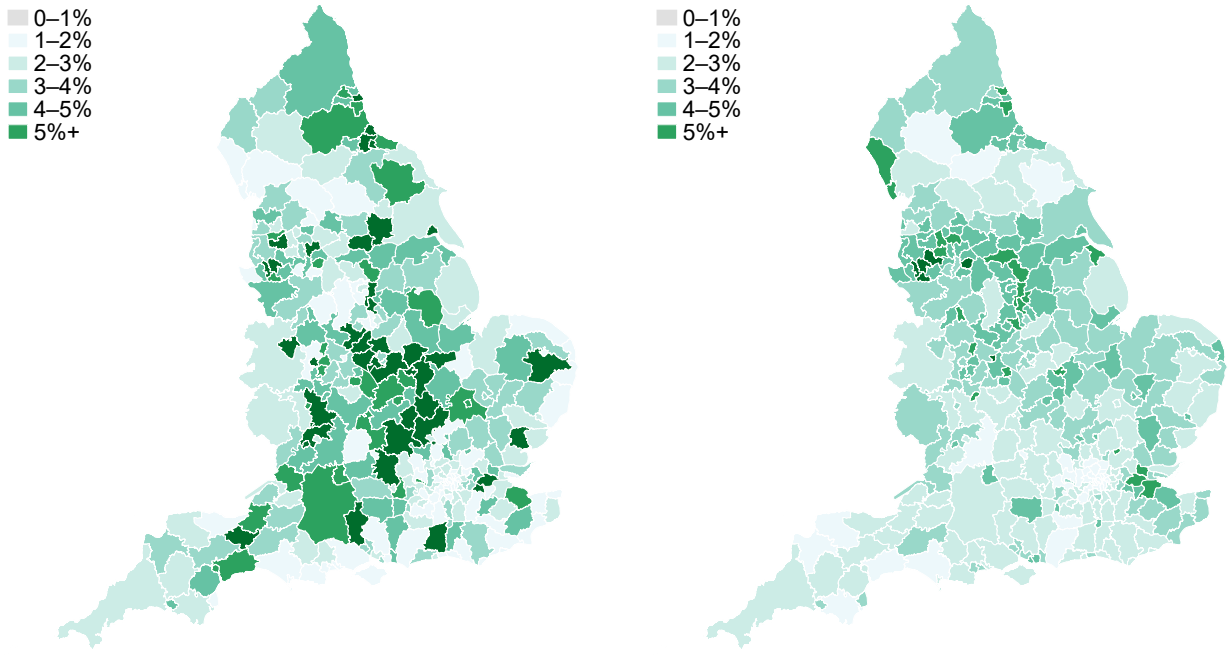


Figure 2: Half-yearly house purchases under the Help to Buy equity loan and mortgage guarantee schemes in England

Notes: Source: MHCLG.

3. We here assume that around 80% of total purchases were by FTBs in 2014–15, and take total FTB mortgages issued in England from MHCLG statistics (Ministry of Housing, Communities and Local Government 2023).

Figure 3 shows the geographic distribution of house purchases under the schemes across local authority districts (LADs) in England between October 2013 and December 2015, expressed as a share of total house sales. Buyers made more frequent use of the equity loan in areas with high shares of new-builds, e.g. the South East and outer commuting zones of major cities. The mortgage guarantee, by contrast, saw higher take-up in the North and Midlands, since it also applied to purchases of existing housing stock. Figure 4 shows that both schemes, but particularly the mortgage guarantee scheme, were more prevalent in local authorities with lower pre-HtB prices.



(a) Equity loan, share of sales

(b) Mortgage guarantee, share of sales

Figure 3: Help to Buy house sales as a share of total house sales by local authority district, October 2013–December 2015

Notes: Source: MHCLG; Land Registry.

3 Data and sample

Data. The primary source of data for our analysis is the UK Household Longitudinal Study (UKHLS), or Understanding Society (USoc), a nationally representative longitudinal

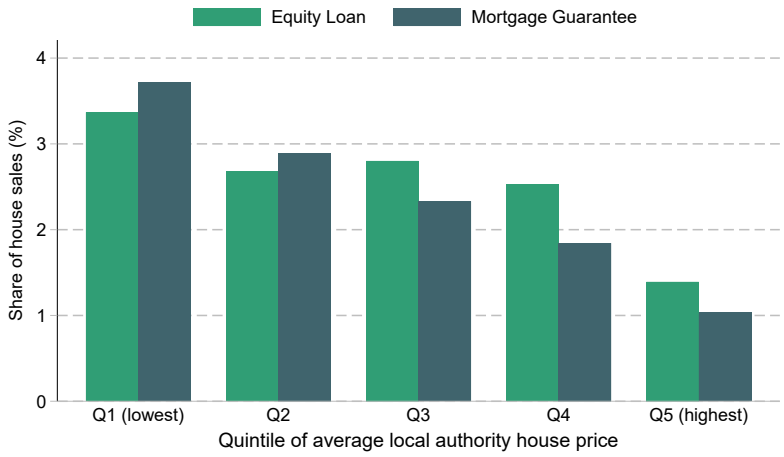


Figure 4: Equity loan and mortgage guarantee house purchases as a share of house sales, by local authority house price quintile, October 2013–December 2015

Notes: Quintiles based on average LAD house prices. Source: MHCLG; Land Registry.

household survey covering the United Kingdom. We use waves 1 to 5, covering the period 2009–10 to 2012–13, and supplement these with harmonised data from the British Household Panel Survey (BHPS), which ran from 1991 to 2008–09. Former BHPS respondents were included in the USoc sample, allowing us to extend the panel back further. The panel structure of the data allows us to track individual housing tenure transitions over time.

We measure homeownership at the individual level, using the person(s) owning the accommodation. This is particularly important given that we focus here on young adults, many of whom live in houses owned not by themselves but by their parents.[4] For those who transition into homeownership between survey waves, we measure the deposit paid as the reported purchase price of the property minus the initial mortgage amount.[5] This measure captures the buyer's equity contribution at purchase, which is the relevant quantity for our frontier model. For those buyers for whom the deposit measure is missing, we replace the measure with information from the next wave or previous wave, if available. We winsorise the deposit measure at the 97th percentile within each financial year and buyer status, i.e.

4. Appendix Section A compares individual-level homeownership with alternative household- and benefit unit- level definitions in our sample.

5. For the post-policy period, this estimated deposit will include the government equity loan, one reason that we focus on our pre-policy sample and estimated pre-policy frontier throughout.

first-time buyers vs. home movers. We use cross-sectional weights available in the survey in our descriptive statistics, although not when estimating our stochastic frontier model.

To construct local house price distributions, we use Land Registry Price Paid data, which records the transaction price and property characteristics for all residential property sales in England and Wales. We use the full transaction-level data in England for the period 2009 to 2013, matched to the UKHLS at the local authority level. The data includes an indicator for new-build properties, which we use to construct separate price distributions for new-build and existing properties within each local authority district (LAD) and year. Finally, we draw on the 1991 Census to measure the local authority-level homeownership rate, which we use to construct our instrument predicting selection into homeownership.

Sample. We construct our analysis sample from the USoc and BHPS data as follows. We take a sample of non-homeowners observed in England between 2009–10 and 2012–13, restricting to observations with non-missing income, geography, and demographic covariate data. We further restrict to those aged 22–44 at the time of observation. Table 1 shows summary statistics for this pre-policy sample of non-homeowners, separately for the overall sample and the subsample who transition into homeownership in the next wave. As shown, buyers are a similar age on average to non-buyers. They are slightly less likely to be female, are much more likely to have a degree, are more likely to live with a partner pre-purchase, and are less likely to have children in the household pre-purchase. Buyers also have substantially higher benefit-unit income than non-buyers, and their parents are more educated: 30% of buyers have a degree-educated parent, compared to 19% of all non-homeowners. These patterns show clear selection into home purchase – in particular, buyers have higher incomes and parents who are likely to be wealthier. Our frontier estimation procedure, to be detailed in the next section, will thus explicitly correct for this sample selection.

Table 1: Summary statistics for the pre-policy non-homeowner estimation sample

	Buyers and non-buyers	Buyers only
Age	31.3 (6.6)	31.0 (6.0)
Female (%)	52.0 (50.0)	49.0 (50.0)
Degree (%)	24.5 (43.0)	53.2 (49.9)
Has partner (%)	51.4 (50.0)	74.3 (43.7)
Child in household (%)	47.2 (49.9)	34.1 (47.4)
Parent has degree (%)	19.4 (39.5)	29.6 (45.7)
Parent mid/high-skill occ. (%)	72.0 (44.9)	88.3 (32.2)
Annual income (£)	26,770 (21,002)	49,247 (30,619)
Deposit (£)	—	67,085 (80,118)
Property price (£)	—	207,799 (146,182)
N	16,497	525

Notes: Weighted means (cross-sectional respondent weights); standard deviations in gray. Pre-policy sample: non-homeowners aged 22–44 resident in England, financial years 2009–10 to 2012–13, observed in the subsequent survey wave and with consistent deposit information. Buyers transition to homeownership between consecutive survey waves. Deposit and property price are observed only for buyers. Income is annualised benefit-unit monthly income, nominal. Parental education and occupation shares exclude observations with missing parental information.

4 Empirical method

Our empirical strategy proceeds in two steps. First, we estimate the maximum deposit that each non-homeowner could plausibly raise based on their observable characteristics, using a stochastic frontier model with a sample selection correction. Second, we translate this maximum deposit into a maximum affordable price under effective pre- and post-HtB borrowing constraints. Based on local housing characteristics, we then calculate the share of local transacted properties that become newly affordable under the policy.

4.1 Estimating maximum deposit affordable

To characterise housing affordability, we must first estimate the maximum deposit that a given non-homeowner could plausibly raise based on their characteristics, whether or not they actually purchase a home. The deposit, in turn, determines the maximum price an individual can afford given the borrowing constraints they face under current market and policy conditions.

We face two challenges in using the deposits placed by the non-homeowners who actually purchase a home during our sample period to estimate the maximum deposit capacity among all non-homeowners, including the non-purchasers. First, observed deposits reflect both the maximum deposit an individual could raise and the choice over how much of a deposit to put down. Second, we only observe deposits for those who choose to purchase. To address the first challenge, we use standard methods, namely stochastic frontier analysis, to estimate the maximum rather than the expected deposit as a function of observable characteristics. To address the second challenge, we apply a sample selection correction to account for the fact that buyers may not be a random sample of non-homeowners even after conditioning on observables.

Using the stochastic frontier approach, we model the deposit d_{it} put down by individual i

at time t as:

$$\begin{aligned} \log(d_{it}) &= \beta' X_{it} - u_{it} + v_{it}, \\ u_{it} \sim N^{+}(0, \sigma_u^2) &\text{ and } v_{it} \sim N(0,\, \sigma_v^2), \end{aligned} \tag{1}$$

Here, X_{it} is a vector of observable characteristics, which always includes decade of age, parental occupation and education, financial year, sex, and education. In our main specification, we also include region as well as indicators for having children and a partner in the household. In the parlance of stochastic frontier analysis, the predicted maximum deposit conditional on observables, $\beta' X_{it}$, is known as the deterministic deposit frontier, v_{it} is a symmetrically-distributed unobserved noise term, and $u_{it} \geq 0$ is a one-sided unobserved inefficiency term representing the gap between the observed deposit and the maximum deposit capacity. u_{it} has a half-normal distribution. Intuitively, the frontier $\beta' X_{it}$ gives the maximum deposit an individual could plausibly raise given their characteristics. We can think of this as the deposit an individual could raise if they saved as much, and received as much from external sources, as those with similar characteristics to them who put down the largest deposits. u_{it} captures the extent to which an individual chooses to save less or retain liquid wealth for other purposes and thus falls short of this maximum. As robustness comparisons, we estimate a parsimonious specification without region, children, and partner controls as well as a no-selection model estimated only on buyers via standard stochastic frontier analysis, as displayed in Appendix Tables 7 and 8.

To estimate this model, we need to account for a classic sample selection problem: we observe d_{it} only for those who choose to purchase a home, and this decision is likely correlated with unobserved factors that also affect deposit capacity. For example, individuals with greater unobserved sources of wealth will likely put down a higher deposit, relative to their observed characteristics, but may also have stronger tastes for homeownership. Estimating the frontier on buyers only could therefore lead to biased estimates of the deposit frontier, so we apply a sample selection correction following Greene (2010). Let s_{it}^{*} denote a latent

variable which determines home purchase s_{it}, such that $s_{it} = 1$ if $s^*_{it} > 0$ and $s_{it} = 0$ otherwise. We specify the selection equation as

$$s^*_{it} = \delta' Z_{it} + \gamma' X_{it} + w_{it}, \qquad s_{it} = \mathbf{1}[s^*_{it} > 0], \tag{2}$$

where Z_{it} is an instrument correlated with home purchase but not deposit size, and w_{it} is a standard normal error term. The key feature of Greene's model is a joint distribution for the frontier noise v_{it} and the selection error w_{it}, allowing for correlation between the two. This joint distribution captures the idea that unobserved factors that make an individual more likely to purchase may also be correlated with their deposit capacity.

Our instrument of choice is a proxy for historical homeownership norms in the community where an individual grew up. Specifically, we use the homeownership rate in 1991 in the local authority district (LAD) where an individual is first observed in our panel dataset. In our sample, the mean age at which respondents are first observed is 28; given relatively low rates of spatial mobility in England, this first observed LAD should be highly correlated with an individual's true childhood LAD. The local homeownership rate, in turn, captures local norms and information networks around homeownership, and thus serves as a strong predictor of the likelihood of purchasing a home. Exogeneity of our instrument requires that, conditional on observables X_{it}, historical homeownership rates are uncorrelated with the unobserved preferences or wealth that enter our frontier deviation error u_{it}. Certainly, local homeownership rates are correlated with family wealth, but recall that we control for rich demographic characteristics that include most plausible determinants of wealth. Thus, wealth and preferences would have to vary systematically between high- and low-homeownership areas even for similarly-educated individuals whose parents have the same education and occupation in order to pose a threat to identification.[6]

We estimate the homeownership and selection equations jointly by maximum likelihood.[7]

6. We show in Section 5 that the selection correction does not in fact meaningfully affect our deposit predictions, and show that our results are robust to not including selection in Appendix Table 8.

7. We use the sfaselectioncross routine in the R package sfaR (Dakpo, Desjeux, and Latruffe 2025), which

From the estimated model, the predicted frontier for individual i in year t is

$$\widehat{\log(d_{it})} = \hat{\beta}' X_{it}. \tag{3}$$

This deterministic component of the log deposit frontier yields the expected maximum log deposit for an individual with characteristics X_{it}.

We then calculate this predicted frontier for our sample of non-homeowners, including those who do not actually purchase a home, to predict the maximum deposit capacity for each individual in each year. Importantly, our main exercise is a pre-policy counterfactual, which uses pre-policy individuals and housing characteristics.

Since the maximum house price is a nonlinear function of d_{it}, and since the frontier is estimated in logs, evaluating each individual's expected deposit at the point prediction $\exp(\widehat{\log(d_{it})})$ would introduce bias via Jensen's inequality. We therefore draw from the estimated distribution of the symmetric error v_{it} 100 times, adding this residual to our estimated maximum log deposit. Each time, we draw a realisation of a standard-normal random variable $\varepsilon_{it}^{(r)}$ and then simulate a deposit realisation as

$$\tilde{d}_{it}^{(r)} = \exp\left(\widehat{\log(d_{it})} + \hat{\sigma}_v \, \varepsilon_{it}^{(r)}\right), \quad \varepsilon_{it}^{(r)} \overset{\text{iid}}{\sim} N(0,1), \tag{4}$$

where $\hat{\sigma}_v$ is the estimated homoskedastic standard deviation of the symmetric error v_{it}. Each draw represents a plausible realisation of the deposit that individual i could have raised in year t, given their characteristics and the frontier estimated from the pre-policy buyer population. The affordability measures described below are computed for each draw r and averaged across draws.

initialises from a first-stage probit for the selection equation.

4.2 Estimating share of local properties affordable

To measure affordability, we must translate the maximum deposit into a maximum affordable home price. This calculation requires assumptions about the borrowing constraints faced by prospective buyers, which determine the size of the mortgage they can obtain. In England, there are two constraints on the amount a buyer can borrow as a mortgage.

One is the loan-to-value (LTV) constraint, under which the deposit must make up a certain fraction of the total house price. In England, immediately before the introduction of the Help to Buy schemes, the highest LTV mortgages available were around 90 per cent, meaning that buyers needed to provide a cash deposit of at least 10 per cent of the purchase price. Both the Help to Buy equity loan scheme and the mortgage guarantee scheme relaxed this constraint, with buyers effectively only having to put down a deposit of 5 per cent. We therefore assume a pre-policy LTV constraint of 90 per cent and a post-policy LTV constraint of 95 per cent.

The second borrowing constraint is the loan-to-income (LTI) constraint, under which borrowers can only borrow up to a certain multiplier of their gross income. We assume an LTI constraint of 4.5 times gross income through this period, consistent with the Financial Policy Committee's recommendation (Financial Policy Committee 2014). The equity loan scheme meant that borrowers could take out lower mortgages for a given house price: the government-provided 20 per cent loan reduced the maximum required mortgage to 75 per cent of the house price. In consequence, buyers could more easily meet the LTI constraint.

For any given individual, one of these will be the binding constraint, which prevents them from being able to afford a more expensive house. Formally, we model the maximum affordable mortgage for individual i in year t as the minimum of the mortgage implied by the LTV constraint and the mortgage implied by the LTI constraint given the policy in force at the time. The maximum affordable house price pre-HtB is therefore given by

$$p_{it}^{max,pre} = d_{it}^{max} + \min\left(\frac{LTV^{pre-HtB} d_{it}^{max}}{1 - LTV^{pre-HtB}}, LTI \times inc_{it}\right) \tag{5}$$

where d_{it}^{max} is the maximum deposit capacity estimated from the frontier, $LTV^{pre-HtB}$ is the pre-policy loan-to-value ratio (0.9), LTI is the loan-to-income multiplier (4.5), and inc_{it} is the gross benefit-unit income of individual i in year t.

In the post-HtB period, we must distinguish between existing properties and new-builds. The mortgage guarantee scheme applied to both and relaxed only the LTV constraint, while the equity loan scheme applied only to new-builds and, by providing an additional loan, relaxed the LTI constraint. Thus, the maximum existing property price affordable post-HtB is given by

$$p_{it}^{max,post} = \begin{cases} d_{it}^{max} + \min\left(\frac{LTV^{post} d_{it}^{max}}{1-LTV^{post}},\ LTI \times inc_{it}\right) & \text{if } p_{it}^{max,post} \leq 600{,}000 \\ \max(600{,}000,\ p_{it}^{max,pre}) & \text{otherwise} \end{cases} \tag{6}$$

where $LTV^{post-HtB}$ is the post-policy loan-to-value ratio (0.95). Note that our post-policy calculations reflect the HtB eligibility price ceiling of £600,000. The second line captures two cases: (i) for some individuals, the policy may raise their maximum affordable price up to the ceiling; (ii) for others, the pre-policy maximum affordable price may already exceed this ceiling, in which case the maximum price they can afford remains unchanged. The maximum new-build house price affordable post-HtB additionally accounts for the effect of the equity loan scheme on the LTI constraint and is given by

$$p_{it}^{max,post,newbuild} = \begin{cases} \min\left(\frac{d_{it}^{max}}{1-LTV^{post}},\ \frac{d_{it}^{max}+LTI\times inc_{it}}{s}\right) & \text{if } p_{it}^{max,post,newbuild} \leq 600{,}000 \\ \max(600{,}000,\ p_{it}^{max,pre}) & \text{otherwise} \end{cases} \tag{7}$$

where $s = 0.8$ is the buyer's equity share, given that the government provides an equity loan covering 20% of the price. The first term inside the outer minimum is the deposit floor: the buyer must still provide a deposit of at least $(1 - LTV^{post})$ of the total price, regardless of the equity loan. The second term is the price affordable when the buyer can combine their deposit with the maximum mortgage (defined by the LTI constraint) to cover their s share of

the price. Thus, either the deposit or the income-based mortgage capacity may set buyers' maximum affordable price. Note that we account for the HtB price ceiling in an equivalent manner to the existing-property case.

For each observation, we locate the maxima p^{max} pre- and post-policy as well as by property type on the local house price distribution taken from the Land Registry. We compute the empirical cumulative distribution function (CDF) of transaction prices in each LAD-year by ranking all Land Registry sales. For each individual, the CDF rank at their maximum affordable price gives the share of locally-transacted properties they can afford. When computing the increase in affordability under the equity loan scheme, we rank sales separately by new-build and existing properties, calculating the positions $p_{it}^{max,post,newbuild}$ in the new-build distribution and $p_{it}^{max,post}$ in the existing property distribution. We then take the average of the two positions, weighted by the new-build share of total sales. We next analyse the shifts in the distributions of these ranks across different groups in order to understand the affordability implications of HtB.

5 Results

Table 2 reports the maximum likelihood estimates of our stochastic frontier model with sample selection correction, showing both the selection and frontier equations. We present results from our preferred model estimated on the pre-policy sample and including region and household composition variables. We show estimates from specifications excluding these variables in Appendix Table 7 and show estimates from specifications without correction for selection in Appendix Table 8. The results are broadly similar across specifications, and the selection correction turns out not to meaningfully affect our deposit predictions.

In the first-stage probit estimates of the selection equation for homeownership transition (Panel A), we find that the 1991 local authority homeownership rate – our selection instrument – strongly predicts transitions into ownership. In terms of individual characteristics, the

Table 2: Stochastic frontier estimates with sample selection (pre-policy sample, 2009–2012)

	(A) Selection	(B) Frontier
Homeownership rate (1991)	0.484*** (0.184)	
Age 20–29 (ref.)		
Age 30–39	-0.008 (0.047)	0.538*** (0.106)
Age 40–49	-0.068 (0.065)	0.346** (0.154)
Parents: low/not working (ref.)		
Parents: missing occupation	-0.079 (0.174)	0.266 (0.322)
Parents: mid/high occupation	0.219*** (0.054)	-0.112 (0.222)
Parents: no degree (ref.)		
Parents: missing education	0.020 (0.060)	-0.023 (0.126)
Parents: degree	0.062 (0.053)	0.237** (0.119)
FY 2009/10 (ref.)		
FY 2010/11	0.073 (0.055)	-0.032 (0.125)
FY 2011/12	0.141** (0.056)	-0.025 (0.163)
FY 2012/13	0.069 (0.179)	-0.134 (0.508)
Male (ref.)		
Female	-0.042 (0.042)	0.074 (0.093)
No degree (ref.)		
Degree	0.531*** (0.045)	0.208 (0.446)
North (ref.)		
Midlands/East	0.021 (0.056)	-0.006 (0.127)
London	-0.203*** (0.066)	0.547** (0.226)
Rest of South	0.089 (0.059)	0.345** (0.161)
No child in household (ref.)		
Child in household	-0.247*** (0.048)	-0.074 (0.221)
No partner (ref.)		
Has partner	0.580*** (0.050)	0.072 (0.490)
Constant	-2.841*** (0.147)	10.403*** (2.689)
Panel C: Variance parameters		
$\ln \sigma_u^2$		
Constant	-0.234 (0.465)	
$\ln \sigma_v^2$		
Constant	-0.456 (0.403)	
Selection correction (ρ)		
rho	0.180 (1.171)	
N (non-homeowners)	16,497	
N (buyers)	525	
Log-likelihood	-2302.0	

Notes: Maximum likelihood estimates of the stochastic frontier model with sample selection correction, estimated on non-homeowners observed in the pre-policy period (financial years 2009–10 to 2012–13). $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

strongest predictors of transition are having parents working a mid/high-skill job, being degree-educated, having a partner, and (not) having a child in the household or living in London. In the frontier equation (Panel B), age and parental education most strongly predict deposit capacity. Conditional on other characteristics, individuals in London and the South of England can afford larger deposits. More striking is the fact that individuals' own degree status and whether they live with a partner or children, even in our large sample, do *not* significantly affect their maximum affordable deposits. Our estimates thus underscore the extent to which predetermined characteristics – age or parental background, as opposed to individuals' own education or family structure – almost completely determine their ability to afford the deposit to purchase a home in England.

Figure 5 shows the distribution of the maximum affordable house prices implied by this model across our sample, comparing pre-policy, post-policy without the equity loan, and post-policy with the equity loan. The mortgage guarantee scheme, as shown, has a very limited impact on maximum affordable house prices. Since the mortgage guarantee affects only the LTV constraint, we can conclude that the LTI rather than the LTV constraint binds for most non-homeowners. As a result, the relaxation of the LTV constraint has little effect on maximum affordable prices. The equity loan scheme, in contrast, has a substantial impact on the maximum house price affordable for a large share of non-homeowners, shifting the distribution of maximum affordable prices upwards.

This large shift in the distribution of maximum affordable house prices under the equity loan scheme, however, will only translate into a large increase in the share of properties affordable if local markets supply sufficient numbers of the new-builds eligible for this component of the scheme. Figure 6 shows the distribution of the share of local properties affordable pre- and post-HtB. As shown, the increase in affordability under the equity loan scheme is more muted when measured in terms of share of properties affordable, reflecting the limited supply of new-builds in many areas.

Next, we investigate whether these simulated affordability measures are actually associated

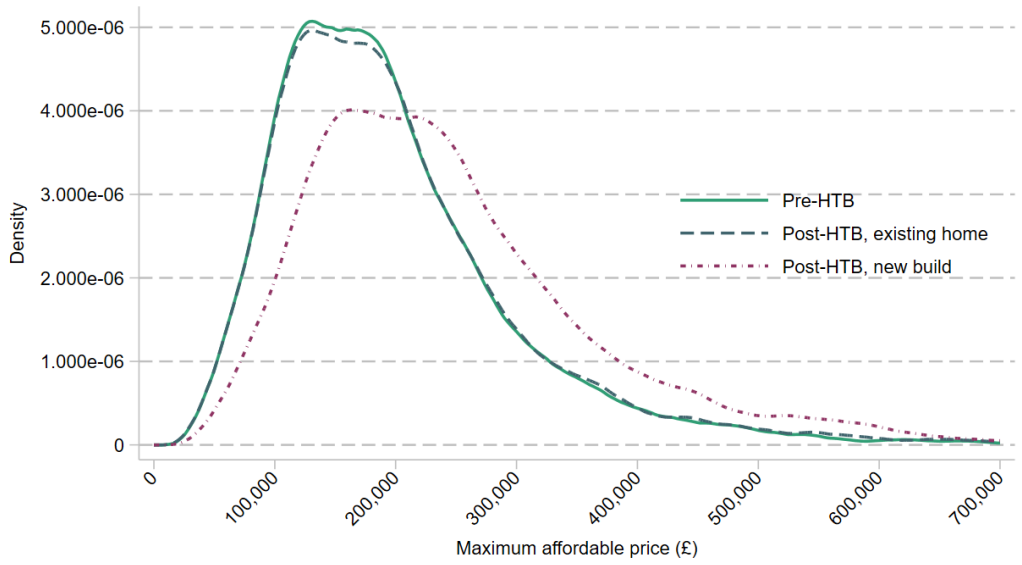


Figure 5: Distribution of maximum affordable house price, pre- and post-Help to Buy, 2011–12

Notes: Kernel density estimates, weighted by cross-sectional respondent weights. Sample: non-homeowners aged 22–44 in England, financial year 2011–12.

with higher rates of homeownership. Figure 7 shows, among non-homeowners observed in 2009–10 or 2010–11, the share who transitioned into homeownership within two years, by decile of their share of locally affordable properties pre-HtB. The relationship is strongly positive: non-homeowners who could already afford a larger fraction of their local market were substantially more likely to buy within two years. Our affordability thus appears to capture meaningful variation in buying capacity.

We can then examine how the simulated affordability shifts we calculate under the 'Help to Buy' policies vary across different groups. Figures 8 and 9 show the change in maximum affordable price under the mortgage guarantee and equity loan schemes, broken down by parental background, own education, age group, income quintile, and region. The mortgage guarantee scheme makes very little difference across the board, apart from among those with the highest incomes – consistent with our interpretation that the LTI constraint, unaffected by the mortgage guarantee, typically binds. The equity loan scheme pushes up maximum

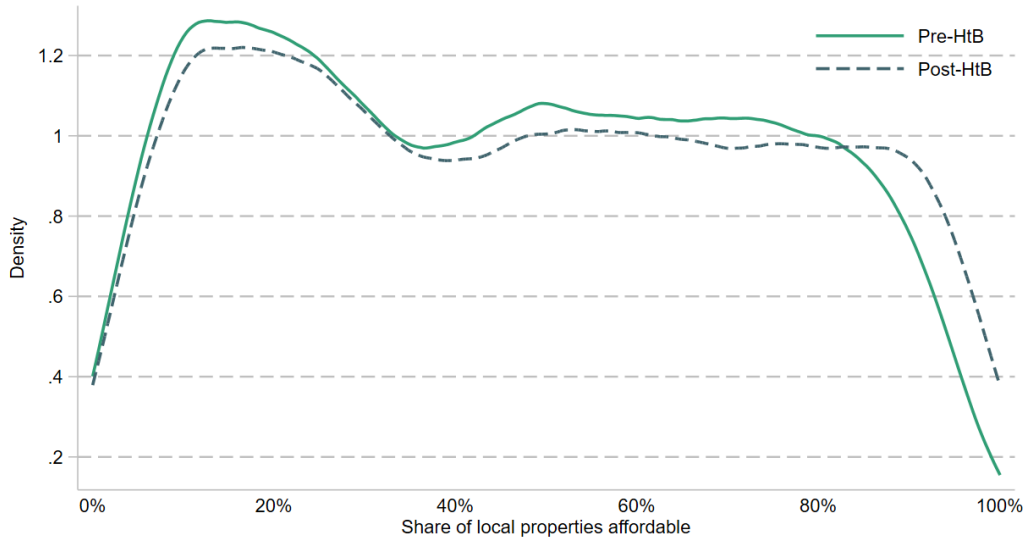


Figure 6: Distribution of share of local properties affordable, pre- and post-Help to Buy, 2011–12

Notes: As Figure 5.

affordable prices most among those living in London, those with the highest incomes, and those at older ages – all groups who could already afford higher prices pre-policy. Based on raw prices, HtB thus appears to have only exacerbated inequalities in housing affordability.

To capture realized housing affordability, we must adjust these changes in raw prices for local housing market conditions. To do so, Figures 10 and 11 show the pre-policy share of local properties affordable and then the mean change in the share of local properties affordable, broken down by the same set of characteristics. Here we take both the mortgage guarantee scheme - which affects the share of existing properties affordable - and the equity loan scheme - which affects the share of new-builds affordable - into account. Relative to our prior analysis of maximum affordable prices, different patterns emerge. The highest-income individuals continue to see the largest changes in the share of properties affordable under Help to Buy schemes, but residents of London and the South East see *smaller* changes in the share of properties they can afford.

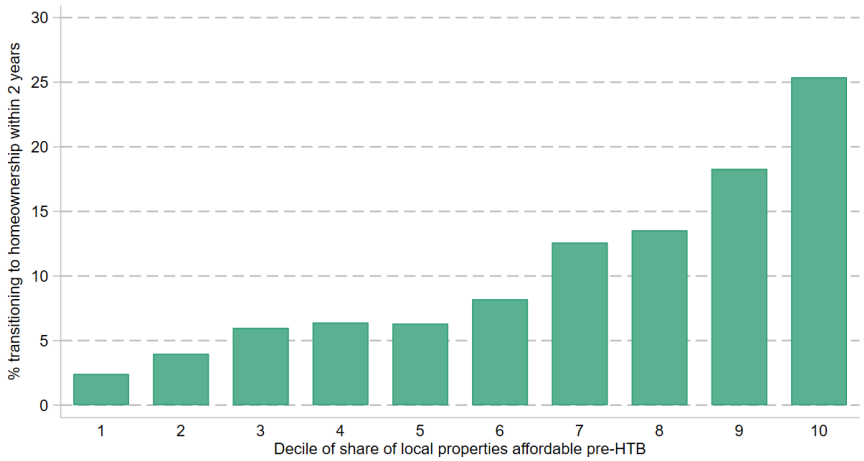


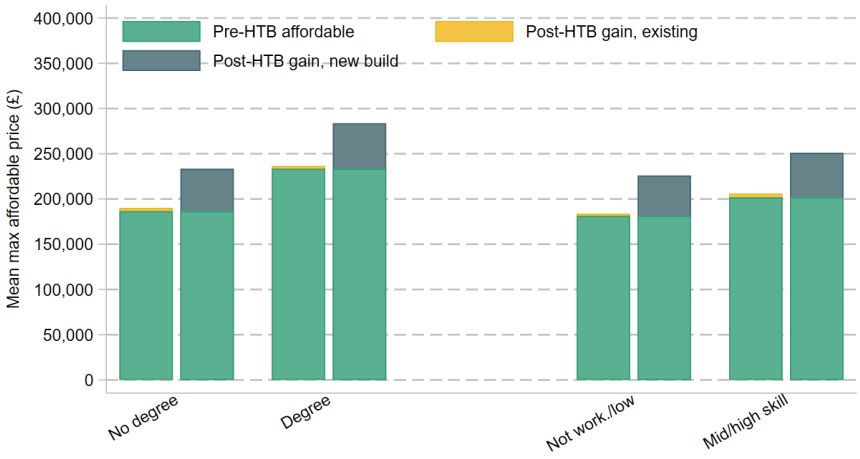
Figure 7: Pre-policy share of local properties affordable and homeownership transitions

Notes: Weighted means (cross-sectional respondent weights). Sample restricted to non-homeowners aged 22–44 resident in England, observed in financial years 2009–10 or 2010–11, with two subsequent survey waves available.

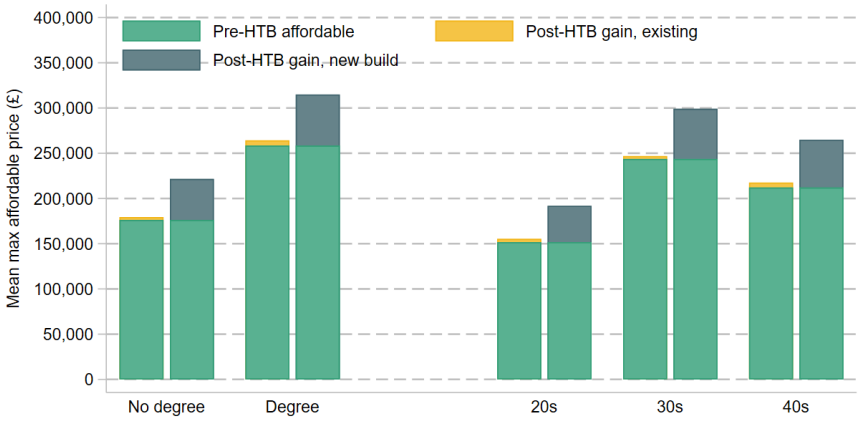
A complex interaction of factors drives differences between maximum affordable prices and local shares affordable. For example, older individuals may have higher deposit capacity, but they may also tend to live in higher-price areas where the share of new-builds is lower, muting the affordability gains from the equity loan scheme. We now run regressions in order to control for all observable characteristics at once and understand which factors drive pre-policy affordability and the ensuing shifts under the HtB schemes.

Tables 3 and 4 present OLS regressions of pre-policy affordability, measured using either the share of local properties affordable or the maximum affordable price, as well as HtB-induced affordability shifts, on individual characteristics. Column 1 of Table 3 shows that age, income and region most strongly correlate with the share of local properties affordable pre-policy. The highest income quintile, compared to the bottom quintile, has a 55 percentage-point higher share of local properties affordable, while living in London, compared to the North East, is associated with a 32 percentage-point lower share affordable.

Column 2 of Table 3 shows that very similar factors matter for the maximum affordable price: the highest income quintile, compared to the bottom quintile, has a £211,000 higher



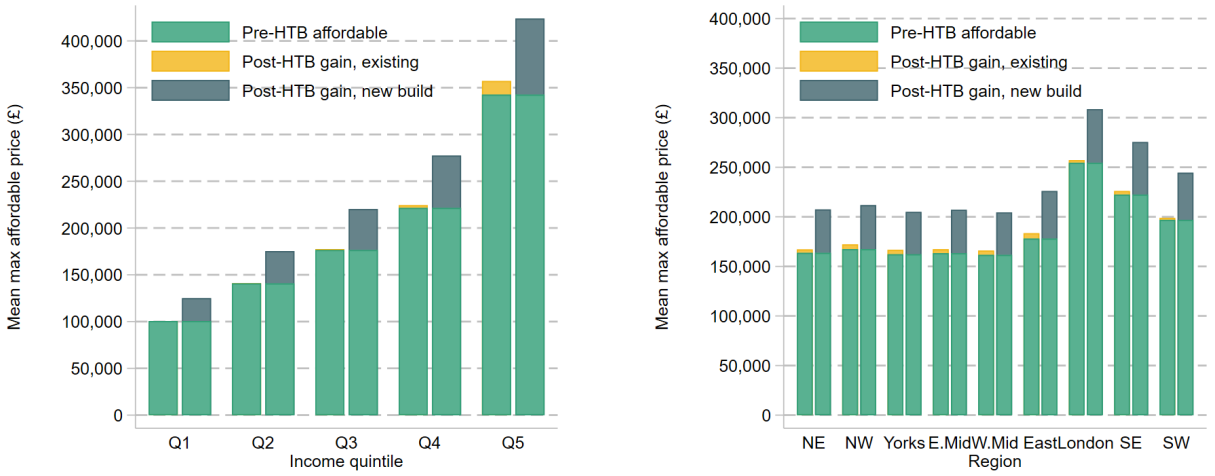
(a) Parental education and occupation



(b) Own education and age group

Figure 8: Maximum house price affordable before and after Help to Buy, by social background, education, and age

Notes: Weighted means (cross-sectional respondent weights). Sample: non-homeowners aged 22–44 in England, financial year 2011–12. Stacked bars: solid portion shows the mean maximum affordable price under pre-HtB borrowing conditions; lighter portion shows the mean increase under Help to Buy. Left bar: existing-home shift (higher LTV only, 90%→95%). Right bar: new-build shift (equity loan, government provides 20% of purchase price). Maximum price subject to £600,000 cap and 4.5× LTI constraint. Missing/unknown parental background categories excluded.



(a) Income quintile

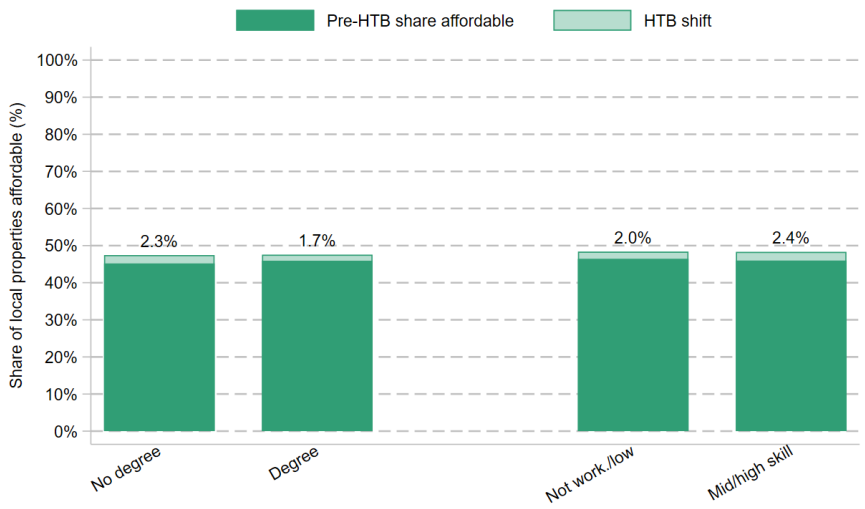
(b) Region

Figure 9: Maximum house price affordable before and after Help to Buy, by income and region

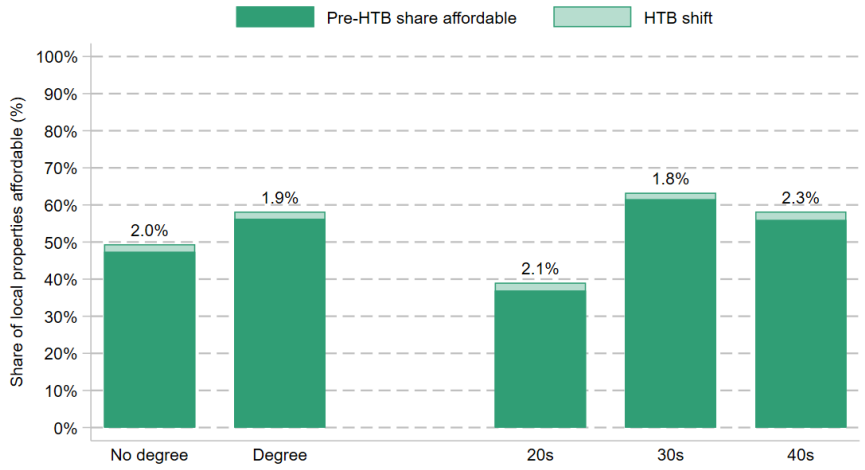
Notes: As Figure 8.

maximum affordable price; age, education, and parental background are also important. There are strong effects of region, but in the opposite direction as in Column 1: living in London is associated with a £58,000 *higher* maximum affordable price, but is associated with a *lower* share of local properties affordable. Evidently, high prices in London more than counterbalance local non-homeowners' higher deposit capacities and maximum affordable absolute prices, such that they can still only afford a smaller share of the local market.

Table 4 shows that income also strongly predicts the size of the *shift* in affordability under HtB. Higher-income non-homeowners saw larger increases in the maximum affordable price and in the share of local properties affordable under the policy. Non-homeowners in London and the South East, compared to the North East, see larger increases in the maximum affordable price but lower increases in the share of local properties affordable, exacerbating pre-existing differences in affordability. Here again, the policy's absolute price boost translates into a smaller additional share of the local market in higher-price areas. The size of the shift also varies substantially by age, with those in their 30s and 40s seeing



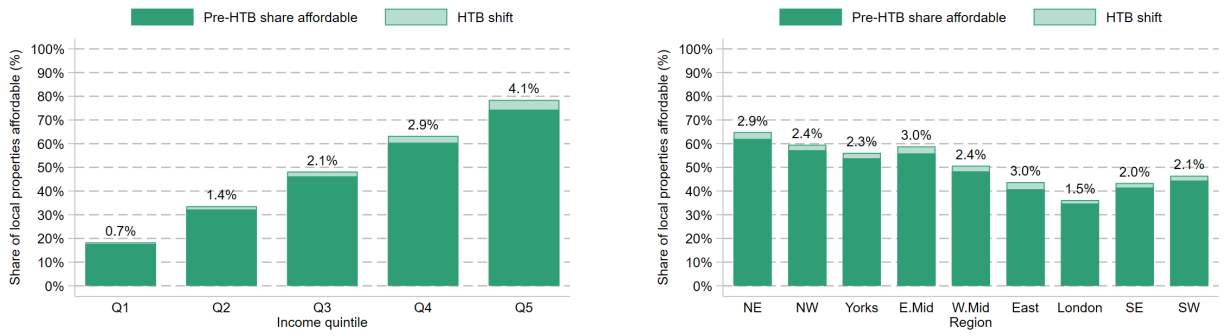
(a) Parental education and occupation



(b) Own education and age group

Figure 10: Share of local properties affordable before and after Help to Buy, by social background, education, and age

Notes: Weighted means (cross-sectional respondent weights). Sample: non-homeowners aged 22–44 in England. Stacked bars: solid portion shows the mean share of local properties affordable before Help to Buy; lighter portion shows the additional share affordable post-policy (the CDF shift). Labels show the mean HtB shift in percentage points.



(a) Income quintile

(b) Region

Figure 11: Share of local properties affordable before and after Help to Buy, by income and region

Notes: As Figure 10.

the largest increase in maximum affordable price but the smallest increase in share of local properties affordable, due to their higher starting point in the distribution.

This regression analysis controls for each factor separately but cannot easily capture interactions between channels or quantify their relative contributions to overall inequality in affordability gains. We therefore complement it with a variance decomposition that isolates three channels through which individuals differ in their simulated affordability: (i) *deposit capacity*, driven by differences in observable characteristics (age, education, parental background) that enter the frontier prediction of log deposits; (ii) *income*, which determines the level of the loan-to-income cap on mortgage borrowing; and (iii) *local housing market conditions*, which determine both the price distribution against which affordability is measured and the share of new-build properties eligible for the equity loan.

To separate these channels, we construct counterfactual scenarios that hold one or more channels constant while allowing others to vary at their actual values. When a channel is 'fixed,' all individuals are assigned the (weighted) sample mean of the relevant variable: for deposit capacity, the mean predicted log deposit; for the LTI constraint, mean income, for area, the national distribution of house prices and characteristics. When a channel 'varies,'

Table 3: Pre-policy affordability levels: non-homeowners, 2011–2012

	(1) Share affordable (%)	(2) Max affordable price (£)
Parents: no degree (ref.)		
Parents: degree	3.927*** (0.574)	25,467*** (1,994)
Parents: not working/low skill (ref.)		
Parents: mid/high skill	-3.906*** (0.432)	-7,384*** (1,003)
No degree (ref.)		
Degree	2.992*** (0.560)	33,883*** (1,905)
Male (ref.)		
Female	0.977*** (0.342)	5,105*** (900)
20s (ref.)		
30s	12.879*** (0.481)	51,374*** (1,657)
40s	8.409*** (0.478)	32,817*** (1,796)
Region		
North East (ref.)		
North West	-3.860 (2.452)	4,014** (1,809)
Yorks & Humber	-5.204* (2.650)	5,250** (2,364)
East Midlands	-6.390** (2.921)	-250 (2,144)
West Midlands	-12.079*** (2.721)	-1,288 (2,365)
East of England	-24.192*** (2.482)	1,272 (2,239)
London	-33.066*** (2.732)	57,619*** (2,759)
South East	-25.895*** (2.399)	32,032*** (2,315)
South West	-18.131*** (2.283)	28,709*** (2,094)
Household income quintile		
Q1 (ref.)		
Q2	13.699*** (0.870)	40,772*** (919)
Q3	26.978*** (1.086)	69,426*** (1,076)
Q4	41.499*** (1.081)	108,412*** (1,086)
Q5	55.787*** (0.915)	211,317*** (3,395)
Observations	7,222	7,222

Notes: OLS estimates, weighted by cross-sectional survey weights. Standard errors (clustered by LAD) in gray. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 4: HtB affordability shifts: non-homeowners, 2011–2012

	(1) Shift in share affordable (pp)	(2) Price shift, new build (£)
Parents: no degree (ref.)		
Parents: degree	-0.593*** (0.066)	810* (429)
Parents: not working/low skill (ref.)		
Parents: mid/high skill	0.229*** (0.051)	-460 (282)
No degree (ref.)		
Degree	-0.346*** (0.073)	1,949*** (428)
Male (ref.)		
Female	-0.138*** (0.041)	204 (232)
20s (ref.)		
30s	-1.178*** (0.071)	4,927*** (322)
40s	-0.537*** (0.080)	4,508*** (428)
Region		
North East (ref.)		
North West	-0.505*** (0.166)	1,005* (585)
Yorks & Humber	-0.462*** (0.165)	991 (678)
East Midlands	0.004 (0.264)	-219 (666)
West Midlands	-0.475*** (0.162)	-263 (708)
East of England	-0.147 (0.193)	1,120 (706)
London	-1.521*** (0.211)	4,757*** (628)
South East	-1.271*** (0.184)	3,695*** (611)
South West	-0.862*** (0.162)	3,205*** (602)
Household income quintile		
Q1 (ref.)		
Q2	0.690*** (0.066)	9,943*** (228)
Q3	1.478*** (0.078)	18,578*** (241)
Q4	2.426*** (0.103)	30,108*** (302)
Q5	4.004*** (0.145)	54,166*** (925)
Observations	7,222	7,222

Notes: OLS estimates, weighted by cross-sectional survey weights. Standard errors (clustered by LAD) in gray. Shifts measured as post-HTB minus pre-HTB position in the local price distribution. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

each individual retains their own value. We compute all combinations of the three channels, from 'all fixed' (no heterogeneity across any channel) to 'all vary' (the fully heterogeneous baseline). For each scenario, we re-run the full affordability calculation, simulating deposits over 100 Monte Carlo draws from the estimated noise distribution, computing maximum affordable prices under pre- and post-HtB mortgage rules, and evaluating CDF ranks against the relevant price distribution.

This decomposition produces the cross-sectional variance of average simulated outcomes (averaged over draws) under each scenario, expressed as a percentage of the variance under the fully heterogeneous baseline. If a channel is an important source of heterogeneity, allowing it to vary should substantially increase the variance relative to the 'all fixed' benchmark. Because the channels can interact – for instance, the effect of a higher deposit on the share of affordable properties depends on local prices – the single-channel shares need not sum to 100%, and two-way combinations can exceed or fall short of the sum of their parts.

Figure 12 applies this decomposition to pre-policy affordability *levels* – the share of local properties affordable before Help to Buy. As shown, income and area account for most of the inequality in pre-policy affordability, while differences in deposit capacity across individuals play a smaller role. The importance of area reflects the fact that local price distributions differ substantially across the country, so non-homeowners in higher-price areas have lower shares of local properties affordable even if they have higher deposit capacity. Area also determines the share of new-builds available, an important factor in translating the equity loan increase in maximum price affordable into genuine shifts in affordability. The importance of income reflects the fact that the loan-to-income constraint is binding for many non-homeowners, so that differences in income translate directly into differences in maximum affordable price and share of properties affordable. The effect of characteristics and area together is lower than the effect of area alone, suggesting that the two channels partially offset one another.

Figure 13 applies the same decomposition to Help to Buy affordability *gains*. Here again, income and area are the dominant drivers of cross-sectional heterogeneity in simulated gains,

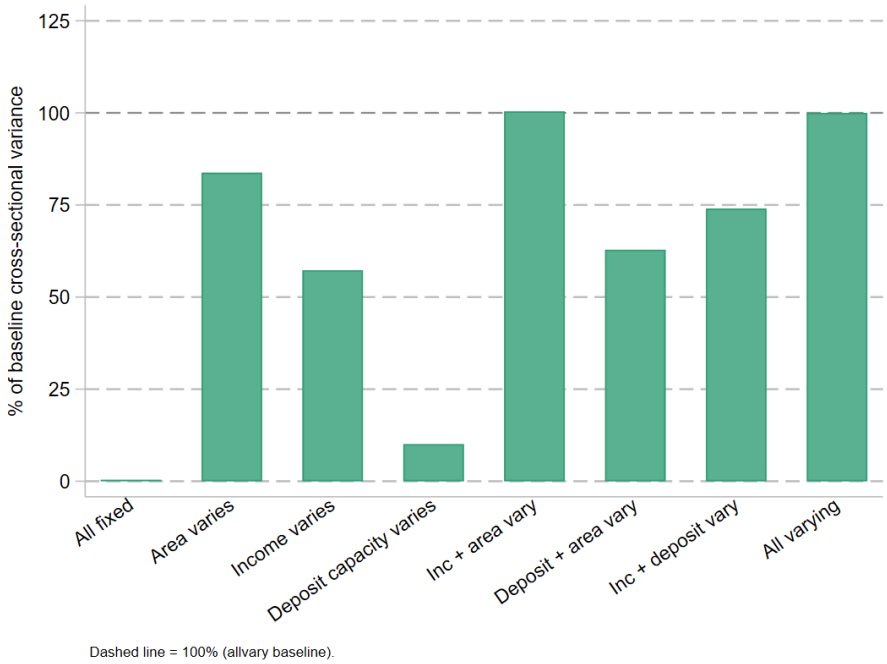


Figure 12: Variance decomposition of pre-policy affordability levels, 2011–12

Notes: Each bar shows the cross-sectional variance of mean simulated pre-HtB CDF rank (share of local properties affordable before Help to Buy) under a given counterfactual scenario, expressed as a percentage of the variance under the fully heterogeneous baseline ('All vary'). Scenarios fix subsets of the three channels at their sample means: 'All fixed' fixes all three; 'Area varies,' 'Income varies,' and 'Deposit capacity varies' allow one channel to vary; remaining bars allow two-way combinations. Means and variances are weighted by cross-sectional respondent weights. Estimates are averaged over 100 Monte Carlo draws.

while variation in characteristics plays a smaller role in explaining differences in gains.

6 Conclusion

This paper proposes a new approach to evaluating how homeownership assistance policies such as England's Help to Buy change individuals' opportunity sets in the housing market. We estimate a stochastic frontier model of deposit capacity and then simulate how the relaxation of borrowing constraints under Help to Buy translated into changes in individuals' maximum affordable house prices and the share of properties they can afford in their local area. Our framework has the potential to help policymakers compare the likely distributional effects of different housing policies.

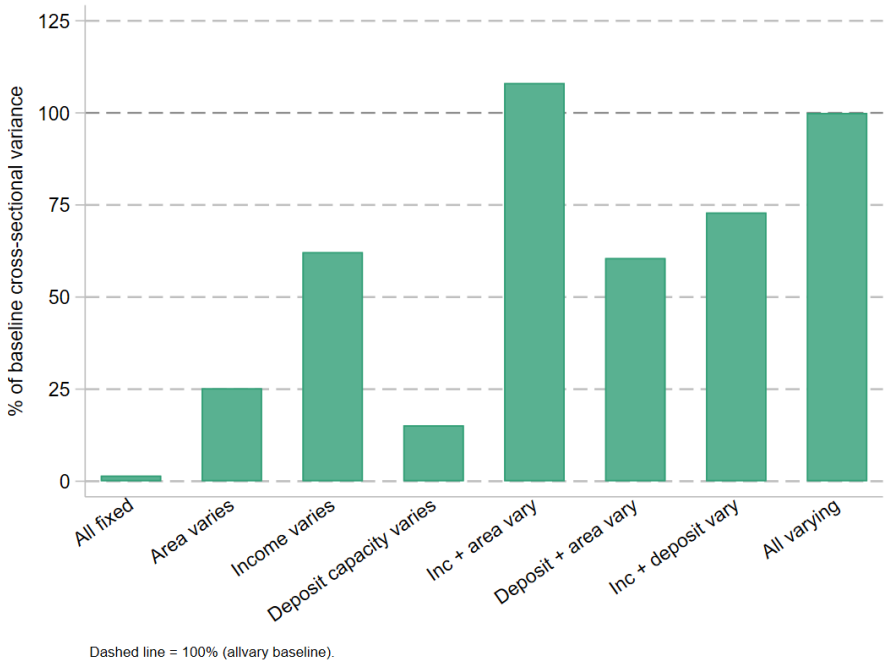


Figure 13: Variance decomposition of Help to Buy affordability gains, 2011–12

Notes: As Figure 12, but for the cross-sectional variance in simulated CDF shifts (percentage-point change in the share of local properties affordable under Help to Buy) rather than the variance in pre-policy levels.

We find that affordability gains implied by the relaxation of borrowing constraints under the Help to Buy schemes varied substantially, both across the policies themselves and across individuals. The mortgage guarantee scheme, which relaxed the loan-to-value constraint, had very little impact on affordability for most non-homeowners because the loan-to-income constraint was more binding. The equity loan scheme, which effectively relaxed both the loan-to-value and loan-to-income constraints for new-build purchases, had a much larger impact on maximum affordable prices.

Income and region of residence most strongly drove differences in affordability gains under Help to Buy. Higher-income non-homeowners saw larger increases in the maximum affordable price and in the share of local properties affordable. Large inequalities emerge by region, with non-homeowners in London and the South East seeing larger increases in the maximum affordable price but smaller increases in the share of local properties affordable, reflecting the fact that the policy's absolute price boost translated into a smaller share of the local market

in higher-price areas. In contrast, differences in deposit capacity across individuals played a smaller role in driving differences in affordability gains.

Importantly, our exercise is a pre-policy exercise: future work could examine the causal impact of the policy on homeownership rates and homeowners' characteristics, or take into account any changes in housing characteristics in response to the policy (e.g. rising prices, increasing housing construction).

References

Bell, Brian, Jack Blundell, and Stephen Machin. 2023. "Where is the Land of Hope and Glory? The Geography of Intergenerational Mobility in England and Wales." *The Scandinavian Journal of Economics* 125 (1): 73–106.

Benetton, Matteo, Philippe Bracke, João F. Cocco, and Nicola Garbarino. 2022. "Housing Consumption and Investment: Evidence from Shared Equity Mortgages." *Review of Financial Studies* 35 (8): 3525–3573.

Blanden, Jo, Andrew Eyles, and Stephen Machin. 2023. "Intergenerational Home Ownership." *Journal of Economic Inequality* 21 (2): 251–275.

Boileau, Bee, and David Sturrock. 2023. *Help onto the Housing Ladder: The Role of Intergenerational Transfers.* IFS Report R289. Institute for Fiscal Studies.

———. 2025. "Which life events are associated with giving and receiving inter-vivos wealth transfers?" *Review of Economics of the Household.*

Carozzi, Felipe, Christian A. L. Hilber, and Xiaolun Yu. 2024. "On the Economic Impacts of Mortgage Credit Expansion Policies: Evidence from Help to Buy." *Journal of Urban Economics* 139:103611.

Coulter, Rory. 2017. "Local House Prices, Parental Background and Young Adults' Homeownership in England and Wales." *Urban Studies* 54 (14): 3360–3379.

Cribb, Jonathan. 2024. "Homeownership for young adults has recovered to its 2010 level." Institute for Fiscal Studies, May 29, 2024. Accessed March 16, 2026. https://doi.org/10.1920/co.ifs.2024.0023. https://ifs.org.uk/articles/homeownership-young-adults-has-recovered-its-2010-level.

Dakpo, K. Hervé, Yann Desjeux, and Laëtitia Latruffe. 2025. *sfaR: Stochastic Frontier Analysis Using R.* https://CRAN.R-project.org/package=sfaR.

Department for Communities and Local Government. 2017. *Help to Buy: Mortgage Guarantee Scheme Quarterly Statistics, October 2013 to 30 June 2017.* Technical report. Department for Communities and Local Government. https://www.gov.uk/government/statistics/help-to-buy-mortgage-guarantee-scheme-quarterly-statistics-october-2013-to-30-june-2017.

Department for Levelling Up, Housing and Communities. 2022. *Help to Buy (Equity Loan Scheme): Data to 30 September 2021.* Official Statistics, UK Government, February. https://www.gov.uk/government/statistics/help-to-buy-equity-loan-scheme-data-to-30-september-2021.

———. 2023a. *English Housing Survey 2022–23: Headline Report.* Technical report. Department for Levelling Up, Housing and Communities. https://www.gov.uk/government/statistics/english-housing-survey-2022-to-2023-headline-report.

———. 2023b. *Help to Buy: Equity Loan Scheme Statistics, April 2013 to March 2023.* Technical report. Department for Levelling Up, Housing and Communities. https://www.gov.uk/government/collections/help-to-buy-equity-loan-statistics.

Financial Policy Committee. 2014. *Financial Stability Report, June 2014.* Technical report. Bank of England, June. https://www.bankofengland.co.uk/financial-stability-report/2014/june-2014.

Greene, William. 2010. "A Stochastic Frontier Model with Correction for Sample Selection." *Journal of Productivity Analysis* 34 (1): 15–24.

Gregg, Paul, and Ricky Kanabar. 2023. *Parental Homeownership and Education: The Implications for Offspring Wealth Inequality in GB.* CEPEO Working Paper 22-01. Centre for Education Policy and Equalising Opportunities.

Harkness, Susan, and Selçuk Bedük. 2024. "What Explains Intergenerational Associations in Home Ownership and Value in the UK? Investigating the Transmission Mechanisms." *Research in Social Stratification and Mobility* 92:100951.

HM Treasury. 2016. *Help to Buy: Mortgage Guarantee Scheme – Closure.* Technical report. HM Treasury. https://www.gov.uk/government/news/mortgage-guarantee-scheme-to-close-at-end-of-2016.

Lee, Hyojung, Dowell Myers, Gary Painter, Johanna Thunell, and Julie M. Zissimopoulos. 2020. "The role of parental financial assistance in the transition to homeownership by young adults." *Journal of Housing Economics* 47.

Madaleno, Mara, and Victor Moutinho. 2023. "Stochastic Frontier Analysis: A Review and Synthesis." In *Advanced Mathematical Methods for Economic Efficiency Analysis,* 692:55–78. Lecture Notes in Economics and Mathematical Systems. Springer.

Ministry of Housing, Communities and Local Government. 2023. *Number of mortgages to first time buyers in England.* Technical report. Ministry of Housing, Communities and Local Government. https://opendatacommunities.org/data/housing-market/mortgages/quarterly-total.

Qiu, Leiju, Yong Tu, and Daxuan Zhao. 2020. "Information Asymmetry and Anchoring in the Housing Market: A Stochastic Frontier Approach." *Journal of Housing and the Built Environment* 35:573–591.

Samaha, Stephen A., and Wagner A. Kamakura. 2008. "Assessing the Market Value of Real Estate Property with a Geographically Weighted Stochastic Frontier Model." *Real Estate Economics* 36 (4): 717–751.

Sturrock, David, and Peter Levell. 2026. "How do house prices affect social mobility."

Suh, Ellie. 2020. "Young British Adults' Homeownership Circumstances and the Role of Intergenerational Transfers." *Longitudinal and Life Course Studies* 11 (3): 383–407.

Tracey, Belinda, and Neeltje van Horen. 2021. *The Consumption Response to Borrowing Constraints in the Mortgage Market.* Staff Working Paper 919. Bank of England.

———. 2026. *Credit Constraints and the Redistribution of Housing Wealth.* Discussion Paper 20997. Centre for Economic Policy Research.

Wang, Selina, and Gabriella Abdul-Hakim. 2024. "Harris to Propose up to $25K in Down-Payment Support for 1st-Time Homebuyers." ABC News, August 15, 2024. Accessed March 12, 2026. https://abcnews.com/Politics/harris-propose-25k-payment-support-1st-time-homeowners/story?id=112877568.

A Measuring homeownership

Homeownership can be measured in different ways in survey data, and the choice of definition can have important implications for the analysis. In our main specification, we use an individual-level measure of homeownership based on the survey's person-level ownership identifiers. This allows us to classify individuals as homeowners only if they are listed as owning the accommodation, which is particularly important for our analysis of young adults who may live in owner-occupied dwellings without being owners themselves (e.g. living with parents or a partner who owns the property). Alternatives are a benefit-unit level measure, which classifies all adults living in an owner-occupied dwelling as homeowners except for those living with their parents, and a household-level measure, which classifies all members of owner-occupied households as homeowners. The household-level measure is commonly used in the literature but may overstate homeownership rates among young adults, while the benefit-unit level measure may be more accurate but relies on assumptions about who is likely to be the owner within a household.

Figure 14 plots weighted homeownership rates under these different definitions of homeownership for our analysis sample (respondents aged 22–44 resident in England). The household-level measure is substantially higher than the other two measures, reflecting the large share of young adults living in parental homes, and does not show the decline over time implied by the other two measures. The benefit-unit and individual-level measures are closer together, but there is a consistent gap between them. The individual-level measure is our preferred definition for the main analysis, as it is more conservative and less likely to misclassify non-owners as owners.

As a robustness check, we re-estimate our main selection-corrected stochastic frontier specification using the benefit-unit level definition to define homeownership transitions. Table 5 reports the estimates. The frontier coefficients are qualitatively similar to those in our baseline specification (Table 2). The BU definition classifies fewer individuals as non-homeowners, because some who are non-owners at the individual level (e.g. those whose partner owns the

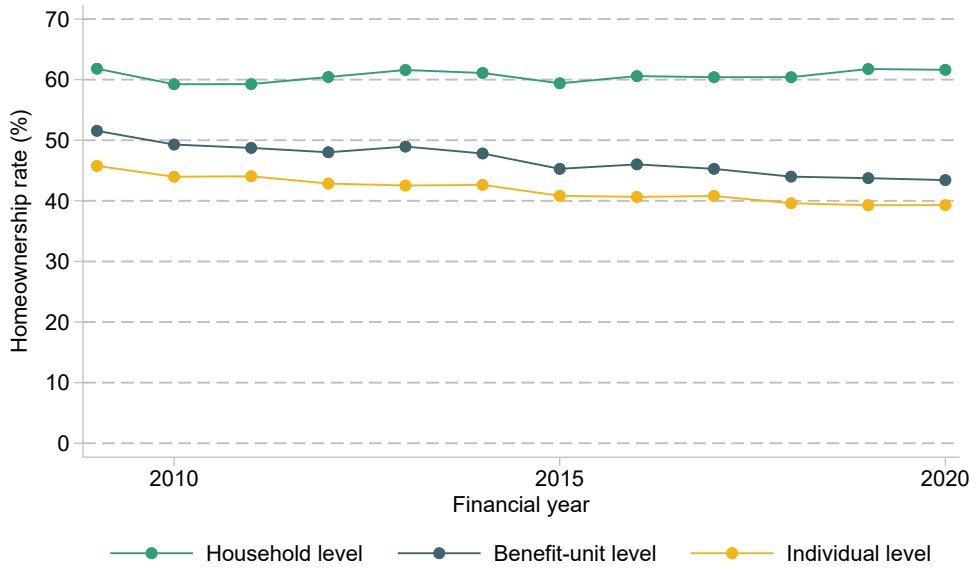


Figure 14: Homeownership rates by definition, analysis sample (England, aged 22–44)

Notes: Weighted means (cross-sectional respondent weights). Sample: all respondents aged 22–44 resident in England, Understanding Society waves 1–13 (financial years 2009–10 to 2020–21). Household-level: all members of owner-occupied households classified as homeowners. Benefit-unit level: as household level, but adults aged 22–59 living with parents reclassified as non-homeowners. Individual level: only persons listed as owning the accommodation.

property) are classified as homeowners at the benefit-unit level; the estimation sample falls from 16,497 to 14,883 non-homeowners, with 438 buyers rather than 525. This compositional shift — dropping relatively better-off partnered non-owners — lowers the mean pre-policy affordability level (38% vs. 46% in the baseline) and produces a somewhat larger mean CDF shift (2.8 pp vs. 2.3 pp), as the remaining non-homeowners start from a lower base and have more room to gain from the policy.

B Alternative frontier specifications

Table 6 summarises the key output across all robustness specifications – including the benefit-unit homeownership definition discussed in Section A above – reporting the sample size, the mean pre-policy affordability level (share of local properties affordable before HtB), and the mean CDF shift (the average increase in this share under HtB). The specifications vary in their predicted affordability levels and shifts, reflecting differences in how each model maps observed characteristics to deposit capacity. We discuss each in turn.

Omitting region covariates. Table 7 presents estimates from a parsimonious specification of the selection-corrected frontier using only the base covariates (age group, parental background, financial year, sex, and education), without region or household composition variables. The frontier coefficients are broadly similar to the baseline (Table 2), but the variance parameters differ meaningfully: the estimated noise variance is substantially larger ($\ln \hat{\sigma}_v^2 = -0.03$ vs. -0.46 in the baseline), and the selection correlation is stronger ($\hat{\rho} = 0.57$ vs. 0.18). Without region dummies, geographic variation in deposits is absorbed into the symmetric error v_i and the selection correction, inflating both. This has a large effect on the simulated affordability measures: the mean pre-policy level is much lower (27% vs. 46%), because the frontier intercept is lower and the wider noise distribution generates many low draws, and the mean CDF shift is much larger (5.6 pp vs. 2.3 pp), because the wider right tail of the deposit distribution pushes some individuals far up the local price CDF under

Table 5: Stochastic frontier estimates: benefit-unit-level homeownership definition

	(A) Selection	(B) Frontier
Homeownership rate (1991)	0.426** (0.196)	
Age 20–29 (ref.)		
Age 30–39	-0.046 (0.050)	0.273** (0.119)
Age 40–49	-0.227*** (0.077)	0.141 (0.304)
Parents: low/not working (ref.)		
Parents: missing occupation	-0.121 (0.195)	-0.381 (0.535)
Parents: mid/high occupation	0.204*** (0.057)	-0.164 (0.242)
Parents: no degree (ref.)		
Parents: missing education	0.019 (0.069)	0.049 (0.149)
Parents: degree	0.113** (0.057)	0.306* (0.156)
FY 2009/10 (ref.)		
FY 2010/11	0.072 (0.059)	-0.024 (0.137)
FY 2011/12	0.103* (0.060)	0.044 (0.170)
FY 2012/13	0.147 (0.187)	0.012 (0.478)
Male (ref.)		
Female	0.036 (0.045)	0.034 (0.101)
No degree (ref.)		
Degree	0.495*** (0.049)	0.357 (0.514)
North (ref.)		
Midlands/East	-0.048 (0.061)	0.186 (0.135)
London	-0.233*** (0.071)	0.647** (0.319)
Rest of South	0.062 (0.063)	0.476*** (0.152)
No child in household (ref.)		
Child in household	-0.302*** (0.053)	-0.035 (0.318)
No partner (ref.)		
Has partner	0.531*** (0.052)	0.093 (0.548)
Constant	-2.697*** (0.157)	10.124*** (3.218)
Panel C: Variance parameters		
$\ln \sigma_u^2$		
Constant	-0.417 (0.443)	
$\ln \sigma_v^2$		
Constant	-0.463 (0.489)	
Selection correction (ρ)		
rho	0.191 (1.470)	
N (non-homeowners)	14,883	
N (buyers)	438	
Log-likelihood	-1938.7	

Notes: Maximum likelihood estimates of the stochastic frontier model with sample selection correction, using benefit-unit-level homeownership to define transitions. Under this definition, adults aged 22–59 living with their parents are classified as non-homeowners regardless of household tenure. Region and household composition covariates included. Estimated on the pre-policy sample (financial years 2009–10 to 2012–13). $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 6: Summary of robustness specifications

Specification	N (non-owners)	N (buyers)	Pre-policy level (%)	CDF shift (pp)
Baseline (selection + region)	16,497	525	45.70	2.26
No region covariates	16,497	525	26.52	5.57
No selection correction	16,497	525	51.48	1.85
BU homeownership definition	14,883	438	38.40	2.77

Notes: Pre-policy level is the weighted mean share of local properties affordable before Help to Buy (%). CDF shift is the weighted mean increase in this share under Help to Buy, in percentage points. Sample restricted to the pre-policy estimation sample (non-homeowners aged 22–44 in England, financial years 2009–10 to 2012–13). Baseline specification: selection-corrected stochastic frontier with region and household composition covariates. Weighted using cross-sectional respondent weights.

Help to Buy.

Dropping the selection correction. Table 8 presents estimates from standard SFA models without sample selection correction, estimated on buyers only. Column (1) uses the base covariates; column (2) adds region and household composition. Without the selection correction, the frontier is estimated directly on the positively selected buyer population, so the predicted deposit frontier is somewhat higher: the mean pre-policy affordability level rises from 46% to 51%. The CDF shift is correspondingly smaller (1.9 pp vs. 2.3 pp), as non-homeowners are placed higher on the pre-policy price distribution, leaving less room for Help to Buy to shift them further. The modest difference between the selection-corrected and uncorrected specifications is consistent with the small and imprecisely estimated $\hat{\rho}$ in the baseline model, and suggests that selection on unobservables is not a major factor in this setting once other observable determinants of deposits have been controlled for.

Distributional robustness. Although the mean CDF shift varies substantially across specifications, the distributional patterns emphasised in the main text are robust. Table 9 reports the mean CDF shift by income quintile, region, age group, parental education, and own education under each specification. The ordering of gains by income quintile is preserved across all specifications: higher-income non-homeowners consistently see larger increases in the share of local properties they can afford. Similarly, the regional pattern — larger CDF shifts in the North and smaller shifts in London and the South East — holds across all

Table 7: Stochastic frontier estimates with sample selection: parsimonious specification

	(A) Selection	(B) Frontier
Homeownership rate (1991)	0.849*** (0.155)	
Age 20–29 (ref.)		
Age 30–39	0.035 (0.043)	0.566*** (0.102)
Age 40–49	-0.053 (0.061)	0.268** (0.126)
Parents: low/not working (ref.)		
Parents: missing occupation	-0.064 (0.170)	0.260 (0.350)
Parents: mid/high occupation	0.245*** (0.052)	-0.029 (0.162)
Parents: no degree (ref.)		
Parents: missing education	0.135** (0.058)	0.094 (0.131)
Parents: degree	0.049 (0.052)	0.238** (0.118)
FY 2009/10 (ref.)		
FY 2010/11	0.070 (0.054)	-0.037 (0.122)
FY 2011/12	0.131** (0.055)	-0.003 (0.131)
FY 2012/13	0.084 (0.174)	-0.179 (0.569)
Male (ref.)		
Female	-0.071* (0.040)	0.032 (0.093)
No degree (ref.)		
Degree	0.573*** (0.043)	0.472* (0.257)
Constant	-2.880*** (0.125)	9.467*** (1.247)
Panel C: Variance parameters		
$\ln \sigma_u^2$		
Constant	-0.344 (0.597)	
$\ln \sigma_v^2$		
Constant	-0.033 (0.480)	
Selection correction (ρ)		
rho	0.573 (0.374)	
N (non-homeowners)	16,497	
N (buyers)	525	
Log-likelihood	-2395.2	

Notes: Maximum likelihood estimates of the stochastic frontier model with sample selection correction (sfaselectioncross), using base covariates only (no region or household composition). Estimated on the pre-policy sample (financial years 2009–10 to 2012–13). $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 8: Stochastic frontier estimates without sample selection (buyers only)

	(1) Base covariates	(2) With region
Panel A: Frontier equation		
Age 20–29 (ref.)		
Age 30–39	0.555*** (0.094)	0.540*** (0.098)
Age 40–49	0.298** (0.151)	0.357** (0.159)
Parents: low/not working (ref.)		
Parents: missing occupation	0.282 (0.394)	0.274 (0.387)
Parents: mid/high occupation	-0.153 (0.124)	-0.139 (0.121)
Parents: no degree (ref.)		
Parents: missing education	0.026 (0.121)	-0.025 (0.121)
Parents: degree	0.229** (0.107)	0.231** (0.105)
FY 2009/10 (ref.)		
FY 2010/11	-0.069 (0.118)	-0.040 (0.115)
FY 2011/12	-0.066 (0.119)	-0.042 (0.117)
FY 2012/13	-0.178 (0.359)	-0.136 (0.349)
Male (ref.)		
Female	0.059 (0.087)	0.079 (0.086)
No degree (ref.)		
Degree	0.206** (0.094)	0.144 (0.094)
North (ref.)		
Midlands/East		-0.010 (0.115)
London		0.578*** (0.132)
Rest of South		0.330*** (0.114)
No child in household (ref.)		
Child in household		-0.045 (0.101)
No partner (ref.)		
Has partner		0.001 (0.111)
Constant	10.909*** (0.236)	10.806*** (0.231)
Panel B: Variance parameters		
$\ln \sigma_u^2$		
Constant	-0.465 (0.604)	-0.231 (0.431)
$\ln \sigma_v^2$		
Constant	-0.325* (0.192)	-0.489** (0.197)
N (buyers)	525	525
Log-likelihood	-731.2	-716.3

Notes: Maximum likelihood estimates of the stochastic frontier model without sample selection correction (sfacross), estimated on buyers only. Column (1) uses base covariates; column (2) adds region and household composition. Both estimated on the pre-policy sample (financial years 2009–10 to 2012–13). $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

specifications.

Table 9: Mean CDF shift (pp) under Help to Buy by characteristic group and specification

	Baseline	No region	No selection	BU def.
Overall	2.25	5.57	1.83	2.83
Income quintile				
Q1	0.70	0.35	0.81	0.59
Q2	1.42	1.74	1.35	1.44
Q3	2.07	4.18	1.62	2.42
Q4	2.90	8.14	2.09	3.83
Q5	4.14	13.44	3.30	5.88
Region				
North East	2.93	7.49	2.01	4.13
North West	2.39	6.60	1.56	3.61
Yorks & Humber	2.31	6.03	1.62	3.44
East Midlands	2.98	7.50	1.95	3.40
West Midlands	2.40	6.01	1.62	2.90
East of England	2.99	5.92	2.17	3.43
London	1.52	3.69	1.76	1.76
South East	1.96	5.21	1.95	2.40
South West	2.08	5.04	2.03	2.43
Age group				
20s	2.39	4.87	1.95	2.54
30s	1.94	5.88	1.57	2.90
40s	2.54	6.84	2.11	3.49
Parent has degree				
No	2.28	5.59	1.85	2.98
Yes	1.68	4.51	1.55	1.87
Parent mid/high-skill occupation				
No	1.99	5.16	1.56	2.45
Yes	2.36	5.75	1.95	2.98
Own degree				
No	2.27	5.56	1.79	2.95
Yes	2.17	5.58	1.95	2.46

Notes: Each cell shows the weighted mean increase in the share of local properties affordable under Help to Buy (CDF shift), in percentage points, for the given subgroup and specification. Evaluated against the pre-policy (2011–12) LAD price distribution. Sample: non-homeowners aged 22–44 in England, financial year 2011–12. Weighted using cross-sectional respondent weights. Specifications: Baseline = selection-corrected SFA with region and household composition covariates; No region = selection-corrected SFA without region or household composition; No selection = standard SFA without sample selection correction; BU def. = benefit-unit homeownership definition. Parental education excludes observations with missing parental information.