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# Household Access to Mortgages in the UK

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**Abstract** We employ the propensity score matching approach to investigate household access to mortgages in the UK using information on 29,732 households between 2003 and 2010. We find that, on average, the probability of obtaining a mortgage is similar for White and Non-White households. However, we find that Black households with low incomes are less likely to have mortgages compared to White households with similar characteristics. Asian households, in contrast, do not seem to have a lower probability of having a mortgage.

**Keywords** Mortgage · Racial origin · Propensity score matching

**JEL classification** D14 · J15 · G21

## 1 Introduction

Financial inclusion<sup>1</sup> has moved up the global reform agenda and become a topic of increasing importance for policy makers given its critical role in reducing poverty and boosting shared prosperity (World Bank 2014; Demirguc-Kunt and Klapper 2013). Access and usage of finance provides individuals with resources to meet their financial needs, such as saving for retirement, investing in education, and purchasing a house. Restricted access can exacerbate economic disadvantage that may lead to social exclusion. Empirical studies on advanced

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<sup>1</sup>Financial inclusion refers to a process whereby people have access and/or use financial services (such as basic bank and saving accounts) and products (such as loans and mortgages) in the mainstream market that are appropriate to their needs and enable them to lead a normal social life in the society in which they belong (European Commission 2008). Literature also defines households with access to various financial services as “banked”.

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economies find that households with lower usage of financial services are more likely to be from non-White background (see for example Hogarth et al. 2005; Devlin 2005; Carbo et al. 2007; Khan 2008; Honohan 2008; Simpson and Buckland 2009; Demircuc-Kunt and Klapper 2013).<sup>2</sup>

In this paper we investigate differences in the probability of having a household mortgage in the UK. Previous evidence suggests that access to mortgage and other forms of household finance is influenced by ethnicity (Pollin and Riva 2001; Goodwin et al. 2000). Other evidence also suggests that in the UK various households may not have household credit at all (Kempson and Whyley 1999; Devlin 2005; Khan 2008; Deku et al. 2015). Recent public policy concerns have also been raised about the inability of ethnic groups to obtain SME finance (Clegg 2011) and in the literature access to finance has been cited as one of the most significant barriers facing ethnic minority businesses in the UK (Bates 2011; Carter et al. 2015).

While there is evidence suggestive of prejudice in ethnic group usage of financial services, the aforementioned UK empirical literature does not consider a major household financial market, namely, mortgages. Our analysis seeks to fill this gap in the literature. Previous research on the likelihood of obtaining household mortgage finance mainly focuses on the US and shows that non-White minorities face inequality in access to mortgages on non-economic grounds. This empirical literature finds that non-White households have higher mortgage application rejection rates and are offered less attractive terms than Whites with similar credit and other features (Black et al. 1978; Munnell et al. 1996; Ross and Yinger 1999).

Building on this evidence, we investigate the probability of non-White households obtaining mortgages in the UK. Mortgages are important for households as the ability to obtain a mortgage is critical to a household's capacity to acquire a home, and it is typically the largest financial commitment most people make in their entire lives. Being a homeowner is an important component of wealth acquisition and can increase status and standing in society. Hence, the inability to obtain mortgage credit may significantly hinder household wealth and aggravate social exclusion. We seek to provide a better understanding of the key determinants of household access to mortgage credit in the UK which we hope can help inform public policy.

We use the Propensity Score Matching (PSM) approach and a large household sample compiled from the Living Costs and Food Survey gathered by the Office of National Statistics (ONS). The sample, collected between 2003 and 2010, consists of information on the economic, social and demographic features of 29,732 households, of which 17,398 have a mortgage and 12,234 are renting.<sup>3</sup>

In general, we find that non-White households have the same chance of obtaining a mortgage as White households. However, Black households with low incomes are less likely to have mortgages compared to White households at similar income levels and other characteristics. Asian households, in contrast, do not seem to have a lower probability of having a mortgage. The 2007/08 financial crisis does not seem to have reduced mortgage access for Black households.

The remainder of the paper is organized as follows: Section 2 provides a brief background on the ethnic discrimination literature and also highlights the disadvantages faced by ethnic minorities in the UK. Section 3 discusses the developments in the UK housing market between 2001 and 2010. Section 4 describes the data sources,

<sup>2</sup> Access to consumer finance has been found to relate to such factors as levels of household income, net worth, education, employment status and age.

<sup>3</sup> We do not include observations where the household owns the property outright as the historical source of ownership (whether inheritance or paid mortgage) is unknown.

explains the methodology and provides descriptive statistics. The results are presented and discussed in Section 5. Section 6 concludes.

## 2 Racial prejudice and its economic, social and financial consequences—evidence from the US and the UK

Since the seminal work of Becker (1957) economists have long been interested in advancing theories of racial prejudice (Arrow 1972, 1973, 1998; Altonji and Blank 1999; Lang and Lehmann 2012) and empirically investigating its economic consequences (Donohue and Heckman 1991; Card and Krueger 1992; Lang et al. 2005; Ritter and Taylor 2011; Guryan and Charles 2013). There is substantial international evidence that racial discrimination is a major driver of economic disparities (Wilson 1996; Darity and Mason 1998; Moss and Tilly 2001; Pager and Quillian 2005).

Evidence from the UK illustrates that these disparities manifest themselves in terms of minorities living in poorer quality housing (Phillips and Harrison 2010), having lower quality teachers (Clotfelter et al. 2004) and worse health (Bollini and Siem 1995; Lordan and Johnston 2012). Ethnic minorities are also disadvantaged in the UK labour market despite Equal Opportunity legislation aimed at mitigating these disadvantages. Unemployment rates for ethnic minorities, for instance, have been around double that of Whites for over 50 years, with only half of this gap explained by residential segregation, educational differences and other observable factors (Leslie et al. 2001; Blackaby et al. 2002; Heath and Rethon 2003; Heath and Cheung 2007). This gap appears to have widened since the global financial crisis of 2007/08 (Equality and Human Rights Commission 2010). Also, an ethnic pay gap exists driven mainly by occupational segregation (minorities working in lower paid occupations compared to Whites) although this gap tends to be much smaller within occupations (Brynin and Güveli 2014).

The aforementioned economic, social and health disadvantages faced by UK ethnic groups most likely feed through into poorer access to financial services (Kempson and Whyley 1999; Pollin and Riva 2001; Goodwin et al. 2000) and it is reported to be highest among Black, Pakistani and Bangladeshi households. Black households are more likely have less access due to their positioning in the labour market and due to low income (Kempson and Whyley 1999; Financial Service Authority 2000). Similarly, Bangladeshi and Pakistani households may find it more difficult to obtain financial services due to language, cultural religious reasons (Financial Service Authority 2000). Lower social classes, where ethnic minorities are over-represented, have less access to current and savings accounts (Devlin 2005). It is also suggested that various UK ethnic groups do not have access to household credit (Deku et al. 2015). Ethnic minority households are also more likely to be disadvantaged with regard to education, employment and housing, which in turn also limits their ability to obtain financial services (Khan 2008).

Ethnic minority owned UK businesses also have difficulties in accessing business credit (Bates 2011; Carter et al. 2015). For example, around 40 % of African-Caribbean loan applicants report problems in obtaining loans compared with a third of Asian applicants and only 20 % of White applicants (Jones et al. 1994). African-Caribbean business owners were the most likely to have formal management training or qualifications but, despite these skills, also had the lowest rate of access to bank and start-up finance (Smallbone et al. 2003). Some have argued that limited access to financing by ethnic minority businesses is due to

discouragement and the possibility of loan denials rather than ethnic discrimination by banks (Coleman 2000; Fraser 2009).<sup>4</sup> One reason why ethnic minority business owners may feel discouraged from applying for bank loans is because they fear prejudicial treatment (Blanchflower et al. 2003; Kon and Storey 2003). Fraser (2009) argues that loan denials are linked to differences in creditworthiness rather than ethnic discrimination.<sup>5</sup>

While there is a literature covering ethnic minority use of a variety of UK consumer financing, research on household mortgages remains limited. In contrast, there exists an established US literature. For instance, Black and Hispanic households are more likely to be rejected and offered less attractive terms for mortgages than Whites (Black et al. 1978; Munnell et al. 1996; Ross and Yinger 1999). Non-Whites pay more for their mortgages even when factors such as income levels, property dates and the age of buyer are controlled for (Oliver and Shapiro 1997; Courchane and Nickerson 1997; Crawford and Rosenblatt 1999; Black et al. 2003; Cheng et al. 2015). Although these higher rates may be counteracted with more favourable terms, such as longer low rate lock-ins (Crawford and Rosenblatt 1999). Also, disparities in mortgage approval rates tend to fall substantially for Black households the longer their credit history (Han 2011). *Redlining*, outlawed in the US by the 1974 Equal Credit Opportunity Act, has also been widely researched.<sup>6</sup> Early work finds little evidence of such discriminatory mortgage lending practice (Schafer and Ladd 1981; Benston and Horsky 1992; Munnell et al. 1996; Tootell 1996). However, the majority of later studies document that minority neighbourhoods have lower access to mortgage funding (Phillips-Patrick and Rossi 1996; Siskin and Cupingood 1996; Ross and Yinger 1999) and are more likely to be subject to predatory lending practices (Calem et al. 2004; Williams et al. 2005; Dymski 2006).<sup>7</sup>

Given the economic and social disadvantages faced by ethnic minorities in the UK, and evidence on their lower usage/access to various consumer financial services, we seek to expand this literature by examining the probability of different ethnic groups obtaining household mortgages. This evidence will add to evidence we already have on the US household mortgage market. Before we outline our data and approach the following section highlights developments in the UK housing market over our period of study.

<sup>4</sup> Banks in the UK typically use credit scoring techniques to assess the riskiness of borrowers. Anti-discrimination legislation prevents the use of ethnicity, gender, disability or religious beliefs in determining credit scores. However, scoring techniques are often used as a complement to relationship lending, involving close contact between the entrepreneur and bank manager, which introduces the possibility for credit assessments to be tainted by personal prejudices (Fraser 2009).

<sup>5</sup> Fraser (2009) finds that Black African firms are significantly more likely to miss loan repayments and/or exceed their agreed overdraft limit and this behavior seems to largely account for their much higher loan denial rates.

<sup>6</sup> Redlining is the refusal to lend to certain neighborhoods due to non-economic features. In the US, in addition to the 1974 Equal Credit Opportunity Act, Community Reinvestment Act of 1977 made it illegal for lenders to have a smaller amount of mortgage funds available in minority neighborhoods compared to similar White neighborhoods.

<sup>7</sup> There is also literature on discrimination in the US consumer credit market, however, the findings are not uniform. Some studies conclude that non-Whites are not discriminated against in terms of access to consumer credit (Lindley et al. 1984; Hawley and Fujii 1991). Others find that loan approval rates are lower for non-Whites (Duca and Rosenthal 1993) and that they pay higher interest rates (Edelberg 2007). Lenders chose to discriminate against non-Whites because, on average, they have higher default risk (Lin 2010). In addition, a number of studies look at auto loan pricing and find no evidence of discrimination (Goldberg 1996; Martin and Hill 2000) although this could be because non-price terms differ for minorities compared to Whites leading those discriminated against to drop out of the market (Ayres and Siegelman 1995).

### 3 Snapshot of developments in the UK housing market

The UK has one of the most persistently volatile housing markets, with four boom and bust cycles since the 1970s (Stephens 2011). This is important as the consequences of these cycles may have a disproportionate impact on different segments of the population. Boom and bust cycles may influence housing choices and bank lending behavior, inhibit house building and increase wealth inequalities. We present a set of key indicators of the housing market over 2001 to 2010 in Table 1.

Average house prices in the UK increased 65.6 % between 2001 and 2007 from £138,281 to £227,735 and dropped significantly afterwards with the impact of the financial crisis. UK housing supply, unlike the US, is argued to be much less sensitive to price changes and increases in demand for housing has a large impact on price but not volume (Meen and Andrew 2005). High levels of house completions were achieved in the period between 2003 and 2007. However, after the financial crisis new house construction fell notably, failing to cover the demand from newly formed households. Hence, the ratio of rented to owner occupied houses increased steadily, from 4.44 % in 2006 to 5.23 % in 2010 and average monthly rent increased 4.9 % during this period, above average yearly inflation level of 2.1 %. These figures signal an increase demand for rental properties perhaps because of tighter lending policies of banks during and after the financial crisis.

The number of households in the UK increased steadily over this period, an average of 0.77 % a year with average household size remaining unchanged at around 2.36. The average age of mortgage holders also gradually increased after the crisis. A combination of rising household numbers and lower housing completions together with tighter credit conditions are likely to have forced poorer and younger households out of the market.

In the pre-crisis period borrowing costs for mortgages became more expensive for households, increasing from 3.81 to 5.79 % between 2003 and 2008 (based on 2 year variable rates). However, other lending conditions became more favorable. Households were able to borrow more (mortgage payments to average pay increased two fold between 2001 and 2007) with the requirement of lower initial deposits. For first time borrowers the average deposit amount was 16.4 % in 2006 compared to 23 % in 2003. These favorable conditions indicate a relaxing of mortgage lending standards prior to the financial crisis and a tightening thereafter.<sup>8</sup> Looking at the age distribution of borrowers, younger households increased their share of the housing market pre-crisis. However, this trend soon reversed as the share of households under 34 years fell from 47.2 % in 2007 to 40 % in 2010.

Different types of mortgage products are available in the UK. Households can borrow for maturities ranging from 5 to 30 years. Borrowers may choose to repay the capital along with the interest or opt out for paying only interest.<sup>9</sup> Rates may be fixed (typically 2 to 5 years) or variable (determined by the lender or tracking an official rate—such as the Bank of England's base rate). Borrowers can switch from fixed to variable rates although penalty costs (often 3 months mortgage payments) are charged. Borrowers need to make deposits to obtain a mortgage and these vary according to the lender. After the financial crisis minimum deposit levels increased to around 25 % of property valuation, whereas pre-crisis deposits typically were around 5 %. The increase in initial deposits has disadvantaged poorer and younger

<sup>8</sup> Sometimes discussion is on loan-to-value ratios – typically 95 % prior to the crisis and 75 % after instead of deposit requirements of 5 and 25 %, respectively.

<sup>9</sup> Capped rate and collared mortgages are also available.

Table 1 UK housing market developments between 2001 and 2010

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Price, rent and construction										
Average house price (thousands in GBP) <sup>1,9</sup>	138.3	169.0	190.1	209.3	211.0	221.9	227.7	189.0	194.1	186.5
House price (YOY % change on average value) <sup>1,2</sup>	0.122	0.222	0.125	0.101	0.008	0.051	0.026	-0.170	0.027	-0.039
New built houses to newly formed households (%) <sup>3</sup>	0.808	1.221	1.306	1.412	0.971	1.159	1.113	0.822	0.796	0.659
New built houses (YOY % change) <sup>3</sup>	-0.007	0.052	0.040	0.084	0.036	0.024	-0.003	-0.182	-0.145	-0.111
Rented to owner occupied houses ratio (%) <sup>3,6</sup>	0.441	0.437	0.453	0.444	0.444	0.459	0.469	0.483	0.505	0.523
Average monthly rent (YOY % change) <sup>3</sup>	0.015	0.035	0.013	0.030	0.056	0.046	0.037	0.049	0.051	0.060
Household formation <sup>3</sup>										
Total households (thousands)	23,931	24,081	24,227	24,373	24,593	24,782	24,979	25,196	25,389	25,595
Household size	2.37	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
Average age (years)	37.7	36.8	36.5	37.6	37.1	37.0	36.9	37.9	38.2	39.0
Mortgage lending rates and standards										
2 years variable interest (%) <sup>4,5</sup>	4.99	4.04	3.81	4.60	4.75	4.73	5.59	5.79	3.53	3.00
House price to earnings - First time buyers <sup>1,7</sup>	3.05	3.74	4.18	4.80	4.69	5.03	5.37	4.39	4.40	4.36
Mortgage payments to average pay (%) <sup>1,8</sup>	67.7	79.3	85.7	113.8	108.7	119.6	137.0	106.9	96.0	90.6
Deposit to house price (%) <sup>3</sup>	25.8	27.3	31.7	32.7	30.3	28.9	29.3	31.6	35.2	35.0
Deposit to house price - First time buyers (%) <sup>3</sup>	16.7	19.0	23.0	21.1	19.3	16.4	17.2	21.8	27.7	27.4
Total mortgage lending (YOY % change, value) <sup>4</sup>	0.39	0.43	0.23	-0.01	0.06	0.19	0.00	-0.40	-0.38	-0.01
Properties taken into repossession (%) <sup>3</sup>	0.16	0.11	0.07	0.07	0.12	0.18	0.22	0.34	0.43	0.34
Distribution of borrowers ages <sup>3</sup>										

**Table 1** (continued)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Under 25	9.0	10.5	6.8	7.2	8.2	7.6	7.8	7.3	6.3	5.1
25–34	39.7	41.0	35.7	36.4	39.3	39.7	39.5	36.0	35.5	34.9

<sup>1</sup> *Source:* Nationwide database. Available at <http://www.nationwide.co.uk/about/house-price-index>

<sup>2</sup> House prices adjusted for retail prices. This uses the Office for National Statistics Retail Price Index (RPI) to convert nominal prices to current prices

<sup>3</sup> *Source:* Department for Communities and Local Government database. Available at <https://www.gov.uk/government/organisations/department-for-communities-and-local-government/about/statistics>

<sup>4</sup> *Source:* Bank of England database. Available at <http://www.bankofengland.co.uk/boeapps/iadb>

<sup>5</sup> Based on 75 % Loan to value (LTV) ratio

<sup>6</sup> Includes privately rented houses and houses rented from housing association and local authorities

<sup>7</sup> Calculated as the ratio of Nationwide first time buyer house price to mean gross earnings

<sup>8</sup> Measures initial mortgage payments as a percentage of take home pay

<sup>9</sup> House prices adjusted for retail prices. This uses the Office for National Statistics Retail Price Index (RPI) to convert nominal prices to current prices



households who typically have more limited savings. Property can be repossessed if the borrower falls into arrears—under current law lenders have to give at least 3 months notice before repossession actions take place.<sup>10</sup> In the UK, unlike the US, households can still be pursued through the courts for any negative equity even after the repossession of the property by the lender. Overall one can see that the access to mortgage finance was more favorable to poorer households prior to the crisis and conditions have tightened thereafter. Given that ethnic minorities are disproportionately represented in the lower household income groups, it could be that they have also suffered more from the changed mortgage market environment.

## 4 Data and methodology

### 4.1 Data source

We collect our data from the Living Costs and Food Survey gathered by the Office of National Statistics (ONS) in the UK for the years between 2003 and 2010. This is an annual exercise to collect data on private household expenditure on goods and services. Most of the questions address issues relating to household characteristics such as, race, family relations, employment details, as well as information on household spending and income features. Following previous literature on the UK (Kempson and Whyley 1999; Devlin 2005; Deku et al. 2015), the household reference person is assumed to be the most influential within the household even though certain responses require that variables are aggregated for all household members.

Our sample consists of 29,732 households, of which 17,398 have a mortgage and 12,234 are renting. We do not include observations where the household owns the property outright as the historical source of ownership (whether inheritance or paid mortgage) is unknown. Non-White households constitute 5.68 % (1,681 households) of the entire sample. Within the non-White group the distribution of Asian and Black households are 944 and 737, respectively.<sup>11</sup> We exclude *mixed race* and *other race* categories from our sample as it is not possible to identify ethnic background of these categories accurately.

### 4.2 Propensity score matching

Here we aim to answer the following question: Are non-White households, *ceteris paribus*, less likely to have mortgages than White households with comparable economic and other characteristics? A potential selection bias emerges as being a non-White household is likely to be endogenous and related to various other observable characteristics. As such we follow Rosenbaum and Rubin (1983) and use PSM as a way to reduce selection bias. Matching restricts inference to the sample of non-White households (the treatment group, denoted  $T_i=1$  for household  $i$ ) and White households (the control group, denoted  $T_i=0$ ). The treatment group is matched with the control

<sup>10</sup> Obtaining a court order for repossession and forcing out borrowers from homes may take as much as 9 months to a year.

<sup>11</sup> Asian household sub-groups include Asian Indian, Asian Chinese, Asian Pakistani, Asian Bangladeshi or other Asian. Black household sub-groups are Black Caribbean, Black African and Black Other.

group on the basis of its propensity score which is a function of households' observable characteristics ( $X_i$ ):

$$P(X_i) = \text{Prob}(T_i = 1 | X_i), \text{ with } (0 < P(X_i) < 1)$$

Following Dehejia and Wahba (2002), we match the households based on the nearest-neighbor with the replacement. Propensity scores are estimated via a probit model utilizing household head's characteristics (age, employment, occupational classification, education, gender and marital status) and other household characteristics (household size, income, benefits and regional location) as independent variables, which are drawn from the aforementioned literature.

*Age* is categorized into 10 year bands ranging from 16 to 65+. *Employment* status is defined as employed, unemployed, retired or unoccupied. *Occupational classification* indicates the skill level and content of the head of household's employment into six categories as: higher managerial, professional or working for a large employer; lower managerial; clerical and intermediate; small employers or self owned business; lower supervisory or technical; and routine/semi-routine manual or service. For *education* we use three UK educational qualification levels as GSCE (typically at 16 years of age), A-levels (typically at 18 years of age) and higher education (including further and higher university education). *Marital status* is grouped as married, co-habiting or single (including widowed, divorced and separated). *Household size* is the number of persons in a household. *Income* indicates the total weekly income of the household. *Income gap* equals 1 if household expenditure is more than its income and 0 otherwise. *Benefits* represent those households receiving any form of government benefit payments (from the Department for Work and Pensions or the Social Security Agency). *Region* is where the household is located.<sup>12</sup> We also use a set of year dummy variables to capture the effect of the macroeconomic environment.

We acknowledge the limitations of our analysis, which is common to the extant literature. PSM has advantages and shortcomings. It does not depend on the assumption of functional form and has the advantage of restricting inference to the sample of White and non-White households that are actually comparable in their observable characteristics. On the other hand, the PSM procedure relies on the assumption of selection on observables (namely the Conditional Independence Assumption), and it only corrects for selection bias among included observable characteristics. While we control for a rich set of covariates to explain access to mortgages, it cannot be completely ruled out that the existence of unobservable characteristics (such as social and cultural differences that could be correlated with racial differences) may still bias the treatment effect (Berkovec et al. 1996; Pager and Shepherd 2008; Han 2011). Controlling for all characteristics that affects the outcome requires very informative data on individuals, especially on the credit worthiness of borrowers. Unfortunately this information is not available in the database we are utilizing and this may lead to bias in our results. In an effort to minimize these potential biases, we examine sub-groups of households where some economic indicators (such as being employed, having higher income or savings) aim to capture indirect dimensions of the credit-worthiness of potential mortgage applicants.

<sup>12</sup> These 13 regions are: North East, North West, Merseyside, Yorkshire and the Humber, East Midlands, West Midlands, Eastern, London, South East, South West, Wales, Scotland and Northern Ireland.

### 4.3 Descriptive statistics

Table 2 provides summary statistics for the sample. In the first three columns, we display statistics for the whole sample and divide the sample by tenure. Non-White households constitute 5.7 % of all households and this ratio is higher, 7 %, for the renting group. The percentage of household heads that are employed for mortgage owners are 91.7 compared to 42.2 of the renting group. Average weekly income for mortgage owners is GBP 797, which is more than double the renting group (GBP 342). Household heads are more likely to hold a higher education qualification if they are home owners. Renting households are more likely to be female and less likely to be married when compared to mortgage owners.

We also present characteristics of White and non-White households within each tenure choice. In the renting group White households are older than non-White households with mean ages 48.4 years and 40.8 years, respectively. A larger percentage of White renting households are over 65 and retired. In terms of size White households are smaller (mean size 2.18 members) than non-White ones (mean size 2.88 members), and a significantly lower percentage of White households have higher educational attainment. Although there are large observable differences between non-White and White household renters, these groups look much closer in terms of households' characteristics for households with mortgages. They have similar age distributions, educational and employment characteristics. One difference between the two groups is the average weekly income where White households earn on average £39 more per week.

In the latter four columns of Table 2 we divide the sample by racial origin. A higher percentage of non-White households (51.5 %) do not have mortgages compared to White households (40.9 %). Within the non-White group, the ratio seems to be driven by Black households, of whom 64.9 % do not have a mortgage. For Asian households this ratio is 41.6 % and close to the White households' mortgage ownership. Black households have a lower employment rate, are employed in lower paid occupations and have the lowest average weekly income. Compared to White households a lower percentage of Black households have a basic educational attainment (up to GCSE level), although they are more likely to have received (post-16 years of age) higher education. Furthermore, a higher proportion of Black household heads are female (55.2 %) and single (64.2 %). A larger fraction of Asian households are employed (73.3 %) with 20.4 % of them occupying managerial roles. Asian households' gross weekly income is the highest of all groups and they are more likely to have a degree in higher education and to be married.

Overall the descriptive statistics illustrate that non-White UK households are a diverse group with Asian households on average being economically better-off, while Black households are most economically disadvantaged.

## 5 Results

### 5.1 White versus non-White households

We present propensity score estimations for the whole sample as well as the sub-samples in Table 3. Briefly, we find that non-White households have lower incomes and a larger household size. They are also more likely to experience income gap and be a benefit recipient. Non-White household heads are more likely to be married and less likely to work in

**Table 2** Descriptive statistics

	By tenure		Renting		With mortgage		By racial origin				
	All households	Renting	With mortgage	White	Non-white	White	Non-white	White	Non-white	Asian	Black
Number of observations	29,732	12,334	17,398	11,465	869	16,586	812	28,051	1,681	944	737
Non-white ethnic origin	5.7 %	7.0 %	4.7 %					40.9 %	51.5 %	41.6 %	64.6 %
Households with no mortgage	45.5/43.0	45.8/45.0	43.8/43.0	48.4/46	40.8/38.0	43.8/43	43.1/42	45.7/44.0	41.9/40.0	40.9/39.0	42.9/42
Age (mean/median in years)	4.4 %	8.5 %	1.4 %	8.5 %	7.5 %	1.4 %	1.4 %	4.3 %	4.5 %	3.7 %	5.2 %
16–24	20.0 %	21.2 %	19.1 %	20.5 %	29.7 %	19.1 %	20.7 %	19.7 %	25.4 %	29.7 %	20.2 %
25–34	28.7 %	20.0 %	34.8 %	18.9 %	32.8 %	34.7 %	36.7 %	28.3 %	34.7 %	32.9 %	37.4 %
35–44	22.2 %	14.6 %	27.6 %	14.6 %	14.9 %	27.7 %	27.1 %	22.3 %	20.8 %	21.4 %	20.6 %
45–54	13.2 %	12.7 %	13.6 %	13.2 %	6.3 %	13.8 %	10.0 %	13.5 %	8.1 %	7.7 %	8.4 %
55–64	11.6 %	23.1 %	3.4 %	24.2 %	8.9 %	3.3 %	4.1 %	11.9 %	6.5 %	4.6 %	8.1 %
65+											
Employment status											
Employed	71.2 %	42.2 %	91.7 %	41.5 %	51.6 %	91.9 %	87.0 %	71.3 %	68.8 %	73.3 %	64.7 %
Unemployed	2.6 %	5.2 %	0.8 %	5.0 %	8.8 %	0.8 %	0.8 %	2.5 %	4.9 %	3.6 %	7.1 %
Retired	12.0 %	24.7 %	3.1 %	25.7 %	9.4 %	3.0 %	3.7 %	12.3 %	6.7 %	4.3 %	8.5 %
Unoccupied	14.1 %	27.8 %	4.4 %	27.8 %	30.2 %	4.3 %	8.5 %	13.9 %	19.6 %	18.8 %	19.7 %
Household size (mean/median)	2.59/2.00	2.23/2.00	2.86/3.00	2.16/2.00	2.88/3.00	2.83/3.00	3.42/3.00	2.57/2.00	3.14/3.00	3.54/3.00	2.65/2.00
Gross weekly income (mean/median in £)	608/504	342/242	797/707	340/242	374/264	797/710	758/644	611/509	560/438	636/491	464/370
Income gap	38.6 %	47.8 %	32.1 %	47.9 %	45.9 %	32.1 %	30.4 %	38.6 %	38.4 %	40.5 %	35.0 %
Occupational classification											
Higher managerial/large employer	13.3 %	4.0 %	20.0 %	3.8 %	6.7 %	19.9 %	22.5 %	13.3 %	14.3 %	20.4 %	7.5 %
Lower managerial	22.2 %	9.5 %	31.3 %	9.3 %	12.5 %	31.5 %	26.9 %	22.4 %	19.5 %	18.1 %	21.6 %
Clerical and intermediate	6.9 %	5.0 %	8.3 %	5.0 %	5.3 %	8.3 %	7.1 %	6.9 %	6.2 %	4.9 %	7.7 %
Small employers/self owned business	8.2 %	5.5 %	10.2 %	3.9 %	3.0 %	8.6 %	9.0 %	6.7 %	5.4 %	7.6 %	3.9 %
Lower supervisory or technical	17.6 %	21.2 %	15.1 %	5.5 %	4.3 %	10.3 %	6.6 %	8.4 %	20.2 %	4.4 %	6.6 %
Routine and semi-routine	6.6 %	3.8 %	8.6 %	20.9 %	23.1 %	14.9 %	17.1 %	17.4 %	5.9 %	19.5 %	21.3 %
Educational attainment											
Up to GCSE level	57.5 %	70.4 %	48.9 %	72.3 %	37.8 %	49.6 %	28.1 %	58.6 %	32.9 %	27.9 %	36.9 %
A levels	22.5 %	17.8 %	25.7 %	17.2 %	28.2 %	25.4 %	29.2 %	22.2 %	28.7 %	25.8 %	33.0 %

Table 2 (continued)

	All households	By tenure		Renting		With mortgage		By racial origin			
		Renting	With mortgage	White	Non-white	White	Non-white	White	Non-white	Asian	Black
Higher education	20.0 %	11.8 %	25.4 %	10.5 %	34.0 %	25.0 %	42.7 %	19.2 %	38.4 %	46.3 %	30.0 %
Female	39.3 %	52.1 %	30.2 %	52.4 %	49.2 %	30.1 %	34.2 %	39.2 %	42.0 %	30.8 %	55.2 %
Marital status											
Married	47.2 %	25.6 %	63.0 %	24.8 %	37.2 %	62.6 %	69.8 %	47.2 %	53.0 %	70.6 %	31.5 %
Cohabit	12.3 %	11.7 %	12.7 %	12.2 %	4.3 %	13.0 %	3.3 %	12.7 %	3.8 %	2.4 %	4.3 %
Single	40.2 %	62.7 %	24.3 %	63.0 %	58.6 %	24.3 %	26.9 %	40.1 %	43.2 %	27.0 %	64.2 %
Benefit recipient	67.7 %	77.2 %	60.9 %	77.7 %	69.0 %	60.5 %	69.4 %	67.5 %	69.2 %	69.4 %	67.2 %
Region											
South East	13.1 %	11.7 %	14.0 %	11.9 %	7.5 %	14.1 %	10.5 %	13.2 %	8.9 %	11.5 %	6.6 %
Northeast	4.2 %	4.8 %	3.9 %	4.9 %	1.9 %	3.9 %	1.3 %	4.4 %	1.6 %	2.1 %	1.1 %
Northwest	8.3 %	7.8 %	8.6 %	7.8 %	6.9 %	8.6 %	7.3 %	8.3 %	7.1 %	10.0 %	4.3 %
Merseyside	2.0 %	2.4 %	1.7 %	2.5 %	0.4 %	1.8 %	0.3 %	2.1 %	0.4 %	0.1 %	0.8 %
Yorkshire	8.7 %	8.7 %	8.7 %	8.9 %	5.2 %	8.8 %	6.1 %	8.8 %	5.6 %	7.4 %	3.9 %
East Midlands	7.1 %	6.6 %	7.5 %	6.6 %	6.1 %	7.5 %	7.7 %	7.1 %	6.9 %	7.1 %	7.5 %
West Midlands	8.1 %	8.1 %	8.1 %	8.0 %	10.0 %	7.8 %	13.6 %	7.9 %	11.7 %	12.9 %	11.7 %
Eastern	8.6 %	7.8 %	9.3 %	8.0 %	4.6 %	9.3 %	7.3 %	8.7 %	5.9 %	7.5 %	4.6 %
London	9.2 %	11.6 %	7.5 %	9.7 %	46.2 %	6.7 %	35.3 %	7.9 %	40.9 %	34.1 %	54.5 %
Southwest	8.3 %	7.8 %	8.6 %	8.1 %	2.1 %	8.9 %	1.7 %	8.6 %	1.9 %	1.9 %	2.2 %
Wales	4.5 %	4.5 %	4.5 %	4.8 %	0.8 %	4.7 %	1.3 %	4.7 %	1.0 %	1.2 %	0.9 %
Scotland	8.9 %	9.2 %	8.7 %	9.7 %	2.5 %	8.9 %	1.9 %	9.2 %	2.2 %	3.0 %	1.5 %
Northern Ireland	8.9 %	9.0 %	8.9 %	9.2 %	5.9 %	9.0 %	5.7 %	9.1 %	5.8 %	1.2 %	0.3 %

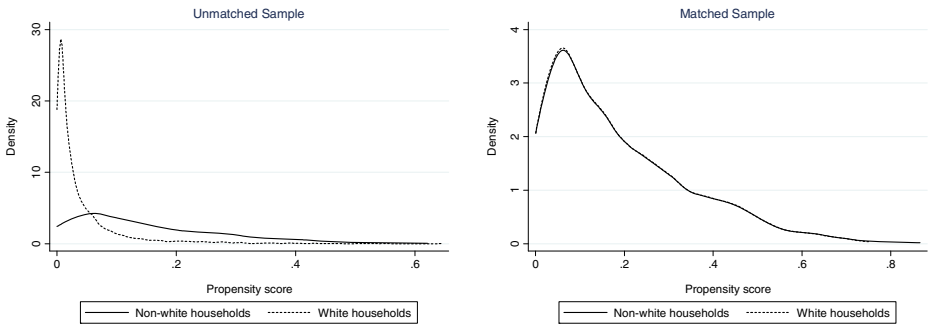
**Table 3** Propensity score estimations. This table presents coefficients of probit models estimating the propensity score, defined in this case as the probability of being a non-white household. Income gap is calculated by deducting household expenditures from income. Income gap takes the value of 1 if the household has more expenditure than income and 0 otherwise. Independent variables are characteristics of the household and household's head

	Households with						
	Whole sample	Income above median value	Income below median value	Employed household head	Household head age younger than 37	Savings	An income gap
Gross weekly income	-0.001*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Household size	0.233*** (0.013)	0.237*** (0.020)	0.243*** (0.020)	0.239*** (0.017)	0.212*** (0.024)	0.206*** (0.030)	0.223*** (0.019)
Age (35–44 is base)							
16–24	-0.128 (0.153)	-0.172 (0.263)	-0.077 (0.193)	-0.216 (0.204)	-0.004 (0.094)	-0.173 (0.317)	-0.007 (0.202)
25–34	-0.022 (0.137)	-0.157 (0.229)	0.047 (0.176)	-0.137 (0.184)	0.029 (0.062)	0.170 (0.250)	-0.081 (0.180)
45–54	-0.036 (0.136)	-0.201 (0.227)	0.062 (0.175)	-0.190 (0.183)		0.136 (0.248)	-0.102 (0.179)
55–64	-0.105 (0.136)	-0.271 (0.228)	-0.008 (0.175)	-0.247 (0.184)		0.004 (0.249)	-0.114 (0.180)
65+	-0.217 (0.132)	-0.343 (0.231)	-0.165 (0.163)	-0.336 (0.188)		-0.023 (0.244)	-0.203 (0.175)
Occupational classification							
Higher managerial and professional	-0.351*** (0.084)	-0.226 (0.196)	-0.741*** (0.143)	-0.566** (0.179)	-0.248 (0.132)	0.022 (0.182)	-0.437*** (0.125)
Lower managerial	-0.426*** (0.079)	-0.370 (0.195)	-0.418*** (0.098)	-0.650*** (0.177)	-0.437*** (0.123)	-0.109 (0.180)	-0.553*** (0.121)
Clerical and intermediate	-0.344*** (0.087)	-0.317 (0.203)	-0.314*** (0.107)	-0.575** (0.182)	-0.315* (0.133)	-0.016 (0.191)	-0.493*** (0.132)
Small employers or self owned business	-0.320*** (0.088)	-0.248 (0.204)	-0.362** (0.114)	-0.544** (0.183)	-0.288* (0.140)	-0.064 (0.203)	-0.315* (0.131)
Lower supervisory or technical	-0.082 (0.072)	-0.055 (0.196)	-0.107 (0.081)	-0.301 (0.177)	-0.027 (0.109)	0.309 (0.182)	-0.195 (0.115)
Routine and semi-routine	-0.293** (0.089)	-0.273 (0.207)	-0.317** (0.111)	-0.505** (0.183)	-0.285 (0.155)	-0.279 (0.212)	-0.466*** (0.1380)
Income gap	-0.145*** (0.031)	-0.172*** (0.048)	-0.161*** (0.043)	-0.184*** (0.038)	-0.141** (0.053)	-0.168** (0.059)	
Educational attainment (higher educ. is base)							
Up to GCSE level	-0.811*** (0.040)	-0.694*** (0.056)	-0.918*** (0.060)	-0.761*** (0.046)	-0.828*** (0.070)	-0.748*** (0.072)	-0.867*** (0.052)
A levels	-0.364*** (0.039)	-0.326*** (0.051)	-0.412*** (0.062)	-0.348*** (0.043)	-0.445*** (0.064)	-0.346*** (0.063)	-0.386*** (0.048)
Employment status (employed is base)							
Unemployed	0.126 (0.085)	-0.001 (0.271)	0.056 (0.097)		0.140 (0.135)	-0.072 (0.239)	0.103 (0.117)
Retired	-0.262 (0.150)	-0.059 (0.324)	-0.269 (0.182)			0.117 (0.300)	-0.420* (0.209)
Unoccupied	-0.011 (0.071)	-0.115 (0.193)	-0.049 (0.082)		0.121 (0.111)	0.144 (0.162)	-0.198 (0.117)
Female	0.037 (0.033)	0.142** (0.047)	-0.055 (0.047)	0.071 (0.039)	0.011 (0.055)	0.087 (0.057)	0.081 (0.042)
Marital status (married is base)							
Cohabit	-0.660*** (0.062)	-0.661*** (0.082)	-0.674*** (0.096)	-0.641*** (0.068)	-0.848*** (0.081)	-0.742*** (0.122)	-0.796*** (0.093)

Table 3 (continued)

	Households with						
	Whole sample	Income above median value	Income below median value	Employed household head	Household head age younger than 37	Savings	An income gap
Single	0.004 (0.041)	0.120* (0.057)	-0.088 (0.059)	0.003 (0.048)	-0.318*** (0.068)	-0.043 (0.074)	0.001 (0.054)
Benefits recipient	-0.250*** (0.038)	-0.272*** (0.053)	-0.181** (0.060)	-0.246*** (0.044)	-0.317*** (0.068)	-0.2224** (0.069)	-0.234*** (0.050)
Region control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.048 (0.095)	-0.243 (0.200)	0.125 (0.122)	-0.058 (0.187)	-0.379** (0.140)	-0.235 (0.166)	-0.233 (0.136)
Number of observations	28,801	14,803	14,021	21,004	8,595	10,676	17,840

\*\*\*, \*\*, and \* indicate statistical significance at the 1 %, 5 %, and 10 % levels, respectively



**Fig. 1** Distribution of property score of white and non-white households before and after matching

managerial positions. The results, sign and significance of the coefficients, are consistent across sub-groups, the only exception being variables in occupation classification.

We match non-White households with one, four and eight corresponding White households. To verify the quality of matching we plot the distribution of the propensity score for both groups before and after matching for the whole sample (Fig. 1). In the unmatched sample, the propensity score distribution of the White households is skewed to the left, whereas it is very close to that of the non-White households in the matched sample. This result suggests that the matches are appropriate.

We present the average treatment effect on the treated (ATT) in Table 4. Estimations include sub-groups of households where we are interested to see whether not having a mortgage is prevalent in sub-groups that have similar income levels, employment status, age, savings and income gap.<sup>13</sup> In Column 1 we observe that for the whole sample ATT is significant. In other words, on average, the effect of being non-White increases the likelihood of not having a mortgage.

Subsequently, we match propensity scores for two sub-groups above and below median income. We find that the difference between non-White and White households remains statistically significant for the below median income group. In contrast, ATT loses its significance for households above median income. This suggests that at higher levels of income non-White households have similar chances having a mortgage as White households. Looking at the households with an employed head, we still find ATT to be statistically significant. Thus, employment itself does not alleviate the chances of non-Whites have a lower chance of obtaining a mortgage. Next we scrutinize the sample by age, specifically for younger households who need access to mortgages. In 2013 the average UK house buyer was likely to be aged 36 when they acquired their first property (Office of National Statistics 2014). Hence, we examine the sample with household heads younger than 37 years old. We find that ATT is still significantly present for this group.

It could be argued that the probability of holding a mortgage is also related to the households' ability to put down a deposit; therefore, having savings may be a precondition to borrowing. With this in mind we examine the sub-group of households reported to have savings. Results show that non-White households have a lower likelihood of having a mortgage even if they have savings. We also look at the circumstances where households

<sup>13</sup> We recognize that these variables are all endogenous in the model. While this is an important caveat to keep in mind for results presented in this section, we think it is nonetheless interesting to see the results for sub-groups.



**Table 4** Propensity score matching: average treatment effect. This table reports results for the propensity score matching estimates of the average treatment effect (ATT) of being a non-White household on the likelihood of not having a mortgage. Robust standard errors are bootstrapped

Number of controls matched	Whole sample	Households with						An income gap younger than 37
		Income above median value	Income below median value	Employed household head	Household head age younger than 37	Savings	An income gap	
One	0.050** (0.024)	0.032 (0.029)	0.084*** (0.026)	0.075*** (0.024)	0.095** (0.038)	0.072** (0.030)	0.068** (0.027)	
Four	0.045*** (0.017)	0.024 (0.024)	0.051** (0.022)	0.076*** (0.017)	0.099*** (0.022)	0.072*** (0.023)	0.091*** (0.019)	
Eight	0.051*** (0.012)	0.030 (0.023)	0.040** (0.020)	0.081*** (0.016)	0.084*** (0.021)	0.065** (0.025)	0.091*** (0.019)	
Matched observations	1,592	734	859	1,139	582	462	1,004	
Number of observations	28,801	14,803	13,921	20,956	8,565	10,655	17,794	

\*\*\*, \*\* and \* represents significance levels at 1 %, 5 % and 10 %, respectively

are less likely to save a deposit. Income gap shows the cases where the household’s expenditure is higher than its income. The result does not change.

As shown in Section 2, the UK housing market changed dramatically following the start of the financial crisis. Bank mortgage lending contracted sharply in the post crisis period with the poorer households (namely, the young and ethnic groups) most likely being the most adversely affected. To capture differences in accessing mortgages between these two periods, we repeat our analysis separately for the pre- (2003–2006) and post- (2007–2010) crisis period. Results are presented in the first two columns of Table 5. We find that results are similar as the effect of being a non-White household increases the likelihood of not having a mortgage in both periods. However, it is worth noting that, in the post 2007 period, the statistical significance of ATT weakens.

We also examine whether our results differ in regions where larger communities of non-White households live. We divide the regions into two groups using a 5 % threshold of non-White household presence. Regions that have more than 5 % non-White households to total residents include the North West, Yorkshire and Humber, East Midlands, West Midlands, London and the South East (Office for National Statistics 2012). We hypothesize that in regions where there are more non-White residents lending institutions will be less likely to not provide mortgages to these households as they constitute a large customer base. In addition lending personnel may have developed expertise to assess mortgage risks and have learned to deal appropriately with specific issues that are distinctive to various ethnic groups. On the other hand, in regions where non-White residents are rare, lending institutions may not develop such expertise and therefore in such regions ethnic minorities are less likely to have mortgages. We present our results in the latter two columns of Table 5. We find that the ATT is larger and has higher statistical significance in the sample from regions where non-White households constitute less than 5 % of the total residents. This result provides some evidence that non-White households living in regions where fewer minorities reside are less likely to have a mortgage.

### 5.2 Asian and Black households

This section compares Asian and Black household separately to White households as they have been shown to have different socio-economic characteristics noted earlier in this paper. Our findings are presented in Table 6. The main results for the whole sample are shown in the first two columns. We find that ATT is insignificant when Asian and White households are

**Table 5** Pre- and post- crisis periods and regional analysis. This table reports results for the propensity score matching estimates of the average treatment effect (ATT) of being a non-White household on the likelihood of not having a mortgage. Robust standard errors are bootstrapped

Number of controls matched	Pre-crisis period (2003–2006)	During and post-crisis period (2007–2010)	Regions with more than 5 % non-White population	Regions with less than 5 % non-White population
One	0.075*** (0.026)	0.065* (0.038)	0.028 (0.024)	0.174*** (0.052)
Four	0.066*** (0.025)	0.063* (0.033)	0.044** (0.020)	0.116*** (0.040)
Eight	0.064*** (0.022)	0.070** (0.023)	0.048*** (0.016)	0.108*** (0.031)
Matched observations	949	643	1,362	230
Number of observations	18,056	10,745	15,863	12,938

\*\*\*, \*\* and \* represents significance levels at 1 %, 5 % and 10 %, respectively

**Table 6** Asian and Black Households. This table reports results for the propensity score matching estimates of the average treatment effect (ATT) of being an Asian or Black household on the likelihood of not having a mortgage. Robust standard errors are bootstrapped

Number of controls matched	Pre-crisis period (2003–2006)		During and post-crisis period (2007–2010)		Regions with more than 5 % non-White population		Regions with less than 5 % non-White population			
	Asian versus White	Black versus White	Asian versus White	Black versus White	Asian versus White	Black versus White	Asian versus White	Black versus White		
One	0.003 (0.026)	0.079*** (0.032)	0.028 (0.034)	0.089** (0.040)	0.034 (0.043)	0.125** (0.051)	0.023 (0.027)	0.050** (0.029)	0.096** (0.047)	0.140** (0.062)
Four	0.013 (0.024)	0.088*** (0.022)	0.028 (0.035)	0.075*** (0.036)	0.014 (0.038)	0.092*** (0.029)	0.026 (0.024)	0.076*** (0.026)	0.071 (0.046)	0.109*** (0.050)
Eight	0.018 (0.022)	0.090*** (0.021)	0.030 (0.031)	0.081*** (0.027)	0.002 (0.025)	0.091*** (0.029)	0.012 (0.021)	0.082*** (0.023)	0.071 (0.045)	0.102** (0.049)
Matched observations	896	696	532	417	364	279	746	616	150	80
Number of observations	28,105	27,905	17,250	17,524	10,466	9,396	15,247	15,117	12,858	12,788

\*\*\*, \*\* and \* represents significance levels at 1 %, 5 % and 10 %, respectively

**Table 7** Black Households. This table reports results for the propensity score matching estimates of the average treatment effect (ATT) of being a Black household on the likelihood of not having a mortgage. Robust standard errors are bootstrapped

Number of controls matched	Households with							An income gap
	Income above median value	Income below median value	Employed household head	Household head age younger than 37	Savings			
One	0.080 (0.054)	0.147*** (0.048)	0.134*** (0.040)	0.193*** (0.045)	0.057 (0.049)			0.118*** (0.037)
Four	0.082 (0.058)	0.139*** (0.030)	0.127*** (0.027)	0.130*** (0.039)	0.096** (0.047)			0.125*** (0.032)
Eight	0.066 (0.042)	0.124*** (0.027)	0.145*** (0.029)	0.131*** (0.031)	0.093** (0.044)			0.125*** (0.030)
Matched observations	276	420	466	219	174			458
Number of observations	14,345	12,208	20,283	8,202	10,367			17,248

\*\*\*, \*\* and \* represents significance levels at 1 %, 5 % and 10 %, respectively

matched. The effect of being an Asian household does not reduce the likelihood of not having a mortgage when compared to White households. On the other hand, ATT is positive and significant when we match White households with Black households. Black households are less likely to have a mortgage when compared to White households.

We re-do our analysis for sub-groups pre-and post-crisis period. Our results are presented in columns two to five in Table 6. Similar to the aforementioned findings, we find that, when compared to White households, only ATTs for Black households are significant. Results for Asian households are not statistically significant. These findings are consistent in both the pre and post 2007 periods, with ATTs becoming slightly larger in the latter period when we compare Black to White households. We also separate the regions with higher or lower non-White household populations (again using the 5 % threshold) and compare the sub-groups of households with White households within these two regional groups. Results, presented in the latter four columns of Table 6, show that Black households, whether or not they live in a region with a higher portion of non-White residents, are less likely to have a mortgage. It is worthwhile to note that ATT are larger for the regions with less than a 5 % non-White population.

Overall, our sub-group results reveal that our main findings for the non-White households are driven by the Black household sample. Asian households do not seem to have a lower probability of having a mortgage when compared to White households. Hence, we shift our focus to Black households and stratify this sample by income levels, employment status, age, presence of savings and income gap. Results are presented in Table 7. We find that the difference between Black and White households remains statistically significant when we examine households that have below median income, have an employed household head and have savings. Younger Black households also seem to be less likely to have mortgages in comparison to their White peers. In contrast, ATTs are not significant for above median income groups. Black households with higher levels of income seem to have similar chances of obtaining a mortgage as White households.

## 6 Conclusion

We investigate the probability of households obtaining mortgages in the UK using a sample of 29,732 households between 2003 and 2010. Using PSM we compare mortgage ownership of White and non-White households which are very similar in terms of their observable characteristics. On average, we find no difference in the probability of obtaining a mortgage for White and non-White households. However, we do find that low income Black households are less likely to hold mortgages. We do not observe differences between Black and White households at higher income levels. The 2007/08 financial crisis does not seem to have had any influence in making the situation worse for lower income Black households as they have a higher chance, compared to Whites, of not having a mortgage pre-and post-crisis. There are geographical disparities in our findings: Black households are less likely to have mortgages in regions where fewer minorities reside. In contrast, we find that Asian households, unlike Black households, do not seem to have a lower probability of having a mortgage compared to White households.

Despite possible limitations of our methodology and data, we still argue that more work needs to be done trying to explain why it appears that Black households have poorer use of mortgage finance. One shortcoming of our analysis is that we only observe tenure status of

households as a reduced form outcome, therefore, we cannot determine whether the lower probability of having a mortgage is a result of demand or supply-side factors.<sup>14</sup> It may also be claimed that the results capture self-exclusion due to Black households' possible cultural or religious differences. Our findings parallel those from the literature on SME financing in the UK, where Black business owners are found to have the lowest usage of bank finance. Perhaps, similar to the Black business case, Black households with low incomes may feel discouraged and do not apply for mortgages due to the belief that they would be rejected. An avenue for research may be to further investigate these issues.

Policy makers in the UK should seek to develop mechanisms aimed at lenders so they have to demonstrate that they are not discriminating against certain groups from the mortgage market based on non-economic criteria as well as consider ways to reduce possible barriers that may inhibit Black households' use of mortgage market.

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## References

- Altonji JG, Blank RM (1999) Race and gender in the labor market. In: Ashenfelter O, Card D (eds) *Handbook of labor economics*, vol. 3C. Elsevier Science, Amsterdam
- Arrow KJ (1972) Models of job discrimination. In: Pascal AH (ed) *Racial discrimination in economic life*. Lexington Books, Lexington
- Arrow KJ (1973) The theory of discrimination. In: Ashenfelter O, Rees A (eds) *Discrimination in labor markets*. Princeton University Press, Princeton
- Arrow KJ (1998) What has economics to say about racial discrimination. *J Econ Perspect* 12:91–100
- Ayres I, Siegelman P (1995) Race and gender discrimination in bargaining for a new car. *Am Econ Rev* 85:304–321
- Bates T (2011) Minority entrepreneurship. *Found Trends Entrep* 7:151–311
- Becker GS (1957) *The economics of discrimination*. University of Chicago Press, Chicago
- Benston GJ, Horsky D (1992) The relationship between the demand and supply of home financing and neighborhood characteristics: an empirical study of mortgage redlining. *J Financ Serv Res* 5:235–260
- Berkovec JA, Canner GB, Gabriel SA, Hannan TH (1996) Mortgage discrimination and FHA loan performance. *J Policy Dev Res* 2:9–24
- Black AH, Schweitzer RL, Mandell L (1978) Discrimination in mortgage lending. *Am Econ Rev* 68:186–191
- Black AH, Thomas PB, DeGennaro RP (2003) Is there discrimination in mortgage pricing? The case of overages. *J Bank Financ* 27:1139–1165
- Blackaby DH, Leslie DG, Murphy PD, O'Leary NC (2002) White/ethnic minority earnings and employment differentials in Britain: evidence from the LFS. *Oxf Econ Pap* 54:270–297
- Blanchflower DG, Levine PB, Zimmerman DJ (2003) Discrimination in the small-business credit market. *Rev Econ Stat* 85:930–943

<sup>14</sup> For example, demand-side factors could be that Black households might choose not to purchase homes or apply for mortgages or may have a greater propensity to purchase homes with cash rather than financing. On the supply-side, they may apply for loans at similar rates as Whites but be more likely to be denied mortgages, or they might be offered mortgages with less desirable terms and, therefore, choose to remain in the rental sector.

- Bollini P, Siem H (1995) No real progress towards equity: health of migrants and ethnic minorities on the eve of the year 2000. *Soc Sci Med* 41:819–828
- Brynin M, Güveli A (2014) Understanding the ethnic pay gap in Britain. *Work Employ Soc* 26:574–587
- Calem PS, Gillen K, Wachter S (2004) The neighborhood distribution of subprime mortgage lending. *J Real Estate Financ Econ* 29:393–410
- Carbo S, Gardener E, Molyneux P (2007) Financial exclusion in Europe. *Public Money Manag* 27:21–45
- Card D, Krueger AB (1992) School quality and Black-White relative earnings: a direct assessment. *Q J Econ* 107:151–200
- Carter S, Mwaura M, Ram M, Trehan K, Jones T (2015) Barriers to ethnic minority and women's enterprise: existing evidence, policy tensions and unsettled questions. *Int Small Bus J* 33:49–69
- Cheng P, Lin Z, Liu Y (2015) Racial discrepancy in mortgage interest rates. *J Real Estate Financ Econ* 51:101–120
- Clegg N (2011) Nick Clegg targets racial 'ceiling' in banks and sport. BBC News, available at <http://www.bbc.co.uk/news/uk-politics-15868844>. Accessed: 24 February 2015
- Clotfelter CT, Ladd HF, Vigdor J (2004) Teacher quality and minority achievement gaps. Terry Sanford Institute of Public Policy, Durham
- Coleman S (2000) Access to capital and terms of credit: a comparison of men-and women-owned small businesses. *J Small Bus Manag* 38:48–63
- Courchane MJ, Nickerson D (1997) Discrimination resulting from overage practices. *J Financ Serv Res* 11:133–151
- Crawford GW, Rosenblatt E (1999) Differences in the cost of mortgage credit implications for discrimination. *J Real Estate Financ Econ* 19:147–159
- Darity WA, Mason PL (1998) Evidence on discrimination in employment: codes of color, codes of gender. *J Econ Perspect* 12:63–90
- Dehejia HG, Wahba S (2002) Propensity score-matching methods for nonexperimental causal studies. *Rev Econ Stat* 84:151–161
- Deku S, Kara A, Molyneux P (2015) Access to consumer credit in the UK. *Eur J Financ*. doi:10.1080/1351847X.2015.1019641
- Demircuc-Kunt A, Klapper L (2013) Measuring financial inclusion. Explaining variation in use of financial services across and within countries. Brookings papers on economic activity. Brookings Institute, Washington
- Devlin JF (2005) A detailed study of financial exclusion in the UK. *J Consum Policy* 28:75–108
- Donohue J, Heckman J (1991) Continuous versus episodic change: the impact of civil rights policy on the economic status of Blacks. *J Econ Lit* 29:1603–1643
- Duca JV, Rosenthal SS (1993) Borrowing constraints, household debt, and racial discrimination in loan markets. *J Financ Intermed* 3:77–103
- Dymski G (2006) Discrimination in the credit and housing markets: findings and challenges. In: Rodgers W (ed) *Handbook on the economics of discrimination*. Edward Elgar Publishing, Cheltenham, pp 215–259
- Edelberg W (2007) Racial dispersion in consumer credit interest rates. Federal Reserve Finance and Economics Discussion Series FEDS 28, Washington DC Federal Reserve
- Equality and Human Rights Commission (2010) How fair is Britain? Equality, human rights and good relations in 2010. The first triennial review. Equality and Human Rights Commission, London
- European Commission (2008) Financial services provision and prevention of financial exclusion. Directorate-General for Employment, Social Affairs and Equal Opportunities. European Communities. Available at: [www.2010againstopoverty.eu/extranet/financial\\_exclusion\\_en.pdf](http://www.2010againstopoverty.eu/extranet/financial_exclusion_en.pdf). Accessed 10 January 2015
- Financial Service Authority (2000) In or out? Financial exclusion: a literature and research review. Financial Services Authority, London
- Fraser S (2009) Is there ethnic discrimination in the UK market for small business credit? *Int Small Bus J* 27:583–607
- Goldberg PK (1996) Dealer price discrimination in new car purchases: evidence from the consumer expenditure survey. *J Polit Econ* 104:622–654
- Goodwin D, Adelman L, Middleton S (2000) Debt, money management and access to financial services: evidence from the 1999 PSE survey of Britain. Working Paper No. 8. Bristol: Centre for Research in Social Policy, University of Bristol
- Guryan J, Charles KK (2013) Taste-based or statistical discrimination: the economics of discrimination returns to its root. *Econ J* 123:417–432
- Han S (2011) Creditor learning and discrimination in lending. *J Financ Serv Res* 40:1–27
- Hawley CB, Fujii ET (1991) Discrimination in the consumer credit market. *East Econ J* 17:21–30
- Heath A, Cheung S (2007) Unequal chances: ethnic minorities in western labour markets. Oxford University Press, Oxford
- Heath A, Rothern C (2003) Trends in racial prejudice. In: Park A, Curtice J, Thompson K, Jarvis L, Bromley C (eds) *British social attitudes: the 20th report*. National Centre for Social Research, London

- Hogarth JM, Anguelov CE, Lee J (2005) Who has a bank account? Exploring changes over time 1989–2001. *J Fam Econ Iss* 26:7–30
- Honohan P (2008) Cross-country variation in household access to financial services. *J Bank Financ* 32:2493–2500
- Jones T, McEvoy D, Barrett G (1994) Raising capital for the ethnic minority small firm<sup>7</sup>. In: Hughes A, Storey D (eds) *Finance and the small firm*. Routledge, London and New York, pp 145–181
- Kempson E, Whyley C (1999) *Understanding and combating financial exclusion*. Joseph Rowntree Foundation, York
- Khan O (2008) *Financial inclusion and ethnicity: an agenda for research and policy action*. Runnymede Trust, London
- Kon Y, Storey DJ (2003) A theory of discouraged borrowers. *Small Bus Econ* 21:37–49
- Lang K, Lehmann JK (2012) Racial discrimination in the labor market: theory and empirics. *J Econ Lit* 50:959–1006
- Lang K, Manove M, Dickens WT (2005) Racial discrimination in labour markets with posted wage offers. *Am Econ Rev* 95:1327–1340
- Leslie D, Lindley J, Thomas L (2001) Decline and fall: unemployment among Britain's non-White ethnic communities 1960–1999. *J R Stat Soc Ser A* 164:371–387
- Lin CJ (2010) *Racial discrimination in the consumer credit market*. Ohio State University, Economics Department, Phd thesis
- Lindley JT, Selby E Jr, Jackson JD (1984) Racial discrimination in the provision of financial services. *Am Econ Rev* 74:735–741
- Lordan G, Johnston D (2012) Discrimination makes me Sick! Establishing a relationship between discrimination and health. *J Health Econ* 31:99–111
- Martin RE, Hill RC (2000) Loan performance and race. *Econ Inq* 38:136–150
- Meen G, Andrew M (2005) *Affordability targets: implications for housing supply*. ODPM, London
- Moss P, Tilly C (2001) *Stories employers tell: race, skill, and hiring in America*. Russell Sage, New York
- Munnell AH, Tootell GMB, Browne LE, McEneaney J (1996) Mortgage lending in Boston: interpreting HMDA data. *Am Econ Rev* 86:25–53
- Office for National Statistics (2012) *Ethnicity and national identity in England and Wales, December*. HMSO, London
- Office for National Statistics (2014) *House price index*. Statistical bulletin, July. HMSO, London
- Oliver M, Shapiro T (1997) *Black wealth, white wealth: a new perspective on racial inequality*. Routledge, New York
- Pager D, Quillian L (2005) Walking the talk? What employers say versus what they do. *Am Sociol Rev* 70:355–380
- Pager D, Shepherd H (2008) The sociology of discrimination: racial discrimination in employment, housing, credit, and consumer markets. *Annu Rev Sociol* 34:181–209
- Phillips D, Harrison M (2010) Constructing an integrated society: historical lessons for tackling Black and minority ethnic housing segregation in Britain. *Hous Stud* 25:221–235
- Phillips-Patrick FJ, Rossi CV (1996) Statistical evidence of mortgage redlining? A cautionary tale. *J Real Estate Res* 11:13–24
- Pollin JP, Riva A (2001) Financial inclusion and the role of postal systems. In: Ruozi R, Anderloni L (eds) *Modernization and privatization of postal systems in Europe: new opportunities in the area of financial services*. Springer, London
- Ritter JA, Taylor LJ (2011) Racial disparity in unemployment. *Rev Econ Stat* 93:30–42
- Rosenbaum PR, Rubin DB (1983) The central role of the propensity score in observational studies for causal effects. *Biometrika* 70:41–55
- Ross S, Yinger J (1999) Does discrimination in mortgage lending exist? The Boston Fed study and its critics. In: Turner MA, Skidmore F (eds) *Mortgage lending discrimination: a review of existing evidence*. Urban Inst. Press, Washington
- Schafer R, Ladd H (1981) *Discrimination in mortgage lending*. MIT Press, Cambridge
- Simpson W, Buckland J (2009) Examining evidence of financial and credit exclusion in Canada from 1999 to 2005. *J Socio-Econ* 38:966–976
- Siskin BR, Cupingood LA (1996) Use of statistical models to provide statistical evidence of discrimination in the treatment of mortgage loan applicants: a study of one lending institution. In: Goering J, Wienk R (eds) *Mortgage lending, racial discrimination, and federal policy*. Urban Inst. Press, Washington, pp 451–468
- Smallbone D, Ram M, Deakins D, Baldock R (2003) Access to finance by ethnic minority businesses in the UK. *Int Small Bus J* 21:291–314
- Stephens M (2011) *Tackling housing market volatility in the UK*. Joseph Rowntree Foundation, Housing Market Taskforce
- Tootell GMB (1996) Redlining in Boston: do mortgage lenders discriminate against neighborhoods? *Q J Econ* 111:1049–1079
- Williams RA, Nesiba R, McConnell ED (2005) The changing face of inequality in home mortgage lending. *Soc Probl* 52:181–208
- Wilson WJ (1996) *When work disappears: the world of the urban poor*. Alfred Knopf, New York
- World Bank (2014) *Global financial development report*, Washington DC