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DIVERSITY AND NEIGHBOURHOOD SATISFACTION*

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This article investigates the impact of ethnic diversity on individuals' satisfaction with their neighbourhoods. It uses panel data and a variety of empirical methods to control for potential endogeneity of diversity and of location choices. We find that a higher white share raises overall satisfaction with the neighbourhood in our (overwhelming white) sample, but has no significant impact on generalised trust or other commonly used measures of social capital. We suggest that part of the impact of diversity on overall neighbourhood satisfaction may be through an effect on fear of crime, though we find no effect on actual crime.

Sizeable parts of the population of most Western countries seem troubled by increased ethnic diversity in their societies. For many people, the most direct impact of these changes is felt in their communities. This article is about how ethnic diversity within neighbourhoods in the UK affects people's satisfaction with their local areas.

We consider a wider range of outcomes than most of the existing literature: overall satisfaction with the neighbourhood, trust in others, activity in organisations (these two being commonly used measures of 'social capital', e.g., Putnam, 2000), the intention to move, actual residential mobility, perceptions of and actual crime, and the quality of social life and of local services. In doing so, we aim to provide a more complete description of the impact of diversity on communities. The main findings of our article are that a lower white share leads to lower levels of neighbourhood satisfaction in our (overwhelmingly white) sample and increased perceptions of crime (though crime itself seems unrelated). But diversity is not strongly associated with the level of generalised trust, activity in organisations, the quality of social life or the quality of local services. The lack of correlation with many of these variables is perhaps as interesting as the significant results. This article contributes to two sizeable strands of research on the impact of diversity at local level: studies of the link between social capital and diversity, and studies on the impact of diversity on neighbourhood choices and residential mobility.

A number of existing studies find that greater diversity reduces trust (Putnam, 2007; Dinesen and Sønderskov, 2012), lowers involvement in organisations (Alesina and La Ferrara, 2000, 2002; Costa and Kahn, 2003), lowers the level of social cohesion (see the survey by Van der Meer and Tolsma, 2014), lowers the level of public good provision (Alesina *et al.*, 1999; the review by Alesina and La Ferrara, 2005), lowers the quality of government (Alesina and Zhuravskhaya, 2011) or changes attitudes to redistribution (Dahlberg *et al.*, 2012).

The studies cited above have been controversial and subject to a number of criticisms (see Portes and Vickstrom, 2011, for an overview). First, confounding factors—at both individual and neighbourhood levels—may play a role in explaining the correlation between diversity and trust. One example of this can be poverty, as shown by the Moving To Opportunity (MTO) evaluations

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(Kling *et al.*, 2007, Ludwig *et al.*, 2012, and Chetty *et al.*, 2016), which have found important effects of neighbourhood poverty on subjective well-being, mental health and long-term child outcomes. In addition, Uslaner (2012) argues that it is segregation rather than diversity that is important, while Tesei (2015) points to the importance of racial income inequality.

There are also concerns that most studies in this area rely on correlations in cross-sectional data in which causal evidence is limited (Portes and Vickstrom, 2011).[1] One contribution of this article is to pay greater attention to causality using three different approaches. First, we use individual-level longitudinal data to document the effect of diversity on neighbourhood perceptions. This allows us to control for individual and neighbourhood fixed effects. Second, we develop an empirical approach to control for the possible selection bias caused by the endogeneity of residential choice. Third, we instrument for diversity using an instrument popularised by Altonji and Card (1991) and Card (2001), which uses predicted ethnic mix based on neighbourhood-specific initial ethnic mix and national growth rates in the population of different ethnic minorities. We hope that, in addressing these empirical issues, we will make some progress in providing causal estimates of the impact of diversity. Throughout, we report a wide variety of specifications (including some very demanding ones) in order to convey the robustness (or lack of it) of our empirical findings.

One other relevant literature is that on how ethnic composition affects neighbourhood choice. In the United States the most striking evidence for this is 'white flight', the process by which some US neighbourhoods and cities rapidly became majority black (Card *et al.*, 2008; Boustan, 2010, 2012, for the United States and Kaufmann and Harris, 2015, for the UK) but other studies have also estimated preferences for racial composition (e.g., Bayer *et al.*, 2007). Studies of residential mobility reveal the preferences of the marginal residents of a neighbourhood but, without further assumptions, find it harder to make more general statements about the impact of diversity on preferences. In contrast, our variable on neighbourhood satisfaction is informative about the preferences of infra-marginal residents, which may be the most important impact, especially in countries like the UK where residential mobility is quite low. To give an extreme example, if residential mobility costs were so high that nobody ever changed neighbourhood, studies of residential mobility would yield no information about preferences over neighbourhood composition but our variable would be able to identify the effect.

A further area in which this article makes a contribution is its study of the UK.[2] Most of the literature on diversity studies the United States, and there is a risk that conclusions do not generalise to other countries, e.g., because of the different history and nature of inter-ethnic relations.[3] The influential study of Putnam (2007) concludes by noting that the rise in diversity is probably here to stay and societies need to work out how to manage its consequences—consideration of other countries can then be helpful in deciding whether some impacts are

[1] There are some exceptions that focus on the impact on diversity on slightly different outcomes. Most of these study the MTO experiment in the United States (Kling *et al.*, 2007, Ludwig *et al.*, 2012, and Chetty *et al.*, 2016) and exploit the random provision of housing vouchers to encourage low-income families to move to lower-poverty neighbourhoods. An example applied to a different context is Algan *et al.*, 2016. They exploit the random assignment of tenants to apartment blocks in France to investigate the impact of ethnic diversity on social relationships and housing quality.

[2] The existing studies of the UK (Laurence and Heath, 2008; Letki, 2008; Andrews, 2009; Fieldhouse and Cutts, 2010; Twigg *et al.*, 2010; Laurence, 2011; Becares *et al.*, 2011; Sturgis *et al.*, 2011; Demireva and Heath, 2014) have focused on the link between diversity and trust with the main focus being whether neighbourhood deprivation or diversity is the most important factor.

[3] For example, black–white interactions might be thought to be different in the two countries, as evidenced by the different levels of interracial marriage. Fryer (2007) reports that in 2000 about 5% of blacks in the United States are in an interracial marriage while for the UK in 2001, 35% of blacks are in a an interracial couple.

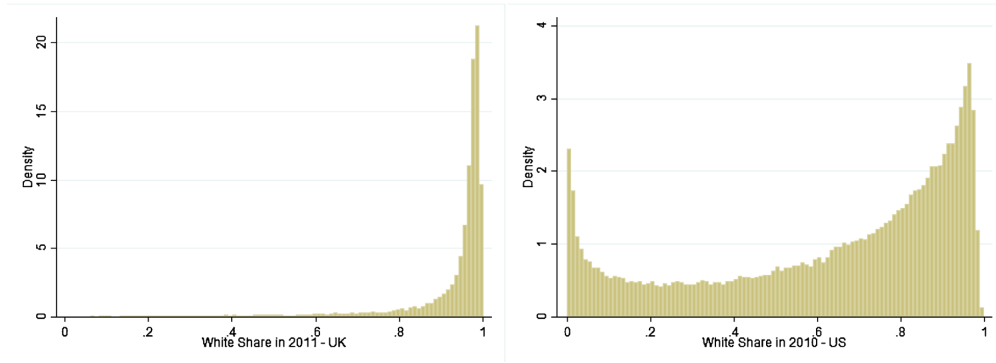

Fig. 1. *Distribution of the Share of White People Across Small Areas. UK and US Comparison.* ***Panel A:*** *UK, 2011, Census Wards.* ***Panel B:*** *US, 2010, Census Tracts*

Notes: Authors' elaboration of UK Census Data (2011) and US Census Data (2010). Census Wards refer to Census Area Statistics (CAS) Wards created for 2001 Census outputs. There are 10,072 CAS Wards in England, Wales and Scotland, and they account for, on average, 5,000 people. Census tracts for the United States are small, statistical divisions that account for 4,000 people on average.

inevitable or can be mediated. The UK is an interesting country in which to study the impact of diversity, as many neighbourhoods have undergone sizeable changes in the last 25 years. The fraction of the population that is non-white has risen from 5.3% in the 1991 census to 11.7% in the 2011 census. However, the pattern of residential segregation is very different in the UK and the United States, which might indicate differences in attitudes to diversity. Fig. 1 presents the density of the white share of the population in US census tracts in 2010 and UK wards in 2011.[4] The United States shows a marked bimodality, which might be taken as prima facie evidence that people care about the ethnic composition of their neighbourhood. But the UK distribution has no bimodality, perhaps suggesting that ethnic diversity is less salient in the UK than in the United States.

To summarise, we think that our article makes a contribution in the following areas: by investigating the impact of diversity on a wider range of outcomes than considered by most of the literature, by paying more attention than most studies to confounding factors and causality, by providing information about the impact of diversity on infra-marginal neighbourhood residents and by providing estimates of the impact of diversity for a country other than the United States.

The plan of the article is as follows. In Section 1 we describe the individual data that we use, and introduce the outcome measures that we study. Section 2 presents the neighbourhood data and discusses our measures of diversity. Section 3 describes our empirical methodology and the instrumental variables and selection controls that we use to address endogeneity of our diversity measure and of residential choices. Section 4 reports our results for satisfaction with the neighbourhood—we find robust evidence that a lower white share is associated with lower neighbourhood satisfaction. Section 5 presents evidence that neighbourhood satisfaction predicts intention to move and actual residential moves. Section 6 considers outcomes that have often been studied in the social capital literature (trust and activity in organisations)—we find no significant,

[4] Both tracts and wards have average population of about 4,000 so are broadly comparable in size.

robust, relationship with diversity. Section 7 considers satisfaction with particular aspects of the neighbourhood—perceptions of crime, and quality of local services and social life. We find negative effects of the white share on perceptions of crime, which are not mirrored by evidence on actual crime rates. Results on the quality of services and of social life are more mixed and generally not significantly different from zero. Section 8 provides an account of the transmission mechanism from neighbourhood characteristics to overall satisfaction with the neighbourhood. These estimates cannot be thought of as causal but we argue that they can provide some suggestive evidence on which channels may play a predominant role in explaining how diversity affects neighbourhood satisfaction. Section 9 concludes.

1. Individual Data

This study uses data for the period 1991–2014 from the British Household Panel Study (BHPS)[5] and its successor Understanding Society (UKHLS),[6] two longitudinal British surveys with a similar sample structure to the PSID in the United States, though asking a wider range of questions on social attitudes. They follow a representative sample of households over time, interviewing all individuals aged 16 or above.[7] BHPS started in 1991 and lasted for 18 waves, finishing in 2008. The first wave included around 10,300 individuals from 5,500 households in Great Britain.[8] UKHLS started in 2009 and is still ongoing. The first wave surveyed individuals from approximately 40,000 households. Since 2010, UKHLS also includes the whole BHPS panel[9] that, at the time, surveyed individuals from about 8,000 households. Together, they allow for the construction of a panel that covers more than 20 years. They include a wide variety of detailed questions on perceptions and attitudes towards the neighbourhood where people live. Unfortunately, not all questions appear in each year and there is no year in which all questions that we consider appear[10]—this has implications for our empirical enquiry, which we discuss below. Table 1 presents descriptive statistics on the variables, grouped into broad categories. First, there a question on whether people like their present neighbourhoods: 92.6% do. This is the main outcome variable that we study, primarily because it captures overall satisfaction with neighbourhoods but also because it is asked more frequently than many of the other questions and because it is where our results seem to be more robust. We also consider the fraction who plan to stay in their current neighbourhood (69%) and their actual mobility from one year to the next (6.7%). The next panel of Table 1 considers some measures of social capital—generalised trust, whether active in or member of at least one organisation and whether one is willing to improve one's neighbourhood. The third panel of Table 1 presents measures relating to the perception of crime—both an overall worry about being a victim of crime (47.8% of people are) and fears

[5] University of Essex, Institute for Social and Economic Research (2014). British Household Panel Survey, Waves 1–18, 1991–2009: Special Licence Access, Lower Layer Super Output Areas and Scottish Data Zones. [data collection]. 3rd edition. UK Data Service. SN: 6136, http://doi.org/10.5255/UKDA-SN-6136-2

[6] Kantar Public, NatCen Social Research, University of Essex, Institute for Social and Economic Research (2016). Understanding Society: Waves 1–6, 2009–2015: Special Licence Access, Census 2001 Lower Layer Super Output Areas. [data collection]. 7th edition, [original data producer(s)]. UK Data Service. SN: 6670, http://doi.org/10.5255/UKDA-SN-6670-7

[7] Since 1994, BHPS includes a short module for individuals aged 11–15.

[8] Following the first wave sampling, new entrants in the sample are mainly represented by people reaching the minimum age for the interview and people joining the original households. Additional samples of households from Scotland and Wales were included in 1999, and for Northern Ireland in 2001.

[9] The attrition rate for the BHPS panel between 2008 and 2010 was 20%.

[10] Table B1 in the Online Appendix lists the relevant questions and the waves in which they appear.

Table 1. *Descriptive Statistics for Values and Attitude Variables in the British Household Panel and in Understanding Society.*

Variable	Mean	Standard Deviation	N
Satisfaction:			
Like your present neighbourhood	0.926	0.262	244,223
Plan to stay in your neighbourhood	0.690	0.463	102,012
Actual mobility	0.067	0.250	428,457
Social capital:			
Generally speaking, most people can be trusted	0.368	0.482	102,584
Active in at least one organisation	0.585	0.493	164,438
Member of at least one organisation	0.530	0.499	164,661
Willing to improve your neighbourhood	0.760	0.427	102,115
Crime:			
Worry you're being victim of crime	0.478	0.500	76,264
Feel unsafe walking alone at night	0.182	0.386	76,229
Likely home broken into	0.236	0.425	33,480
Likely car stolen/broken into	0.078	0.269	33,482
Likely people being attacked on the street	0.083	0.276	33,807
Likely racial insults/attacks	0.056	0.230	33,405
Likely teenagers hanging about	0.568	0.495	34,114
Likely drunks/tramps on the street	0.149	0.356	34,082
Likely graffiti on the walls	0.232	0.422	34,152
Likely vandalism	0.263	0.440	34,130
Quality of local services:			
Good schools	0.699	0.459	61,387
Good medical services	0.706	0.456	73,782
Good transportation	0.500	0.500	70,804
Good shopping facilities	0.577	0.494	75,323
Good leisure facilities	0.441	0.497	71,382
Suitable for children	0.656	0.475	32,953
Social life:			
Meet your neighbours often	0.772	0.419	147,400
Friends in the local neighbourhood	0.613	0.487	102,377
Can obtain advice locally	0.563	0.496	102,176
Can you borrow from people in the neighbourhood	0.440	0.496	102,039
Feel similar to people in the neighbourhood	0.605	0.489	102,149
Talk to people in your neighbourhood	0.694	0.461	102,441
Satisfied with social life	0.656	0.456	141,769

Notes: All variables are dummies constructed on affirmative replies to the corresponding questions. Table B1 in the Online Appendix reports the waves where each variable appears.

about specific types of crime. As a summary index of fear of crime we mostly use the overall 'worry' question as this has the largest sample size, having been a question in more waves of the survey. The fourth panel of Table 1 summarises responses to questions about the quality of local services such as schools, medical, transport, shopping and leisure. The final panel of Table 1 summarises measures relating to the quality of social life, such as interactions and friendships with neighbours. We combine measures of social capital, quality of local services, and quality of life in separate indices that are constructed using the first principal component of each group of variables. Principal component analysis results are reported in Table B2 of the Online Appendix.

Table 2. *Descriptive Statistics for Individual-level Characteristics for the British Household Panel and Understanding Society Sample.*

Variable	Mean	Standard Deviation
Age	46.42	18.46
Female	0.539	0.498
Unemployed	0.045	0.208
Retired	0.215	0.411
Full-time student	0.007	0.085
Other non-working	0.049	0.216
Married	0.532	0.499
Number of children	0.511	0.929
Non-white	0.097	0.296
Higher education	0.293	0.455
Low education	0.242	0.428
No education	0.175	0.380
Social house tenant	0.180	0.384
Private tenant	0.099	0.299

Notes: Excluded dummies for each set—working, high school education and homeowners, for labour force status, education and house status, respectively—are not reported.

All our regressions control for year fixed effects and, although they are not the focus of interest, we also include individual-level controls, which are summarised in Table 2. The individual-level controls are age, education, gender, labour force status, housing tenure, marital status, number of children and a dummy variable for being non-white (though some of these variables are redundant in the specifications with individual fixed effects). We also control for time-varying and time-invariant neighbourhood characteristics that we discuss in the following section.

2. Neighbourhood-Level Data

The geo-coded versions of the BHPS and UKHLS also contain detailed information on the residence of the respondents in each wave, specifically the Lower Super Output Area (LSOA) level[11] that will be our main geographical reference.[12] There are 40,880 LSOAs in Britain,[13] containing on average 1,395 people.[14] The sample size of BHPS/UKHLS is too small to be able to compute reliable neighbourhood characteristics at this spatial scale so we use other data sources to measure them, mostly the decennial censuses, 1991–2011 inclusive.

2.1. *Measuring Diversity*

The main variable of interest in our study is ethnic diversity. The number of ethnic groups categorised varies across censuses and in our analysis we use nine groups that can be defined

[11] LSOAs were created from the 2001 population census to improve the reporting of small area statistics; they were then revised according to the 2011 census. Both BHPS and UKHLS contain information at the 2001 LSOA level. In 2001, LSOAs in England and Wales were constructed to have a minimum of 1,000 inhabitants and 400 households, and a maximum of 3,000 inhabitants and 1,200 households. Scotland designed statistical areas following the same criteria. Where other area codes were available, information was harmonised using Postcodes Directories (EDINA, University of Edinburgh) and Postcode Headcounts (Office for National Statistics).

[12] In all text, 'neighbourhood' means Lower Super Output Area.

[13] 32,476 of which are in England, 6,502 in Scotland and 1,896 in Wales. Northern Ireland is excluded from this analysis.

[14] This datum refers to the 2001 *Census of Population* reference year for the LSOA areas used in this article.

Table 3. *Descriptive Statistics for Area-Level Characteristics.*

Variable	Mean	Standard Deviation	Min	Max
Britain: all areas (census years only)				
White share	0.919	0.143	0.007	1
Ethnic fractionalisation index	0.127	0.181	0	0.869
Ethnic fractionalisation index (non-whites only)	0.647	0.200	0	0.880
Immigrant fractionalisation index	0.145	0.140	0	0.681
Black share	0.021	0.052	0	0.637
Asian share	0.046	0.099	0	0.987
Muslim share	0.017	0.060	0	0.938
Immigrant share	0.088	0.107	0	0.939
Immigrant share from EU	0.027	0.029	0	0.378
Immigrant share from rest of the world	0.061	0.086	0	0.911
Unemployment rate	0.037	0.034	0	0.990
Area (Ha)	564	2,720	0.73	115,963
Country of birth mix in 1971 (area level)	0.097	0.098	0	0.641
House owners	0.669	0.198	0	1
Urban areas in 1991	0.110	0.312	0	1
Britain: BHPS and UKHLS sample				
White share	0.900	0.175	0	1
Ethnic fractionalisation index	0.146	0.203	0	0.872
Ethnic fractionalisation index (non-whites only)	0.666	0.166	0	0.877
Immigrant fractionalisation index	0.156	0.149	0	0.683
Black share	0.022	0.055	0	1
Asian share	0.057	0.125	0	0.962
Muslim share	0.025	0.084	0	0.952
Immigrant share	0.097	0.118	0	0.757
Immigrant share from EU	0.030	0.031	0	0.422
Immigrant share from rest of the world	0.067	0.095	0	0.757
Unemployment rate	0.037	0.029	0	0.589
Area (Ha)	599	2,152	1.24	77,870
Country of birth mix in 1971 (area level)	0.092	0.093	0	0.641
House owners	0.672	0.193	0.008	1
Urban areas in 1991	0.106	0.308	0	1

Notes: Area-level information refers to the Lower Super Output Area codification related to the 2001 census. *Britain overall* panel displays descriptive statistics for all English, Welsh and Scottish LSOAs for the census years only. *BHPS and UKHLS sample* panel displays results for the subset of LSOAs that appears in the British Household Panel and in Understanding Society. Please refer to Online Appendix A for a description of the variables included.

on a consistent basis: White, Indian, Pakistani, Bangladeshi, Chinese, Black Caribbean, Black African, other Asian, other Black, and a residual category grouping together all other ethnicities. We use information from 1991 to construct an instrumental variable for the ethnic mix, as explained in the following section.[15]

We impute values for the inter-censual years using linear interpolation for each area. The use of interpolation for inter-censual years will not lead to bias if the deviation of the true level of the white share from the trend is independent of the level of the trend, i.e., the true white share varies randomly about the trend. As an additional check on our procedure we apply it to data at a higher level of geographical aggregation (local authorities), where annual series on residents by country of birth are available. The correlation between our interpolated series and the actual series is 0.98, providing reassurance about the interpolation procedure.

[15] We will also compare our results with what can be obtained by running the analysis measuring diversity with respect to the country of birth. Results are discussed at the end of Section 5.

The existing literature uses a variety of measures to summarise the ethnic mix of an area. One popular measure is the fractionalisation index (see, e.g., Alesina and La Ferrara, 2000), which is defined as:

$$FRAC_n = 1 - \sum_g s_{gn}^2, \tag{1}$$

where s_{gn} is the share of ethnic group g in neighbourhood n. This can be interpreted as the chance that two randomly chosen people in the area belong to different groups.[16] The fractionalisation index is simply one of many possible ways in which the ethnic mix of a neighbourhood might affect outcomes. It might be that it is only the share of one's own ethnic group that is important or it might be the shares of particular ethnic groups. Or it might also be that it is the immigrant share rather than the ethnic group that is important. In the UK, historically, most minorities were migrants and most migrants were minorities. But this correlation has weakened over time: many minorities are now UK–born and there has been substantial white immigration into the UK following the accession of the Eastern European A8 countries into the EU in 2004.

In principle, one can distinguish between these different hypotheses by conducting a 'horse race', testing one measure against another and seeing which has the greatest explanatory power. In practice, we do not have enough power in the data to resolve this question beyond reasonable doubt as there is a high degree of collinearity between different possible diversity measures as shown in Table 4.[17] For example, the correlation between the white share and the ethnic fractionalisation index is −0.96 because there are only a small number of neighbourhoods where the minority share is very high.[18] The practical implication is that one cannot distinguish clearly between the hypothesis that it is the white share that is the relevant neighbourhood characteristic or the fractionalisation index. This is in spite of the fact that these have different implications, e.g., a linear effect of the white share implies a monotonic relationship between the white share and outcomes while the fractionalisation index does not—however, the values of the white share where they are different is sparse in our data.

After some experimentation we decided to use the white share as the diversity measure in our main specification, as this can be considered a parsimonious model for diversity that seems to work best for most specifications (see Becares *et al.*, 2011, for another study that uses ethnic group shares as the diversity measure). But we recognise that others might prefer other variables, and we also present results for a variety of alternative specifications—including the fractionalisation index and the shares of people in the other ethnic groups as additional variables, as well as the shares of migrants and of Muslims. While we do think that our article presents robust evidence that there is an impact of some measure of ethnic mix on neighbourhood satisfaction, we also think that the exact measure of the ethnic mix that is important remains a more open question.

One other issue that we do not explore is the difference between fractionalisation and segregation (e.g., see Alesina and Zhuravskhaya, 2011; Uslaner, 2012). Many measures of segregation (see Massey and Denton, 1988, for a classic review) depend not just on the ethnic composition of the own neighbourhood but on its comparison with the ethnic composition of a wider area (e.g.,

[16] An alternative interpretation relates to individuals putting a positive weight on their own-group share so that the 'treatment' effect varies across ethnic groups within their neighbourhood. The fractionalisation index is then the average treatment effect across neighbourhoods.

[17] Information on the country of birth is also available for the 1991–2011 censuses but the country of birth classification changes quite extensively across censuses. To estimate the migrant mix we use four groups that are consistently available throughout all censuses: the United Kingdom, Ireland, Europe and other countries.

[18] Fewer than 1% of the LSOAs have a proportion of white people that is lower than 50% white in 1991, and, even though the white share fell over time, only 5% of areas had less than 50% white residents in 2011.

Table 4. *Correlations Between Measures of Diversity.*

	White share	Ethnic F-index	Ethnic F-index (non-whites)	Immigrant F-index	Asian share
White share	1				
Ethnic F-index	−0.958*	1			
Ethnic F-index (non-whites)	−0.161*	0.238*	1		
Immigrant F-index	−0.853*	0.906*	0.290*	1	
Asian share	−0.904*	0.804*	0.062*	0.702*	1
Black share	−0.727*	0.773*	0.219*	0.688*	0.382*
Immigrant share	−0.886*	0.902*	0.247*	0.979*	0.745*
Immigrant share (EU)	−0.528*	0.617*	0.293*	0.822*	0.351*
Immigrant share (RoW)	−0.927*	0.918*	0.209*	0.944*	0.811*
Muslim share	−0.692*	0.580*	−0.013*	0.472*	0.804*
Unemployment rate	−0.163*	0.166*	0.020*	0.091*	0.113*
	Black share	Immigrant share	Immigrant share (EU)	Immigrant share (RoW)	Muslim share
Immigrant share	0.696*	1			
Immigrant share (EU)	0.488*	0.797*	1		
Immigrant share (RoW)	0.704*	0.979*	0.657*	1	
Muslim share	0.245*	0.494*	0.182*	0.555*	1
Unemployment rate	0.205*	0.097*	0.042*	0.107*	0.134*

Notes: Correlations are estimated for the universe of the LSOAs, for the years for which census data are available, namely 1991, 2001 and 2011. Please refer to Online Appendix A for a description of the variables included. F-index denotes fractionalisation index. Unemployment rate vs. unemployment rate correlation cells are excluded from the table for the sake of space. *Immigrant share (EU)* is the share of residents born outside UK and inside the EU, while *Immigrant share (RoW)* is the share of residents born in a non-EU country. * $p < 0.01$.

a city), and the segregation index applies to this larger area. A neighbourhood with a low white share would not be classed as a segregated neighbourhood if surrounding areas also had the same white share. Which measures affect people's welfare is ultimately an empirical matter,[19] but it is perhaps plausible that it is the ethnic composition of the local neighbourhood itself that is the most important. However, Echenique and Fryer (2007) develop a 'spectral segregation index' that can be used to compute measures of segregation for individuals using information on social networks. We do not have direct measures of social networks but if all connections are within the neighbourhood and those connections are drawn at random from people in the neighbourhood then the spectral segregation index corresponds to the white share (Ballester and Vorsatz, 2014). So our preferred measure of diversity can—under some assumptions—be given a theoretical justification.

2.2. *Other Neighbourhood Characteristics*

Even though our main interest is in the measures of diversity described above, our specifications include time-varying controls for deprivation, which is likely to be another factor influencing satisfaction and which has received a lot of attention in the UK literature (e.g., Demireva and Heath, 2014, inter alia). We use two measures. The first is the 'claimant count' (an

[19] We provide some comparison with the effect of diversity calculated at different spatial scales in the Online Appendix, finding that our results are almost entirely explained by the local area level variation rather than the one measured at higher layers.

administrative measure of the numbers claiming jobseeker's allowance, the UK's unemployment-related benefit) normalised by the working-age population so this can be interpreted as a measure of the unemployment rate, and we refer to it as such. The claimant count is available at the LSOA level on an annual basis through NOMIS.[20] We include this as a control variable in all our specifications. The second is the UK government's Index of Multiple Deprivation (IMD) that combines a range of indicators of disadvantage including the claimant count and crime rates. This is the measure of deprivation most commonly used in the existing literature for the UK (e.g., Demireva and Heath, 2014). The IMD is available at five-yearly intervals so has to be interpolated for intervening years. There is the concern that some of the indicators in the IMD might be considered as potential outcomes, and the IMD varies in the way it is constructed across UK countries. However, our results are robust to whether we include or exclude the IMD. As an additional time-varying area-level control, we include the fraction of households in the area who are homeowners: we experimented with other time-varying controls (details are given in Section 4) but this was the only one we found to be significant.

In specifications that do not include neighbourhood fixed effects we control for some other time-invariant area characteristics, namely the 1971 country of birth mix,[21] the 1991 industrial composition, the size of the neighbourhood and a dummy for the urbanisation of the area in 1991.[22] This is important as some studies (e.g., Sturgis *et al.*, 2011) have argued that the estimated impacts of diversity are sensitive to the other neighbourhood controls that are included.

We now turn to the empirical specification we use.

3. Empirical Specification

We are interested in how the white share (or some other neighbourhood characteristics) affects an outcome variable, y. Suppose we can model the outcome variable for individual i in neighbourhood n in period t, y_{int}, as:

$$y_{int} = \beta^n W_{n(i,t)t} + \beta^c x^c_{int} + u_{int}, \tag{2}$$

where x^c_{int} are individual and neighbourhood characteristics, while W_{nt} is the white share in neighbourhood n in period t and $n(i, t)$ denotes the neighbourhood in which individual i is living in period t. u_{int} is a residual that might have both a neighbourhood and an individual component. We typically have a relatively small number of observations per neighbourhood but this is not a problem unless the selection of the sampled individuals within neighbourhoods is biased in some way and the data is not constructed in a way that would lead to such a bias.

There are several issues associated with the estimation of (2). First, it might be that even if people were randomly assigned to their neighbourhoods (which they are not), the white share is correlated with unobserved neighbourhood characteristics so that the errors in (2), u_{int}, are not independent of the white share W_{nt} and OLS estimation of (2) would lead to bias. One strategy for dealing with this issue is to control for a wide range of neighbourhood characteristics and to exploit our longitudinal data by including individual, area fixed effects, and combinations

[20] This corresponded to the count of the number of people claiming jobseeker's allowance (JSA) from 1996 until 2012. With the introduction of the universal credit system in 2013, means-tested elements of JSA have been replaced by this new system (Nomis, Official Labour Market Statistics).

[21] Constructed upon five 'country of birth' groups: United Kingdom and Europe, Africa, India, Pakistan and other countries: data from 1971 *Census of population*.

[22] Table 3 shows descriptive statistics for those control variables.

of them. This may not eliminate all sources of bias (e.g., there could be other time-varying covariates) so our main strategy is to instrument for the white share (the precise instrument is described later), i.e., to assume that there is a set of instrumental variables z_{nt} independent of u_{int} but correlated with W_{nt}. The first stage of this instrumental variable approach will then be:

$$W_{nt} = \pi^n z_{nt} + \pi^c x_{int} + \eta_{int} \equiv \hat{W}_{n(i,t)t} + \eta_{int}. \tag{3}$$

3.1. *Sample Selection*

Even if one assumes that W_{nt} is independent of unobserved neighbourhood characteristics, estimation of (2) faces an additional problem caused by the fact that each individual is only observed in one neighbourhood in each period. The observed neighbourhood (and hence the observed white share) is possibly correlated with u_{int} as individuals are more likely to be found in neighbourhoods that offer them higher utility. In other words, the neighbourhood in which we observe people is the result of a choice. We do have evidence that people do respond in this way—e.g., 'white flight', the process by which some US neighbourhoods and cities rapidly became majority black (Card *et al.*, 2008; Boustan, 2010, 2012, for the United States, and Kaufmann and Harris, 2015, for the UK). A less dramatic example would be the literature on how immigration into an area affects the migration decisions of natives (Borjas, 1987, 1994; Borjas *et al.*, 1996; Card and Di Nardo, 2000; Card, 1990, 2001, 2005; Saiz and Wachter, 2011; Amior, 2019).

This source of bias cannot be resolved by including fixed effects or instrumenting the neighbourhood white share so requires a different approach. The first step of the approach that we use to deal with the choice process is to substitute (3) into (2) to have:

$$y_{int} = \beta^n \hat{W}_{nt} + \beta^c x^c_{int} + \beta^n \eta_{int} + u_{int}. \tag{4}$$

We then assume that neighbourhood choice is based on the maximisation of some objective function, V_{int}, which is given by:

$$V_{int} = \gamma^n W_{nt} + \gamma^c x^c_{it} + \nu_{int}, \tag{5}$$

where the residuals ν_{int} may be correlated with $(\eta_{int},\ u_{int})$ but are assumed independent of the instruments z_{nt}. Substituting (3) into (5) leads to:

$$V_{int} = \gamma^n \hat{W}_{nt} + \gamma^c x^c_{it} + \gamma^n \eta_{int} + \nu_{int}. \tag{6}$$

Following Das *et al.* (2003), we also assume that the expectation of the error in (4) can be written as a function of the propensity scores, p_{int}, the probability of individual i choosing neighbourhood n, conditional on the covariates, and the neighbourhood being chosen. In the non-binary case, this will generally be the probabilities of choosing all neighbourhoods, not just the chosen one.[23] That is, one can write (4) as:

$$E\left[y_{int} | X_{int},\ D_{int} = 1\right] = \beta^n \hat{W}_{nt} + \beta^c x^c_{int} + \lambda\left(p_{i1t},\ \ldots,\ p_{iNt}\right), \tag{7}$$

where are X_{int} all the individual and area level characteristics for which we control, and D_{int} is a binary variable taking the value 1 if individual i is observed in neighbourhood n at time t. The final term, $\lambda(p_{i1t},\ \ldots,\ p_{iNt})$, can be thought of as a more complicated version of the

[23] This might seem an arbitrary assumption but it is satisfied by all the most commonly used discrete choice models. See Das *et al.* (2003) for details. Dahl (2002), building on Lee (1983), presents assumptions under which the sample selection term depends only on the probability of the chosen option—as this probability depends on the payoffs from all options this leads to an empirical formulation similar to the more general case.

familiar sample selection correction term popularised by Heckman (1976, 1979). Using (6), the propensity scores can be written in the following form:

$$p_{ijt} = p_j\left[\gamma^n\left(\hat{W}_{1t} - \hat{W}_{nt}\right), \ldots, \gamma^n\left(\hat{W}_{Nt} - \hat{W}_{nt}\right)\right]. \tag{8}$$

The propensity scores have this form because only the differences in the white shares affect choices, whereas the individual characteristics cancel out. In our context, where the number of neighbourhoods that an individual might choose is very large, it is not computationally straightforward to estimate (7) and (8) in its general form. Our approach is to approximate the terms using a linear form. That is, we write (7) as:

$$E\left[y_{int}|X_{int},\ D_{int} = 1\right] = \beta^n \hat{W}_{nt} + \beta^c x^c_{int} + \sum_{j \neq n} \omega_{nj}[\gamma^n\left(\hat{W}_{jt} - \hat{W}_{nt}\right)], \tag{9}$$

where ω_{nj} is the weight put on the white share of neighbourhood j in influencing the sample selection term for neighbourhood n. It is natural to assume that more distant neighbourhoods have less influence and we assume that the weights have the form:

$$\omega_{nj} = e^{-\alpha d_{nj}}, \tag{10}$$

where d_{nj} is the distance between the neighbourhoods and α is a measure of the cost of distance. Using (10) in (9) leads to

$$E\left[y_{int}|X_{int},\ D_{int} = 1\right] = \beta^n \hat{W}_{nt} + \beta^c x^c_{int} + \beta^a\left(\hat{W}_{(\cdot,n)t} - \hat{W}_{nt}\right), \tag{11}$$

where

$$\hat{W}_{(\cdot,n)t} = \sum_{j \neq n} e^{-\alpha d_{nj}} \hat{W}_{jt}, \tag{12}$$

i.e., the sample selection correction term is a function of the difference between the chosen neighbourhood white share and a weighted average of other neighbourhood white shares.[24] In implementing (12) we use a value $\alpha = 0.03$ derived from census data on residential moves, though our results are not sensitive to this choice over plausible values.[25] The sample selection term can be interpreted as a first-order Taylor series approximation to the difference in utility between living in this neighbourhood and others in a discrete choice model where one nest is the current neighbourhood and the other nest is all other neighbourhoods.

The intuition for how one can distinguish between the impact of the absolute value of the white share on neighbourhood satisfaction and sample selection is that the fact that people have to live somewhere means that the choice of neighbourhood will be influenced by the white share in this neighbourhood relative to that in other possible residential choices. So sample selection will be determined by the relative, not the absolute, white share, as shown in (11).

Equation (11) is not quite estimable because it includes the predicted values for the white share. To estimate the model, we replace with the actual white share and instrument it. For the own neighbourhood we use an own-neighbourhood instrument and for the sample selection term we use the equivalent relative instrument.

[24] Weights ω_{nj} are rescaled to sum up to 1.

[25] Specifically, to determine the value of α we exploit LSOA level flow data from 2001 and 2011 censuses of population. We estimate the probability of moving from one area to other group areas—based on the distance from the area of origin—as a function of the distance between areas. The resulting α is approximately 0.03. As a robustness check, we also set α to be equal to 1. Results are quite similar in magnitude to the ones displayed in the tables.

3.2. *Instrumental Variable*

As an instrument for the white share we use a 'shift-share' instrument popularised by Altonji and Card (1991) and Card (2001). This type of instrument builds on the idea that, for historical reasons, area varies in terms of ethnic composition. Our main instrument for the ethnic shares is constructed in the following way. Denote by n_{gn0} the population of minority group g in neighbourhood n in some base year. Denote by P_{gt} the population of minority group g at time t and by P_{g0} the population of minority group g at some initial time. Then we define the predicted share of each ethnic group g in neighbourhood n at time t, $\widehat{s_{gnt}}$, based on national population movements as:

$$\hat{s}_{gnt} = \frac{n_{gn0}\dfrac{P_{gt}}{P_{g0}}}{\sum_{g'} n_{g'n0}\dfrac{P_{g't}}{P_{g'0}}}. \tag{13}$$

And we use as the instrument for the ethnic mix measure I $(\hat{s}_{1nt,}, \ldots, \hat{s}_{Gnt})$. In level equations when we do not have neighbourhood fixed effects we control for the initial ethnic mix in the area: this ensures that variation in the instrument comes from the interaction of initial ethnic mix and the changing population shares of different ethnic groups in the UK as a whole.

We will use this instrumental variable method in most of our specifications.[26] Our first stages, reported in the Online Appendix, Table B3, are always very strong. Although this instrument is common in the literature, two recent papers have raised concerns about its use. Goldmsith-Pinkham *et al.* (2018) have argued that the Altonji–Card instrument is numerically equivalent to using initial ethnic shares as instruments when there are only two periods of data for each cross-sectional unit.[27] But this is not the case when there are more than two periods, as in our application. All our specifications include time effects and either baseline ethnic group shares or neighbourhood fixed effects as controls so the variation exploited in the instrument comes from the interaction of the time-varying national ethnic minority shares and the cross-neighbourhood variation in initial ethnic minority shares. Ruist *et al.* (2018) argue that the high degree of persistence in the shift-share instrument leads to a conflation of the short- and long-run responses of the labour market to immigration shocks. It is not clear that the same pattern of dynamic adjustment is so relevant in our application, but we obtain similar results if we follow the recommendation of Ruist *et al.* (2018) and apply their 'double instrument' method using lagged instruments.[28]

In our main specification the instrument is based on the current neighbourhood in which an individual is living. An alternative is to construct an instrument based on the minority shares in the initial neighbourhood in which the individual is observed. This has the advantage that the baseline minority shares will not be influenced by subsequent mobility but has the disadvantage that the instrument used would change as one varies the first period in which an individual is observed and one still has to worry about the selection into the initial neighbourhood. The sample selection term related to this can, however, be absorbed into individual fixed effects when they are included. The correlation between these two instruments is very high—0.88—because residential

[26] In some specifications we use an example analogous to this IV also for the sample selection control.

[27] Their paper is actually framed in terms of discussion of the Bartik instrument (Bartik, 1991) for local demand shocks, but the principle is the same.

[28] More detailed discussion on this point appears in the following section.

mobility rates are relatively low. So, in our preferred specifications the use of this instrument does not alter the results very much.

4. Results for Overall Satisfaction with Neighbourhood

This section reports results for regressions where the dependent variable is a dummy taking value 1 for people answering *Yes* to the question *Do you like your neighbourhood?* On average, 92.6% of people do. The variable we are interested in is the white share (our measure of diversity). To convey the robustness of the results we report a wide range of specifications:

- With or without individual fixed effects, area fixed effects, (Individual × area) fixed effects, and (individual + area) fixed effects
- Ordinary Least Squares (OLS) and Instrumental Variables (IV) models
- With and without corrections for sample selection
- In levels and differences.

These vary in the type of variation in the white share that is being used to estimate the effect on neighbourhood satisfaction. These specifications are much more wide ranging and demanding than those found in almost all of the existing literature. For example, Putnam (2007) only presents cross-sectional evidence without any fixed effects, and without controlling for endogeneity or sample selection (though there is a discussion of many of these issues). The results for the levels specifications are contained in Table 5 and the differences specifications in Tables 6 and 7. All specifications also contain controls for individual characteristics[29] and a variety of baseline neighbourhood characteristics,[30] as well as time-varying measures of local deprivation: the number of benefit claimants over working-age population, the IMD and the share of home owners. Some of these characteristics only vary across individuals or over time, so will be redundant in some fixed-effect specifications. All specifications cluster the standard errors at LSOA level, the level at which the white share is computed.

4.1. *Levels*

The first column of the top panel of Table 5 shows the results for a model estimated by OLS and without any individual or area fixed effects or sample selection effects but including individual and neighbourhood characteristics. This specification is the closest to those estimated in most of the existing literature on the impact of diversity.[31] It uses variation in the white share across the neighbourhoods chosen by different individuals and variation over time in the white share of the same neighbourhood. There is a significant positive effect of the white share on neighbourhood satisfaction—a fall of 10 percentage points (approximately the change over the period 1991–2011) in the white share is estimated to reduce neighbourhood satisfaction by 1.3 percentage

[29] Namely age—second degree polynomial; gender; working status dummies; marital status dummy; number of children; ethnicity dummy—white vs not white; education dummies; and house tenure dummies. All regressions control for wave fixed effects.

[30] Country of birth fractionalisation index calculated according to 1971 census, shares of employees in each industrial sector (one-digit SIC) in 1991. Other fixed geographical characteristics included are the size of the LSOA, a dummy for urbanisation, and dummies for regions.

[31] This is not to say that there are no studies that attempt to deal with endogeneity issues—for example, see Leigh (2006) and Bjørnskov (2007) for papers using an IV approach in trust equations.

Table 5. *The Impact of the Ethnic Mix on How People Like Their Neighbourhood.*

	No sample selection				
	(1)	(2)	(3)	(4)	(5)
	No FE	*Individual FE*	*Area FE*	*Individual × Area FE*	*Individual + Area FE*
A1. OLS					
White share	0.129***	0.258***	0.100*	0.201***	0.207***
	(0.019)	(0.038)	(0.055)	(0.068)	(0.070)
N	237,884	204,419	233,936	196,239	202,769
A2. OLS—Sample Selection					
White share	0.157***	0.294***	0.114	0.187**	0.241**
	(0.043)	(0.075)	(0.087)	(0.091)	(0.096)
N	237,884	204,419	233,936	196,239	202,769
B1. IV					
White share	0.104***	0.261***	0.079	0.271***	0.269***
	(0.025)	(0.047)	(0.076)	(0.096)	(0.099)
N	233,697	200,433	229,786	192,496	198,806
KP	3405.482	2425.552	506.513	328.597	311.318
B2. IV—Sample Selection					
White share	0.075	0.219**	0.087	0.198*	0.221*
	(0.062)	(0.102)	(0.106)	(0.118)	(0.123)
N	233,697	200,433	229,786	192,496	198,806
KP	44.032	725.242	149.081	101.886	97.219
White share	0.098***	−0.049	−0.025	0.268***	0.285***
	(0.029)	(0.156)	(0.188)	(0.101)	(0.105)
N	233,732	200,498	229,793	192,551	198,859
KP	1112.013	147.779	195.646	281.851	264.085
C2. Initial area IV—Sample Selection					
White share	0.078	−0.028	0.108	0.199	0.209
	(0.071)	(0.140)	(0.175)	(0.124)	(0.129)
N	233,732	200,498	229,793	192,551	198,859
KP	56.492	32.659	68.795	86.045	79.940

Notes: *OLS* is the baseline specification not including any fixed effects. *Individual FE* specifications include respondents' fixed effects, *Area FE* include Lower Super Output Area fixed effects, *Area × Individual FE* include LSOA-individual specific fixed effects, and *Area + Individual FE* include both LSOA and individual fixed effects, taken as separate sets. Panel B shows Instrumental Variable estimates. Right-hand panels include controls for sample selection, as illustrated by equation (13), with α equal to 0.03. IV-Sample Selection specifications use instrumental variables for both the share of white people and for the corresponding sample selection variable. Sample selection coefficients are reported in Table B4 of the Online Appendix. First stage coefficients for the endogenous variables are reported in Table B3 in the Online Appendix. Please refer to Online Appendix A for a description of the control variables and of the variables of interest. KP is the Kleibergen–Paap weak instrument statistic. Standard errors in parentheses, clustered at the LSOA level in all specifications. All regressions include individual, LSOA-level controls, and time fixed effects. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

points. So column 1 of panel A1 suggests that diversity may be important. This is broadly consistent with the findings in Letki (2008), who includes neighbourhood satisfaction as one component of her 'neighbourhood attitude' index.

However, it is possible that these effects cannot be interpreted as causal, as they may be biased for a number of reasons. It may be that the types of individuals who live in more diverse areas are different in some unobserved way that also affects neighbourhood satisfaction. A natural way to explore this hypothesis is to exploit the longitudinal nature of our data and include individual

Table 6. *The Impact of Ethnic Mix on How You Like Your Neighbourhood. First Difference Results.*

	No Sample Selection			
	(1)	(2)	(3)	(4) within area × individual
A1. OLS				
White share (first difference)	0.388***		0.371***	0.518***
	(0.047)		(0.048)	(0.118)
White share (ITT)		−0.179	−0.181	
		(0.150)	(0.145)	
N	171,082	171,083	171,082	156,684
A2. OLS—Sample Selection				
White share (first difference)	0.642***		0.746***	0.482**
	(0.101)		(0.124)	(0.134)
White share (ITT)		0.135	−0.502***	
		(0.172)	(0.205)	
N	171,082	171,083	171,082	156,684
B1. IV				
White share (difference)	0.339***		0.311***	0.913***
	(0.056)		(0.057)	(0.210)
White share (ITT)		−0.130	0.287	
		(0.251)	(0.239)	
N	167,782	167,871	167,782	153,802
KP	4480.868	639.423	311.468	520.218
B2. IV—Sample Selection				
White share (difference)	0.774***		0.794***	0.593**
	(0.129)		(0.133)	(0.224)
White share (ITT)		0.085	−0.268	
		(0.265)	(0.283)	
N	167,782	167,871	167,782	153,802
KP	255.135	303.831	147.322	256.762

Notes: Robust standard errors clustered at the LSOA level in parentheses. In each regression the dependent variable is a dummy that takes value 1 if the respondent states that he/she likes the neighbourhood in which he/she lives. Please refer to Online Appendix A for a description of the control variables and of the variables of interest. KP is the Kleibergen–Paap weak instrument statistic. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

fixed effects—results when we do so are reported in column 2, panel A1. One is now using variation in the white share for the same individual, both from changes within neighbourhoods and changes that result from residential mobility. The diversity variable remains significantly different from zero and the estimated effect is almost double that found in column 1, panel A1. There is no a priori expectation about how the inclusion of individual fixed effects[32] would be expected to affect the estimate: our results imply that there is a negative correlation between people who like *all* neighbourhoods (which is what the fixed effect measures) being less likely to live in neighbourhoods with a high white share.

Column 3, panel A1 reports results when neighbourhood fixed effects are included.[33] In this specification the impact of the white share is smaller than that found in column 1, panel A1, as well as less precisely estimated. That might be explained by the fact that minorities tend to live in

[32] Individual fixed effects are slightly less than 22,000 in this specification.
[33] Neighbourhood fixed effects are approximately 16,000 in this specification.

Table 7. *The Impact of Changes in the Ethnic Mix on How People Like Their Neighbourhood. First Difference Results, Comparison of Results in Different Subsamples.*

	(1) Never moved	(2) Moved at least once	(3) Moving years	(4) Not moving years
A1. OLS				
White share (first difference)	0.289**	0.383***	0.368***	0.383***
	(0.140)	(0.048)	(0.048)	(0.116)
N	84,971	86,111	24,871	146,211
A2. OLS—Sample Selection				
White share (first difference)	0.269*	0.690***	0.723***	0.379***
	(0.139)	(0.111)	(0.122)	(0.116)
N	84,971	86,111	24,871	146,211
B1. IV				
White share (difference)	0.248	0.329***	0.310***	0.599***
	(0.250)	(0.057)	(0.057)	(0.193)
N	83,396	84,386	24,222	143,560
KP	301.289	4433.471	4404.783	498.430
B2. IV—Sample Selection				
White share (difference)	0.229	0.787***	0.778***	0.438**
	(0.259)	(0.132)	(0.133)	(0.210)
N	83,396	84,386	24,222	143,560
KP	178.641	309.666	524.672	247.783

Notes: Robust standard errors clustered at the LSOA level in parentheses. All specifications control for individual, LSOA characteristics and time fixed effects. In each regression the dependent variable is a dummy that takes value 1 if the respondent states to like the neighbourhood in which he/she lives. See Online Appendix A for a description of the control variables and of the variables of interest. See Section 4 for a discussion of the various First Difference Specifications, Instrumental Variables, and controls for sample selection. KP is the Kleibergen–Paap weak instrument statistic. Column 1 shows results for the subsample of people who always remained in the same LSOA, column 2 people who moved at least once, column 3 people who moved at least once, keeping only the years when they moved and the year before that, column 4 people who never moved or of people who moved, but keeping only years when they stayed in the same LSOA. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

less desirable neighbourhoods. In this specification one is exploiting variation in the white share within neighbourhoods over time but there might be correlations with individual characteristics that we think are also important. For this reason, our preferred models control for both area and individual fixed effects.[34]

Given the nature of our data, we can combine area and individual fixed effects in two ways. We can include different fixed effects for each individual-area combination[35] (column 4, panel A1), i.e., a different fixed effect if an individual changes area. This specification exploits variation in the white share as experienced by individuals who remain in the same area. The estimated impact of the white share is now 2 percentage points for a 10 percentage points increase in the white share. Alternatively, including both area and individual fixed effects separately[36] (column 5, panel A1) leads to similar results to the Individual × area fixed effects estimates.

[34] This may come at the cost of not being able to compare our results with area-level aggregate specifications for all models, although we think that the gains in following this approach are higher as accounting for both fixed effects sets is important in this context where we want to study individuals' perceptions.

[35] This leads to slightly less than 30,000 fixed effects.

[36] This leads to slightly less than 31,000 fixed effects.

Our fixed effects specifications do not control for the possible sample selection of individuals into areas. For this reason, we include the sample selection variable that we illustrate in the previous section—essentially, a weighted average of the diversity variable in the surrounding neighbourhood. Results are shown in panel A2 of Table 5. When the sample selection term is included, the estimated coefficients are mostly similar to those in the equivalent specification without sample selection terms, although slightly less significant. The sample selection terms themselves are not generally significant from zero, as shown in Table B5 of the Online Appendix. This is not too surprising, given that the rates of residential mobility are low so that most individuals are in the same neighbourhood from one year to the next. Given that the sample selection term has little predictive power of this term and makes little difference to the results,[37] most of the specifications reported in the rest of the article do not control for sample selection.

While the use of fixed effects and the included time-varying covariates (individual employment status and neighbourhood deprivation and the fraction of home owners[38]) allay some concerns about the endogeneity of the white share, it remains possible that it is correlated with some other time-varying characteristic. For this reason, we also use an instrumental variable strategy instrumenting the white share with variables that one can argue are uncorrelated with unobserved neighbourhood characteristics. The IV estimates are in specifications in panel B1 that mirror the specifications of panel A1. The first stages are reported in Table B6 in the Online Appendix. The Kleibergen–Papp test statistic is reported and the values suggest that the instruments are generally very strong. The estimated coefficients are similar to the OLS estimates though the standard errors are larger and the coefficient estimate with area fixed effects only is not significantly different from zero at conventional significance levels (the instrument becomes weaker in this case, though still very strong). However, including individual as well as area fixed effects or an Individual $\times$ area fixed effect leads to larger and more significant estimated effects, as was the case for the OLS counterparts. Overall, the results seem quite robust. Columns in panel B2 also include the selection term and instrument for it with an IV that is essentially a weighted average of our Card IV. Results are similar in signs, but in general noisier, but one should also take into account that these are very demanding specifications: there are two endogenous variables once the sample selection term is included, as well as a great number of fixed effects.

Panels C1 and C2 of Table 5 presents IV estimates with the alternative instrument discussed earlier, based on the ethnic group shares of the neighbourhood in which an individual is first observed in the sample. Results with just individual or area fixed effects are weaker in this case but results with both types of fixed effects are similar to those with the other instrument. When sample selection terms are included results are slightly weaker than their panel B1 and B2 counterparts, although coefficients are quite similar in our preferred specifications (area and individual FE combinations). However, the sample selection terms themselves are never significant (Table B4) so that one can accept the hypothesis that sample selection is not important.

Table B7 in the Online Appendix investigates the robustness of our results using two methods proposed by Ruist *et al.* (2018) to allay concerns about serial correlation in the instrument and possible dynamic responses. In both cases results for the current white share are similar to our baseline specification.

[37] We experimented its inclusion for all models. In none of these is the selection term statistically relevant, nor does it alter the results.

[38] Tables 2 and 3 illustrate the full set of characteristics that we include in our specifications. As an additional robustness check Table B5 in the Online Appendix shows that results are robust to controlling for the LSOA annual average house price from the Land Registry data. As house price data is only available from 1995 and for England and Wales only, and also could be argued to be endogenous itself, we prefer to keep this control out of our main analysis.

Overall, Table 5 suggests a significant positive effect of the white share on neighbourhood satisfaction. The estimates suggest that a fall in the white share of 10 percentage points is likely to reduce neighbourhood satisfaction by 1–3 percentage points (the average of people dissatisfied is 7.4%) with perhaps a central estimate a little above 2 percentage points.

4.2. *First Differences*

Equation (2) can also be written in first-differenced form as:

$$\Delta y_{int} = \beta^n \Delta W_{it}^{FD} + \beta^c \Delta x_{int}^c + \Delta u_{int},$$

where we define $\Delta W_{it}^{FD} = W_{n(i,\ t)t} - W_{n(i,\ t-1)t-1}$, using $n(i,\ t)$ to represent the area in which individual i lives at time t. This is the natural way to take the first difference, as the question on neighbourhood satisfaction refers to the current neighbourhood. The first column of Table 6 reports estimates for the model in this form, both OLS (panels A1 and A2) and IV (panels B1 and B2) without and with sample selection.[39] Column 1 estimates the model by OLS in panel A1 and by IV in panel B1. The OLS results are in line with the results for 'levels' that an increase in the white share increases neighbourhood satisfaction (though the magnitude of the effect is larger in the differences specification)—in the IV specification the results are quite similar.

For those who do not change neighbourhood ('stayers'), ΔW_{it}^{FD} is the change in the white share within the neighbourhood, but for those who do change area ('movers') the first-difference term also picks any change in the white share that comes from the change in location. The latter source of variation might be thought to be problematic because the residential mobility decision is clearly endogenous. To deal with this, one might consider estimating a model in which the change in diversity is measured for the original area. This could be interpreted as an 'intention to treat' (ITT) estimator, as some individuals can avoid the change in the white share—the "treatment" in this case—by moving to a different area, thus not receiving the 'treatment'. Hence, define $\Delta W_{it}^{ITT} = W_{n(i,\ t-1)t} - W_{n(i,\ t-1)t-1}$ i.e., the change in the white share experienced by the area in which the individual was living last year.

The ITT estimate does not directly measure how much people care about the white share in their current neighbourhood that is the main aim of our enquiry. Suppose that people do care about diversity but that residential mobility is very high and the range of neighbourhoods on offer is so great that any change in the current neighbourhood that one disliked could be avoided by moving to another area. In this case the ITT estimate would be zero but it would be wrong to conclude that people do not care about their neighbourhood—it would be more accurate to say that residential mobility insures them against any changes that they do not like. Similarly, if residential mobility itself is costly, one should not conclude that individuals do not care about diversity on the basis that the ITT estimate is zero.

Using ΔW_{it}^{ITT} as the regressor leads to the results reported in column 2, panel A1, for the OLS estimator and column 2, panel B1, for the IV estimator (we call this the ITT estimate). The estimated coefficients are very different from the equivalent specifications in column 1 of panels A1 and B1. Most strikingly, the coefficient on the ITT white share in the OLS specification becomes negative, though not significantly different from zero.

[39] First-differencing is an alternative way to eliminate individual fixed effects so we do not report specifications with them included.

To investigate the differences between the FD and ITT results, we include both white share variables in the same regression, i.e., estimate:

$$\Delta y_{int} = \beta_1^n \Delta W_{it}^{FD} + \beta_2^n \Delta W_{it}^{ITT} + \beta^c \Delta x_{it}^c + \Delta u_{in(i,t)t}. \quad (14)$$

Column 3 of Panels A1 and B1 present estimates of (14). Column 3 of panel A1 shows that ΔW_{it}^{FD} always has a positive sign, significantly different from zero. However, conditional on ΔW_{it}^{FD}, ΔW_{it}^{ITT} has a negative coefficient in most specifications but has a positive insignificant coefficient in the instrumental variable estimate without sample selection. A significant negative effect of ΔW_{it}^{ITT} could be interpreted as individuals experiencing relief if they have moved away from an area that was becoming less white because they have avoided changes with which they would have been uncomfortable. This explanation is speculative, but the results do suggest that neighbourhood satisfaction may not simply be driven by characteristics of the current neighbourhood. Finally, we also consider first-difference specifications within Individual × neighbourhood pairs, i.e., using only within area changes for each individual—these are reported in column 4, panel A1 for OLS and panel B1 for IV.[40] Also in this case we find that a higher white share is associated with higher neighbourhood satisfaction. The right-hand panel of Table 6 presents estimates of fixed-difference specifications with sample selection corrections. The first-difference specifications are similar, though the instruments become weaker once sample selection is accounted for (panel A2 for OLS and B2 for IV results).

The estimates in Table 6 include both movers and stayers. There might be concerns that these are very different groups with very different responsiveness of neighbourhood satisfaction to the white share. The first column of Table 7 reports estimates for the first difference model estimated on people who never moved in the period in which we observed them, both OLS (panels A1 and A2) and IV (panels B1 and B2) without and with sample selection. The second column reports results for people who moved at least once in the sample. Column 3 shows results for the same sub-population, but isolating only the years when respondents move. The last column pools together information for people who never moved and people who moved, but keeping just years when they do not move. Overall, the results are similar to those reported in Table 6.

4.3. *Heterogeneity in Coefficients*

One obvious concern with the estimates presented so far is that they assume that all individuals are affected by neighbourhood characteristics in the same way, i.e., that the effects are homogeneous.

First, individuals might prefer to be surrounded by their own ethnic group so that the coefficient on the white share would be different, possibly differently signed for whites and ethnic minorities. Some 90.3% of the BHPS-UKHLS sample is white, so the estimates reported above will largely reflect their preferences but the preferences of minorities might well be different.[41] This has been explored by Becares *et al.* (2011), who use data from the British Citizenship Survey that over-samples ethnic minorities to investigate the impact of diversity and deprivation on social cohesion. Table 8 replicates the specifications without sample selection of Table 5 for the sub-sample of white respondents (panels A1 and A2) and of non-white respondents (panels B1 and

[40] This approach is similar to the one used by Dustmann and Fasani (2016) to estimate the impact of crime on mental health at the local level.

[41] BHPS does not over-sample minorities, though UKHLS does. However, UKHLS is a small part of our sample. See Knies *et al.* (2016) for an analysis of UKHLS data showing that people have higher life satisfaction when surrounded by co-ethnics. The short sample period does not allow for as rich a set of covariates as we consider.

Table 8. *The Impact of the Ethnic Mix on How People Like Their Neighbourhood. Results by Respondents' Ethnic Group.*

	OLS				
	(1)	(2)	(3)	(4)	(5)
	No FE	*Individual FE*	*Area FE*	*Individual × Area FE*	*Individual + Area FE*
A1. OLS—Sub-sample: White respondents					
White share	0.180***	0.261***	0.085	0.203***	0.217***
	(0.027)	(0.039)	(0.071)	(0.076)	(0.078)
N	226,186	198,740	222,324	190,787	197,113
A2. IV—Sub-sample: White respondents					
White share	0.147***	0.233***	0.028	0.261**	0.254**
	(0.035)	(0.052)	(0.103)	(0.112)	(0.116)
N	222,041	194,793	218,216	187,083	193,189
KP	2465.339	2559.929	387.600	301.158	286.300
B1. OLS—Sub-sample: Non-white respondents					
White share	0.053**	0.181	0.056	0.018	0.018
	(0.026)	(0.122)	(0.149)	(0.182)	(0.195)
N	11,698	5679	10,177	5452	5531
B2. IV—Sub-sample: Non-white respondents					
White share	0.031	0.366**	0.118	0.138	0.075
	(0.037)	(0.146)	(0.210)	(0.254)	(0.273)
N	11,656	5640	10,136	5413	5492
KP	1490.481	207.430	68.144	61.793	54.440

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time-fixed effects. See notes of Table 5. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

B2). Not surprisingly, as they represent the vast majority of the sample, results for the white sub-sample are quite similar to the results for the whole sample. For the non-white sub-sample, results are positive in all specifications though smaller than the estimates for the white sub-sample in eight out of ten specifications. But the estimates for the non-white sample are only significantly different from zero in one specification. Although the positive coefficients are intriguing, the lack of precision in the estimates means that it is dangerous to read too much into them—a Bonferroni correction for the number of models estimated suggests that even the most significant estimate is not significant at the 95% level.

Other differences often discussed are that elderly and less educated residents may be less comfortable with diversity than the young and more highly educated residents, or that home ownership is important because it affects the ability to move areas and any impact on house prices might also be a consideration.

Table 9 investigates possible heterogeneity introducing in the baseline specifications interactions of the diversity variable with individuals' ethnicity, level of education, age, and home ownership status.[42] We present five sets of estimates, OLS and IV,[43] with different combinations of fixed effects, similarly to what we do for our main specifications (Table 5). There is some evidence of heterogeneity in the results for the highly educated group, for the non-white

[42] We also considered gender, but this was never significant.

[43] First-stage coefficients for the IV models are shown in Table B8 in the Online Appendix for models that include both area and individual fixed effects.

Table 9. *Heterogeneity of the Impact of Ethnic Mix on How People Like Their Neighbourhood.*

	(1) No FE	(2) Individual FE	(3) Area FE	(4) Individual × Area FE	(5) Individual + Area FE
			OLS		
White share	0.190***	0.299***	0.158***	0.176*	0.253***
	(0.027)	(0.058)	(0.061)	(0.106)	(0.089)
White share × Non-white	−0.113***	0.057	−0.117**	0.019	−0.007
	(0.029)	(0.106)	(0.051)	(0.165)	(0.146)
White share × Higher educ.	−0.057***	−0.199***	−0.001	0.138	0.002
	(0.020)	(0.063)	(0.021)	(0.142)	(0.085)
White share × Low education	0.001	0.064	0.005	0.077	0.008
	(0.003)	(0.078)	(0.003)	(0.139)	(0.098)
White share × No education	−0.001	0.015	0.004	−0.113	−0.187
	(0.004)	(0.095)	(0.004)	(0.146)	(0.116)
White share × Age below 50	0.012***	0.009**	0.008**	−0.002	−0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
White share × Homeowner	0.001	0.002	−0.008	0.013	0.015
	(0.011)	(0.011)	(0.014)	(0.011)	(0.011)
White share × Social tenant	−0.030	−0.002	−0.015	0.018	−0.021
	(0.030)	(0.063)	(0.043)	(0.082)	(0.084)
N	237,884	204,419	233,936	196,239	202,769
			IV		
White share	0.150***	0.251***	0.175*	0.213	0.209
	(0.038)	(0.074)	(0.090)	(0.155)	(0.135)
White share × Non-white	−0.089***	0.241**	−0.100**	0.030	0.115
	(0.032)	(0.112)	(0.050)	(0.173)	(0.151)
White share × Higher educ.	−0.088***	−0.277***	−0.019	0.178	0.027
	(0.021)	(0.072)	(0.023)	(0.158)	(0.091)
White share × Low education	0.002	0.092	0.005	0.114	0.081
	(0.003)	(0.094)	(0.003)	(0.172)	(0.109)
White share × No education	−0.002	0.116	0.003	−0.030	−0.067
	(0.004)	(0.106)	(0.004)	(0.164)	(0.122)
White share × Age below 50	0.012***	0.008**	0.007*	−0.002	−0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
White share × Homeowner	0.022	0.093**	−0.026	0.014	0.051
	(0.027)	(0.043)	(0.035)	(0.051)	(0.049)
White share × Social tenant	−0.019	0.019	−0.057	−0.066	−0.080
	(0.036)	(0.069)	(0.051)	(0.097)	(0.096)
N	233,697	200,433	229,786	192,496	198,806

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time-fixed effects. See notes of Table 5. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

respondents and for older people. Results are not robust to the inclusion of area fixed effects and to combinations of area and individual fixed effects.

4.4. *Other Robustness Checks*

In an earlier section we discussed how it is difficult to identify separately whether the right variable to measure diversity is the white share or the fractionalisation index. So it is also possible that our results could really be picking up the impact of some other correlated measure of diversity.

For this reason, we explore results using alternative measures for diversity. Table 10 shows the results obtained with IV strategy, while in the Online Appendix (Table B9) we show the OLS counterpart. We use the fractionalisation index (panel A), a fractionalisation index computed only on the non-white groups together with the white share (panel B), the white share and the black share (panel C), the white share and the Asian share (panel D), the white share and the Pakistani/Bangladeshi share (to pick up the possible hostility towards Muslims) (panel F), the white share and the immigrant share (panel F) and the white share and the foreigner share, separated by people born in Europe and people born in the rest of the world (panel G). An overall theme is that there is a robust significant impact of diversity on neighbourhood satisfaction but that the high degree of collinearity between different diversity measures means that one can be less sure about exactly which aspect of diversity is important. When we compare the white share coefficient to other group shares (panels B–G) the white share tends to prevail, although there is loss of precision in some specifications, in particular when area fixed effects are introduced. One intriguing aspect of the results reported in panels F and G is that the estimated impact of migrants is positive, albeit not significantly different from zero in the preferred specifications. This might be thought surprising, given that negative attitudes towards migrants played an important role in the Brexit vote, but much of the hostility towards migrants is in areas with relatively low migrant shares and Akay *et al.* (2017) found for Germany that more migrants led to higher levels of subjective well-being. However, the standard errors are very large in this case because the white and migrant shares are highly correlated (see Table 4).

In the existing UK literature on the impact of diversity on social capital, there is considerable discussion of the impact of deprivation (Laurence and Heath, 2008; Letki, 2008; Andrews, 2009; Fieldhouse and Cutts, 2010; Twigg *et al.*, 2010; Laurence, 2011; Becares *et al.*, 2011; Sturgis *et al.*, 2011; Demireva and Heath, 2014). All our estimates control for the time-varying unemployment rate as a measure of deprivation. There is perhaps some independent interest in the impact of the unemployment rate on neighbourhood satisfaction (see also Kling *et al.*, 2007, and Ludwig *et al.*, 2012 for the impact of neighbourhood poverty on various measures of well-being) and these results are reported in Online Appendix C. There is a significant impact of unemployment on neighbourhood satisfaction in some specifications, but not all. Because one might also be concerned about the endogeneity of the unemployment rate, Appendix C also reports results when it is treated as endogenous.

We have assumed that it is the LSOA that is the appropriate level of geographical aggregation for affecting neighbourhood satisfaction. We check this using two alternative methods. First, we estimate the same model using travel to work area (TTWA) fixed effects instead of neighbourhood fixed effects (Table B10 in the Online Appendix), finding similar results. Second, we control for measures of diversity calculated both at the neighbourhood and at the TTWA level, and we find that the effect of neighbourhood level diversity is essentially unaltered in our preferred specifications and is the most important factor (Table B11 in the Online Appendix).

Because data on ethnic mix are available only for census years, we use interpolation for the intervening years. The use of interpolation for inter-censual years will lead to unbiased estimates if the deviation of the true level of the white share from the trend is independent of the level of the trend white share, i.e., the true white share varies randomly about the trend. In addition, as reported earlier, our interpolation method works well at a higher level of geographical aggregation for which annual data on the white share are available. Nevertheless, one might be concerned that this interpolation influences the results in some ways. Table B12 in the Online Appendix presents estimates when the sample is restricted to the three census years. In this case very few estimates

Table 10. *How Does the Ethnic Mix Affect How People Like Their Neighbourhood? Comparison Between Different Specifications for Diversity. Instrumental Variable Results.*

		IV				
		(1) *No FE*	(2) *Individual FE*	(3) *Area FE*	(4) *Individual × Area FE*	(5) *Individual + Area FE*
A	F-index	−0.094***	−0.185***	−0.088	−0.213***	−0.216***
		(0.022)	(0.036)	(0.066)	(0.079)	(0.081)
	N	233,697	200,433	229,786	192,496	198,806
	KP	4357.835	4270.823	650.261	418.936	400.556
B	White share	0.106***	0.275***	0.075	0.275***	0.271***
		(0.025)	(0.048)	(0.078)	(0.097)	(0.101)
	F-index (non-white)	−0.008	−0.051	−0.080	−0.101	−0.121
		(0.020)	(0.036)	(0.066)	(0.073)	(0.075)
	N	224,241	191,535	220,437	183,905	189,963
	KP	291.487	402.219	41.980	36.943	35.163
C	White share	0.115***	0.207***	0.203	0.310	0.207
		(0.027)	(0.059)	(0.232)	(0.295)	(0.299)
	Black share	0.064	−0.247*	0.723	0.224	−0.355
		(0.067)	(0.145)	(1.303)	(1.636)	(1.637)
	N	233,697	200,433	229,786	192,496	198,806
	KP	1014.995	976.386	5.400	3.445	3.491
D	White share	−0.006	0.223**	−0.069	0.134	0.243
		(0.049)	(0.097)	(0.294)	(0.422)	(0.429)
	Asian share	−0.146**	−0.054	−0.278	−0.256	−0.047
		(0.057)	(0.130)	(0.525)	(0.762)	(0.774)
	N	233,697	200,433	229,786	192,496	198,806
	KP	753.883	807.403	19.359	12.579	11.900
E	White share	0.089***	0.174***	0.037	0.226	0.278*
		(0.031)	(0.059)	(0.121)	(0.160)	(0.164)
	Muslim share	−0.035	−0.238**	−0.163	−0.187	0.038
		(0.046)	(0.117)	(0.404)	(0.640)	(0.651)
	N	233,697	200,433	229,786	192,496	198,806
	KP	1537.608	396.713	13.231	7.397	7.110
F	White share	0.261***	0.637***	−0.397	0.584	0.459
		(0.044)	(0.089)	(0.630)	(0.947)	(0.935)
	Foreigners share	0.312***	0.712***	−0.709	0.478	0.290
		(0.080)	(0.147)	(0.944)	(1.456)	(1.435)
	N	233,655	200,395	229,746	192,461	198,768
	KP	542.721	328.233	17.085	9.586	9.916
G	White share	0.378***	0.779***	0.466	0.573	0.807
		(0.068)	(0.123)	(0.969)	(1.941)	(1.889)
	EU foreigners	−0.162	0.088	−0.676	0.479	0.278
		(0.231)	(0.428)	(0.877)	(1.480)	(1.492)
	Non-EU foreigners	0.588***	1.073***	1.081	0.456	1.019
		(0.142)	(0.274)	(2.207)	(4.372)	(4.238)
	N	233,655	200,395	229,746	192,461	198,768
	KP	220.782	106.568	3.209	0.926	0.948

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time-fixed effects. See notes to Table 5. Each panel corresponds to a different set of regressions. F-index denotes fractionalisation index. Please refer to Online Appendix A for variables description. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

are significantly different from zero, but this is perhaps not surprising given that one is discarding over 90% of the observations and that fixed effects specifications will be very demanding when an individual can be observed at most three times in the data.

4.5. *Summary*

Most of the specifications that we report suggest that an increase in the white share increases neighbourhood satisfaction among our (overwhelmingly white) sample. We find this in levels and differences, with and without individual fixed effects, allowing for endogeneity and sample selection. Most of the estimated coefficients are in the region 0.1–0.3 with perhaps a central estimate around 0.2. As the white share has fallen by about 10 percentage points in the period 1991–2011 these estimates would imply that neighbourhood satisfaction has fallen by between 1 and 3 percentage points over this period because of rising diversity. This effect is not enormous but the baseline probability is 92.5%, so this is perhaps a sizeable rise in the fraction who are not satisfied with their neighbourhood.

5. Residential Mobility

One potential criticism of the analysis so far is that response to the neighbourhood satisfaction question simply reflects people's subjective response to which no significance can be attached. One way of addressing this is to consider whether responses to the neighbourhood satisfaction question are correlated with intentions to move neighbourhood (itself subjective) and actual residential mobility.

In Table 11 we provide evidence that satisfaction with the neighbourhood has predictive power for the decision to move. Panel A shows results for the actual moving. The dependent variable is a binary variable taking the value 1 if the person is observed in a different LSOA in time t than in time t-1. This is regressed on the lagged values of the neighbourhood satisfaction in columns 1–3 of the first row. In all specifications, a higher satisfaction is associated with a lower probability of moving. The bottom part of panel A shows a reduced form counterpart of the previous models, as it shows the results of a regression of the probability on moving on the white share. Results show that the white share is negatively associated to the probability of moving once fixed effects are taken into account. Panel B of Table 11 shows that current neighbourhood satisfaction is also strongly correlated with the expression of an intention to move. Our conclusion is that responses to the neighbourhood satisfaction question are informative as they can influence real-life choices.

6. Social Capital

Our analysis so far has focused on the impact of diversity on the level of satisfaction with the neighbourhood. While we would argue that this is an outcome of interest as a summary measure of how well the neighbourhood 'works' for individuals, much of the literature on the impact of diversity on community focuses on two commonly used measures of 'social capital'—generalised trust and activity in organisations. This section considers these two outcomes. These questions are asked in fewer years than neighbourhood satisfaction so the sample sizes are much smaller. A number of prominent authors have suggested that diversity erodes generalised trust (e.g., Putnam, 2007)—a view that has been the subject of considerable controversy (e.g., Nannestad, 2008; Gesthuizen *et al.*, 2009; Gerritsen and Lubbers, 2010; Uslaner, 2012).

Table 11. *Actual Moving and Propensity to Stay in the Area. Linear Probability Models.*

A	(1) No FE	(2) Individual FE	(3) Area FE	(4) FD (lagged)
	Dependent variable: *Actual moving*			
Like your neighbourhood (lagged)	−0.080***	−0.105***	−0.083***	−0.037***
	(0.004)	(0.006)	(0.004)	(0.004)
N	209,980	178,617	205,624	149,162
White share (lagged)	0.032***	−0.197***	−0.108***	−0.048
	(0.008)	(0.046)	(0.050)	(0.036)
N	324,960	314,481	322,848	250,387
IV				
White share (lagged)	0.035***	−0.265***	−0.198**	−0.078*
	(0.011)	(0.067)	(0.080)	(0.043)
N	320,381	309,991	318,254	246,747

B	(1) No FE	(2) Individual FE	(3) Area FE
	Dependent variable: *Propensity to stay*		
Like your neighbourhood	0.479***	0.357***	0.407***
	(0.007)	(0.017)	(0.009)
N	69,223	34,083	64,670
White share	0.055***	0.277***	−0.079
	(0.021)	(0.081)	(0.132)
N	100,278	79,239	97,391
IV			
White share	−0.000	0.275**	−0.083
	(0.026)	(0.121)	(0.178)
N	99,009	78,146	96,158

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time-fixed effects. *Actual moving* is a dummy that takes value 1 if the respondent is observed in two different LSOAs from one year to the other. *Propensity to stay* is a dummy variable that takes value 1 if the respondent states that he/she is willing to stay in the area. See notes of Table 5. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

Our method for controlling for sample selection into neighbourhoods has rarely found evidence that this is important in practice, perhaps unsurprising given the low rate of residential mobility. In the interest of brevity and clarity, the estimates that follow only report specifications without controls for sample selection[44]—though our results are very similar if they are included.

The two upper panels of Table 12 present results using generalised trust as the outcome variable. We find no strong evidence that diversity affects the level of trust even in the OLS model without fixed effects that is closest to the specification commonly estimated in the existing literature. This result is very different from the conventional wisdom on the topic mostly derived from US evidence. It could be that there is no inevitable close link between generalised trust and diversity and that the US results are driven by the particular interactions between ethnic groups within that society that do not translate to other societies. An alternative reason may be that the geographical level of our study is different from that used in other studies. For this reason, Table B13 in the Online Appendix reports results with white shares calculated at the TTWA level—again, we do not find any robust impact of the white share on generalised trust.

As an alternative measure of social capital we use a dummy variable, taking value 1 for people who are active in at least one organisation, and results are reported in the two lower

[44] This applies to all specifications in this work, apart from the ones presented in Table 5 and its Appendix counterparts.

Table 12. *Impact of the Ethnic Mix on Trust and Participation to Organisation, Results in Levels.*

	(1) No FE	(2) Individual FE	(3) Area FE	(4) Individual × Area FE	(5) Individual + Area FE
A1. OLS—Dependent variable: Generalised trust					
White share	0.041*	0.016	− 0.073	− 0.074	− 0.097
	(0.024)	(0.051)	(0.129)	(0.150)	(0.169)
N	100,867	66,411	97,037	60,632	64,942
A2. IV—Dependent variable: Generalised trust					
White share	− 0.024	0.106	0.172	0.197	0.184
	(0.030)	(0.071)	(0.196)	(0.224)	(0.255)
N	98,969	64,802	95,179	59,229	63,367
KP	3294.731	1213.763	845.157	511.037	392.686
B1. OLS—Dependent variable: Active in any organisation					
White share	− 0.016	− 0.059	− 0.103	− 0.063	− 0.062
	(0.022)	(0.047)	(0.071)	(0.101)	(0.108)
N	160,222	123,062	156,438	114,256	121,068
B2. IV—Dependent variable: Active in any organisation					
White share	0.006	− 0.015	0.164	0.255	0.219
	(0.029)	(0.060)	(0.109)	(0.168)	(0.178)
N	157,820	120,922	154,082	112,413	118,971
KP	5018.704	2312.934	514.931	300.484	265.545

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time fixed effects. See notes to Table 5. *Generalised trust* is a dummy that takes value 1 for respondents who answer affirmatively to the question 'Do you, in general, trust others?'. *Active in any organisation* is a dummy that takes value 1 if respondents actively participate to at least one of the organisations of which they are members. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

panels of Table 12. We find no significant impact of diversity on activity in organisations in any specification. Some positive effects are found in the TTWA specification—shown in the bottom panel of Online Appendix Table B13—but these effects are not as robust as one would have expected from the previous literature.

7. Other Neighbourhood Outcomes

So far we have investigated the impact of diversity on neighbourhood satisfaction and residential mobility. While there is some impact on overall satisfaction, we have not provided any evidence on the aspects of the neighbourhood that changes that influence overall satisfaction. This section investigates this. We consider possible impacts on the perception of crime, the quality of local services and the quality of one's social life.

7.1. *Fear of Crime*

The questions asked about perceptions and fear of crime are listed in Table 1. We start by analysing the answers to whether the respondent worries about being a victim of crime because the sample size is largest for this question. The results are shown in Table 13, in which the top

Table 13. *Impact of the Ethnic Mix on Crime Perceptions, Results in Levels.*

	(1) No FE	(2) Individual FE	(3) Area FE	(4) Individual × Area FE	(5) Individual + Area FE
			OLS		
White share	−0.075***	−0.178**	−0.597***	−0.626***	−0.616***
	(0.023)	(0.082)	(0.127)	(0.163)	(0.199)
N	74,738	35,807	70,345	28,821	33,716
	(1) No FE	(2) Individual FE	(3) Area FE	(4) Individual × Area FE	(5) Individual + Area FE
			IV		
White share	−0.043	−0.262**	−1.118***	−1.352***	−1.322***
	(0.031)	(0.114)	(0.195)	(0.268)	(0.329)
N	73,612	35,002	69,275	28,260	32,978
KP	4414.965	1099.753	906.296	499.312	332.266

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time-fixed effects. See notes of Table 5. Dependent variable: 1 if affirmative answer to 'Are you worried of being victim of a crime?' * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

panel reports OLS estimates with a variety of individual and area fixed effects and the bottom panel the equivalent specifications but using IV. The estimates suggest that a higher white share is associated with a significantly lower level of concern about crime. Results are both strong and generally robust. We also explore the impacts of the white share on perceptions of the likelihood of particular types of crime, and the results are displayed in Table 14. Coefficients are the same sign for most types of crime, but not all: e.g., racial insults/attacks seem a bit different. However, estimated coefficients are almost never significant in the specifications that combine area and individual fixed effects. This likely reflects the small sample sizes for many of these questions.

These questions all relate to fear of crime, but this may not be the same as actual crime. For example, the literature on the link between migration and crime sometimes finds an impact on fear of crime but little impact on actual crime once one controls for labour market status (that would be expected to affect crime incentives, as argued by Becker, 1968).[45] Unfortunately, we do not have access to actual crime rates at LSOA level for all years. We can use information on the crime index that is part of the IMD. The crime domain of IMD groups together information on four types of crime—burglary, theft, criminal damage, and violence—which is available for the years 2004, 2007, 2010 and 2015. Scotland and Wales use different and non-comparable indices from England, so the results are valid for England only. Table 15 shows results for OLS and IV[46] in a setting that controls for LSOA fixed effects. The white share has a small, though precisely

[45] Bell and Machin (2013) provide a broader literature review on the topic; here we report some of the most recent works on the argument. In the United States, Chalfin (2014) finds no causal effect of Mexican migration on crime. Spenkuch (2014) finds that there is some small effect, concentrated on property and financial crimes, and for migrants with low labour market prospects. Moehling and Piehl (2009) and Moehling and Piehl (2014) find that prison commitment rates for new migrants is in general lower or equal to the natives' one. Evidence from Europe has been targeted mostly in studying the EU enlargements during the 2000s. Bell, Fasani and Machin (2013), Bianchi *et al.* (2012), Mastrobuoni and Pinotti (2015) find modest effect of migration on property crimes only. Nunziata (2015) finds no effect on victimisation, but a significant impact on fear of crime. Sà (2015) finds that the negative effect of migration on house prices is not explained by any migration-related increase in crime.

[46] In this specification we treat both the white share and the unemployment rate as endogenous variables, in a similar fashion to what we do in Online Appendix C. Results do not differ substantially if only the white share is treated as endogenous.

Table 14. *Impact of the Ethnic Mix on Crime Perceptions, Alternative Measures. IV Results.*

	(1)	(2)	(3)	(4)	(5)
	No FE	Individual FE	Area FE	Individual × Area FE	Individual + Area FE
	Dependent variable: *Feel unsafe walking alone at night*				
White share	−0.128***	−0.243**	0.092	−0.037	−0.038
	(0.026)	(0.103)	(0.170)	(0.233)	(0.286)
N	73,574	34,930	69,233	28,220	32,909
KP	4413.448	1095.835	899.707	499.608	332.280
	(1)	(2)	(3)	(4)	(5)
	No FE	Individual FE	Area FE	Individual × Area FE	Individual + Area FE
	Dependent variable: *Likely home broken into*				
White share	−0.156**	−0.311**	−0.355	−0.542*	−0.484
	(0.067)	(0.144)	(0.298)	(0.316)	(0.407)
N	32,191	25,381	30,702	19,421	23,272
KP	859.824	972.522	442.735	437.484	260.888
	(1)	(2)	(3)	(4)	(5)
	No FE	Individual FE	Area FE	Individual × Area FE	Individual + Area FE
	Dependent variable: *Likely car stolen/broken into*				
White share	−0.055	−0.073	0.115	−0.135	−0.118
	(0.042)	(0.100)	(0.207)	(0.244)	(0.315)
N	32,202	25,381	30,693	19,344	23,288
KP	830.083	990.345	432.315	416.042	247.917
	(1)	(2)	(3)	(4)	(5)
	No FE	Individual FE	Area FE	Individual × Area FE	Individual + Area FE
	Dependent variable: *Likely people being attacked on the street*				
White share	−0.151***	−0.263**	−0.172	−0.280	−0.255
	(0.049)	(0.107)	(0.232)	(0.259)	(0.334)
N	32,517	25,720	31,023	19,616	23,589
KP	882.202	969.096	449.234	437.285	261.278
	(1)	(2)	(3)	(4)	(5)
	No FE	Individual FE	Area FE	Individual × Area FE	Individual + Area FE
	Dependent variable: *Likely racial insults/attacks*				
White share	−0.222***	−0.264***	0.128	0.273	0.291
	(0.045)	(0.097)	(0.182)	(0.219)	(0.284)
N	32,126	25,333	30,623	19,273	23,209
KP	900.758	990.306	451.774	431.569	257.315
	(1)	(2)	(3)	(4)	(5)
	No FE	Individual FE	Area FE	Individual × Area FE	Individual + Area FE
	Dependent variable: *Likely vandalism*				
White share	−0.012	−0.265**	−0.320	−0.528*	−0.529
	(0.060)	(0.127)	(0.283)	(0.313)	(0.404)
N	32,827	26,055	31,341	19,845	23,938
KP	863.427	1040.206	455.516	456.819	272.831

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time-fixed effects. See notes of Table 5. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

Table 15. *Ethnic Mix and Actual Crime Index.*

	(1) OLS—Area level controls	(2) IV—Endogenous white share	(3) IV—Endogenous unemployment and white share
% Unemployment	−0.004***	−0.005***	−0.103**
	(0.001)	(0.001)	(0.042)
% White	0.008***	0.010***	0.024***
	(0.001)	(0.001)	(0.006)
% below age 16	0.001	0.001	0.009**
	(0.002)	(0.002)	(0.004)
% above age 65	0.010***	0.010***	0.011***
	(0.001)	(0.001)	(0.002)
% of homeowners	0.005***	0.005***	−0.006***
	(0.001)	(0.001)	(0.001)
% of social tenants	−0.009***	−0.009***	−0.001
	(0.001)	(0.001)	(0.004)
Log of population	0.296***	0.290***	0.181***
	(0.035)	(0.036)	(0.060)
% with no qualifications	−0.008***	−0.008***	−0.003
	(0.001)	(0.001)	(0.003)
% with low qualifications	−0.010***	−0.009***	−0.015***
	(0.002)	(0.002)	(0.003)
% with high qualifications	−0.011***	−0.010***	−0.002
	(0.001)	(0.001)	(0.004)
Observations	129,921	129,921	129,921
R-squared	0.873	0.873	0.886

Notes: Standard errors in parentheses, clustered at the LSOA level. All regressions take into account year and area-level fixed effects. All shares are in % terms. Regressions are at the LSOA level. The actual crime index is taken from the crime section of the Index of Multiple Deprivation for England; the dependent variable is the standardised rank version of it. Details on the Index of Multiple Deprivation are in Online Appendix A. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

estimated, positive impact on the crime rates measured by the IMD.[47] Even though—for data issues—these results are not directly comparable to the specifications that we estimate for crime perceptions, and more research would be useful, we take this as suggestive that diversity is likely to influence fear of crime more than actual crime.

7.2. *Quality of Local Services*

Table 16 does a similar exercise for the quality of local services index, which is the first principal component of the quality of local services variables in Table 1. Results are generally of negative sign, but never statistically significant. One should note that the sample sizes for these outcomes are even smaller than for the fear of crime variable, which might partly explain the large standard errors. To try to dig a bit deeper on this aspect—although the sample size gain is not really significant—we estimate the model for the single measures that compose our quality of local services index, and the results are shown in Table B14 in the Online Appendix.[48] In general, the white share does not seem significantly related to any of the local services outcomes, apart from an apparent negative impact on the quality of transportation.

[47] In contrast with that, unemployment rates have a larger impact on crime rates.

[48] Results on additional measures of neighbourhood perceptions (not included in the index) related to the neighbourhood general aspect are shown in Table B15 in the Online Appendix.

Table 16. *Impact of the Ethnic Mix on the Quality of Services in the Area, Results in Levels.*

	(1) No FE	(2) Individual FE	(3) Area FE	(4) Individual × Area FE	(5) Individual + Area FE
			OLS		
White share	0.117	0.286	−0.125	−0.856	−0.838
	(0.147)	(0.330)	(0.551)	(0.584)	(0.764)
N	22,542	15,366	20,808	11,994	13,610
	(1) No FE	(2) Individual FE	(3) Area FE	(4) Individual × Area FE	(5) Individual + Area FE
			IV		
White share	0.073	0.704	−0.451	−0.752	−0.814
	(0.186)	(0.439)	(0.736)	(0.796)	(1.044)
N	22,092	15,074	20,408	11,810	13,380
KP	704.514	673.866	333.089	302.148	173.495

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time-fixed effects. See notes of Table 5. Dependent variable: Quality of services in the area index, see Table B2 in the Online Appendix for the analysis used to construct the index. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

Table 17. *Impact of the Ethnic Mix on the Quality of Social Life, Results in Levels.*

	(1) No FE	(2) Individual FE	(3) Area FE	(4) Individual × Area FE	(5) Individual + Area FE
			OLS		
White share	0.292**	0.187	0.306	0.595	0.589
	(0.122)	(0.228)	(0.447)	(0.392)	(0.507)
N	32,040	25,217	30,496	19,232	23,021
	(1) No FE	(2) Individual FE	(3) Area FE	(4) Individual × Area FE	(5) Individual + Area FE
			IV		
White share	0.247	0.200	0.329	0.690	0.698
	(0.160)	(0.304)	(0.608)	(0.569)	(0.736)
N	31,367	24,657	29,860	18,909	22,556
KP	1051.363	953.152	463.964	458.805	273.196

Notes: Standard errors in parentheses, clustered at the LSOA level. All specifications control for individual, LSOA characteristics and time-fixed effects. See notes of Table 5. Dependent variable: Quality of social life index, see Table B2 in the Online Appendix for the analysis used to construct the index. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

7.3. *Quality of Social Life*

Table 17 does a similar exercise for the quality of social life index, which is the first principal component of the quality of social life variables in Table 1. All the estimated coefficients are positive, suggesting that a high white share is associated with a higher quality of social life for our respondents. However, the standard errors are very large, so that coefficients are almost never significant. Table B16 in the Online Appendix presents results for the individual components of the index, though estimated results are rarely significantly different from zero.

Overall, there is no strong evidence of a link between the white share and the quality of social life. As the social life measures could be seen as an indicator of social capital, our results are perhaps in line with those for generalised trust. One interpretation is that, unlike the United States, there is no strong link between diversity and social capital in the UK.

8. A Production Function for Neighbourhood Satisfaction

So far we have documented what we have argued are the causal effects of neighbourhood characteristics on various measures of feelings about neighbourhoods, from high-level overall satisfaction to different domains such as social capital, fear of crime, quality of local services and social life. One hypothesis is that feelings about specific domains go into producing an overall satisfaction with the neighbourhood. A simple linear production function for individual i's overall satisfaction, SAT_i, would be:

$$SAT_i = \sum_j \beta_j f_{ji} + \beta^c x_i + \epsilon_i, \tag{15}$$

where f_{ji} is the level of feeling about domain j for individual i e.g., the fear of crime or the quality of local services. What we have estimated are the impact of neighbourhood characteristics on these feelings, i.e. :

$$f_{ji} = \gamma_i W_i + \gamma_j^c x_i + u_{ji}, \tag{16}$$

Substituting (16) into (15) implies that overall satisfaction can be written as:

$$SAT_i = \left[\sum_j \beta_j \gamma_j\right] W_i + \left[\beta^c + \sum_j \beta_j \gamma_j^c\right] x_i + \epsilon_i + \sum_j \beta_j u_{ji},$$

which is what we have also estimated in our equations for overall neighbourhood satisfaction. What is not identified in this estimates are the factor loadings: the β_j on different domains in (15). These are, however, of some interest, e.g., whether crime or social interaction is the main transmission channel from neighbourhood characteristics to overall satisfaction. Ideally, one would estimate (15) instrumenting the different domains using the first stages implied by (16). However, this approach only works if we have at least as many instruments as domains and there is independent variation in the domains. See Table 18.

In the absence of our ability to do that, we report estimates of (15) by OLS. These estimates cannot be given a causal interpretation, but we think that they can be suggestive and so are of some interest. Results that include factors[49] for the different groups of variables are reported in Table 18.[50] Columns 1, 4 and 7 report estimates of neighbourhood satisfaction on the various domains, i.e., (15) without fixed effects (column 1), with individual fixed effects (column 4) and with both area and individual fixed effects (column 7). Neighbourhood satisfaction is, as one might expect, positively related to social capital, quality of local services and social life and negatively related to the fear of crime though the significance of social capital and local services does not survive the introduction of individual fixed effects. In columns 2, 5 and 8 we estimate a model on this sample including only the white share; the estimated effects are slightly larger than in our full sample. Columns 3, 6 and 9 include both the white share and the domain satisfaction measures. The inclusion of the other factors reduces the impact of the white share in both the OLS and the Individual fixed effects models, though not for the area fixed effects model (though standard errors are large). This suggests that our factors do explain some of the impact of the white share on neighbourhood satisfaction, though the white share still has explanatory

[49] Factors are obtained grouping single variables with principal component analysis techniques, we then standardised the indices obtained for interpretation purposes.

[50] Table B17 in the Online Appendix reports results obtained including all variables. In both cases, as there is no year for which all questions are asked, information is pooled for the two closest years in which information is available.

Table 18. *Neighbourhood Satisfaction Production Function.*

	No FE			Individual FE			Area + Individual FE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
White share		0.262***	0.120***		0.483***	0.410***		0.248	0.338**
		(0.039)	(0.034)		(0.106)	(0.100)		(0.189)	(0.144)
Social capital	0.010***		0.009***	0.001		0.001	−0.000		−0.001
	(0.002)		(0.002)	(0.003)		(0.003)	(0.003)		(0.003)
Crime	−0.067***		−0.065***	−0.058***		−0.056***	−0.031***		−0.031***
	(0.003)		(0.003)	(0.005)		(0.005)	(0.005)		(0.005)
Quality of local services	0.017***		0.017***	0.003		0.004	−0.002		−0.001
	(0.002)		(0.002)	(0.004)		(0.004)	(0.003)		(0.003)
Social life	0.039***		0.038***	0.029***		0.028***	0.020***		0.020***
	(0.002)		(0.002)	(0.005)		(0.005)	(0.005)		(0.005)
Observations	20,242	20,238	20,118	13,374	13,374	13,374	11,747	11,747	11,747

Notes: Bootstrapped standard errors (200 replications) in parentheses. The full set of variables is not available for all years. The sample is therefore pooled to aggregate information for closest subsequent years for which information is available. See Online Appendix A for a description of the main variables and Table B2 for a description of the Principal Component Analysis used to construct the variables *Social Capital*, *Crime*, *Quality of local services*, and *Social life*. Indexes are standardised. Dependent variable: 1 if affirmative answer to 'Do you like your neighbourhood?' * $p < 0.1$ ** $p < 0.05$ *** $p < 0.001$.

power, which suggests that we have not identified all the channels through which diversity affects satisfaction with the neighbourhood.

9. Conclusion

This article has investigated the impact of the white share of the population on a variety of measures of neighbourhood satisfaction. Our estimates suggest that diversity does affect overall neighbourhood satisfaction and the fear of crime (though not actual crime), thereby confirming the general conclusion of the existing literature. However, there is one area in which our findings are at odds with the existing literature: we do not find any significant link between diversity, generalised trust and activity in organisations, which are commonly used measures of social capital.

The added value of the article is to consider a wider variety of neighbourhood outcomes than the existing literature, to pay closer attention to issues of causality and endogeneity through the use of fixed effects, instrumental variables and sample selection, and to provide estimates on the impact of diversity on infra-marginal residents, which may be the most important effects, especially when residential mobility rates are low.

While people may care about the nature of their neighbours, they cannot control who they are. My presence in an area may have some externalities on my neighbours, and my decision to move is not something that they can control.[51] This combination of caring about something but being unable to control it is the classic recipe for stress, so it is not surprising that changing communities stir up strong emotions and reactions. As Putnam (2007) noted, the rise in diversity is probably here to stay and societies need to work out how to manage its consequences to make communities thrive.

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Additional Supporting Information may be found in the online version of this article:

Online Appendix
Replication Package

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[51] If there is, as seems likely, residential sorting, we have known since the work of Schelling (1971, 1972) that there is no presumption that the resulting equilibrium is efficient. There is no strong prediction on whether there is too little or too much segregation in equilibrium but a number of studies have documented the impact of segregation on wages, rental prices, and in general on economic performance (e.g., Cutler and Glaeser, 1997; Peri and Ottaviano, 2006; Ananat, 2011; Chetty *et al.*, 2014).

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