The Impact of Immigration on the Well-being of UK Natives*

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Summary

In this report, we analyse the effects of immigration on the well-being of the UK native population. We explore the following research questions:

(a) What is the impact of immigration on natives' subjective well-being?

(b) Does the impact of immigration vary depending on the characteristics of natives and on the type of immigrants?

(c) What are the well-being dimensions affected by immigration and what are the mechanisms at work?

We measure subjective well being using data on self-reported life satisfaction of individuals from the British Household Panel Survey (BHPS) and Understanding Society – The UK Household Longitudinal Study (UKHLS), two large and nationally representative longitudinal surveys. We combine these data with migration statistics at the local authority district (LAD) and lower super output area (LSOA) levels obtained from the census. We consider the period 1997 to 2015.

Our main methodology is based on panel data techniques, which allow controlling for the role of unobserved individual heterogeneity. We address potential endogeneity concerns by using an instrumental variable procedure. We estimate three models: pooled OLS, fixed effects and fixed effects with instrumental variables.

The key results are summarised as follows:

- There is a positive but modest effect of immigration on natives' life satisfaction at the LAD level. This result is robust to several alternative specifications.
- At the LSOA level, immigration has no effect on natives' life satisfaction. Estimated coefficients are smaller than the LAD level and statistically insignificant.
- The magnitude and statistical significance of the immigrant share coefficient varies depending on the gender, age and education level of the native population. However, the estimated differences are small and seldom statistically significant.
- When decomposing the immigrant shares into "EU-14", "Other Europe" and "Outside Europe", the pattern of the estimates is, with a few exceptions, unaltered.
- Further analyses using alternative outcome variables reveal that satisfaction with leisure and satisfaction with health are two relevant domains.
- Natives' displacement does not emerge as a major channel of the estimated results.
- Attitude towards migrants and political preferences (as measured by the leave vote in the area) emerge as channels that mediate the relationship between immigration and life satisfaction.

JEL codes: C90, D63, J61
Keywords: Subjective well-being, migration, ethnic diversity, UK.

1 Introduction

Immigration to the UK has steadily increased in the past decades. The majority of immigrants have arrived in the country for work purposes or for reuniting with family members. More recently, the UK experienced – similarly to many other European countries – a surge in the number of refugees, asylum seekers and irregular immigrants (see e.g., Gordon et al., 2009 for some estimates related to the last decade). These trends, coupled with the relatively slow recovery of the economy and the recent cuts in public spending, progressively led to immigration being perceived by the public as a problem, and have contributed to the rise in anti-immigration sentiments. For example, survey data from Gallup show that as of 2014, about 70% of British people wanted to decrease immigration.[1] This figure was much larger than in other high-immigration countries such as the United States (40%) and Germany (34%). An additional emblematic circumstance is the debate about reducing the number of EU immigrants, which reached a climax around the referendum for leaving the European Union in June 2016, and is still today a very much contested political and public matter.

Economists have been studying the effects of immigration for a long time. The traditional approach has been to focus on the impact of immigration on the native population's labour market outcomes such as wages and employment (Borjas, 1994, 2003, Card, 1990, 2001, D'Amuri et al., 2010). While mixed, the empirical evidence suggests that the impact on natives' outcomes is small in terms of economic size. A study for the UK using data from 1983 to 2000 (Dustmann et al., 2005) concluded that immigration did not negatively influence the wages of the UK-born. More recent research using data from 1975 to 2005 (Manacorda et al., 2012) shows that the absence of an effect on natives' outcomes was attributable to native and immigrant workers being imperfect substitutes in the labour market. As a consequence, an increase in immigration had a negative impact on immigrants already living in the UK but did not affect natives.

The absence of a detectable economic impact is in puzzling contrast with the above-mentioned public concerns about immigration. One possible explanation of this divergence is that immigration has a broader impact on natives' welfare – that is – beyond the economic/monetary sphere. An emerging strand in the economics literature postulates that financial wealth alone is not sufficient to gauge the well-being of people. As Stiglitz et al. (2009, p. 41) put it: "Quality of life is a broader concept than economic production and living standards. It includes the full range of factors that influence what we value in living, reaching beyond its material side."

[1] http://news.gallup.com/poll/187856/migration-policies-attitudes-sync-worldwide.aspx. (Accessed on 25/5/2018).

Against this background, and building upon existing studies, we dig beyond the labour market effects of immigration and investigate its effects on the well-being of the UK native population. In particular, this report addresses the following research questions:

(a) What is the impact of immigration on natives' subjective well-being?

(b) Does the impact of immigration vary depending on the characteristics of natives and on the type of immigrants?

(c) What are the well-being dimensions affected by immigration and what are the mechanisms at work?

2 Existing studies

The key motivation of exploring the effects of immigration beyond the labour market is that "objective measures" such as wages and employment can only partially capture the overall impact that immigration has on the quality of life of natives. Through its influence on the economy, culture and lifestyle, migration can induce benefits on some domains and costs on others. Many of these domains might be intangible (e.g., feelings, attitudes, social cohesion and integration). Complementing the traditional approach based on objective metrics with subjective well-being would help to better understand the broader impact of immigration.

Economists have started exploring the consequences of immigration on aspects beyond the labour market, including public finances (Dustmann and Frattini, 2014), crime (Bell et al., 2013), house prices (Sá, 2015) and physical health (Giuntella and Mazzonna, 2015). However, there are only a few studies that look at the relationship between immigration and subjective well-being. Seminal evidence exists for the case of Germany, with the studies of Akay et al. (2014, 2017). In the first study (Akay et al., 2014), using a panel of individuals for the period 1998-2012, the authors provide evidence that a higher share of immigrants in the local area positively associates with natives' well-being. The analysis shows that natives' life satisfaction varies substantially with the level of migrants' assimilation in the region – an argument that has also been theorised in a recent paper by Stark et al. (2015). In the follow-up study (Akay et al., 2017), the authors provide evidence of a positive effect of ethnic diversity on the well-being of natives, with the impact depending on the cultural and economic distance between immigrants and German natives. While the two studies found an overall positive impact of migration, they also suggest that such effect varies substantially along natives' and migrants' characteristics.

For the case of UK, evidence is less comprehensive. Longhi (2014) looks at the role of ethnic diversity on life satisfaction in England using data from Understanding Society – the

UK Household Longitudinal Study (UKHLS). She finds that the life satisfaction of white British people negatively correlates with the ethnic and country of birth diversity in the local authority district. However, the estimated coefficient is quite small, and the identification is based on cross-sectional variation. Ivlevs and Veliziotis (2018) investigate the link between the inflow of immigrants after the EU enlargement and the life satisfaction of UK-born individuals in England and Wales by combining data from the British Household Panel Survey (BHPS) and the Worker Registration Scheme. They find that, on average, there is no relationship between the immigrant inflow rate and life satisfaction. However, when analysing subgroups, they find that immigration negatively correlates with life satisfaction for older people, those who are unemployed and those with low income. On the other hand, they find a positive association for young people, those who are employed, those with high income and those with higher education. Their study, however, is based on a short period of time and does not directly tackle endogeneity issues. Furthermore, both Longhi (2014) and Ivlevs and Veliziotis (2018) use a measure of migration at the local authority district level, and hence could not assess whether the established relationship is different at a more local level, i.e., the neighbourhood. To the best of our knowledge, the only study using a neighbourhood-level definition of migration is Langella and Manning (2016), who combine data from the UKHLS and the BHPS with the lower super output areas (LSOA) of Great Britain to explore how ethnic diversity affects UK residents' satisfaction with the neighbourhood. They find that a higher percentage of white people in the neighbourhood increases satisfaction with the neighbourhood.

The present report builds upon and extends the studies above in order to provide more systematic and comprehensive evidence of the relationship between migration and subjective well being for the case of the UK.

3 Data

3.1 Sample

Our main data sources are the British Household Panel Survey (BHPS) and Understanding Society – The UK Household Longitudinal Study (UKHLS), two large and nationally representative longitudinal datasets with rich information on individual and household characteristics. These datasets have information on age, gender, education, health, income, as well as nationality and subjective well-being of individuals. BHPS and UKHLS have been used to study immigration and well-being issues before (see, e.g., Longhi, 2014, Laurence and Bentley, 2015, Langella and Manning, 2016, Ivlevs and Veliziotis, 2018). The BHPS sample covers the years 1991-2008, while UKHLS the years 2010-2015. Part of the UKHLS

sample is composed by individuals who were also surveyed in the BHPS, allowing longer longitudinal analyses.

In our main analysis, we used the unbalance sample that covers both the BHPS and the UKHLS. We restrict our sample to UK-born individuals aged 16 or above and living in Great Britain.[2] Our analysis starts from 1997, the first year since for which we have both life satisfaction data in the BHPS and LAD-level characteristics that we can include in the analysis. Note that year 2001 is excluded from the analysis, since life satisfaction questions were not asked in that year. This gives us a total of 163,984 individual $\times$ year observations.

3.2 Measure of SWB

Our analysis focuses on life satisfaction as the measure of subjective well-being. Life satisfaction captures the extent to which individuals think they are satisfied with their life as a whole. To be more precise, it captures a "person's retrospective assessment of her experienced utility" (Kahneman and Sugden, 2005, p. 174). The most common way to measure life satisfaction is to ask individuals to report how they feel. In the BHPS and UKHLS life satisfaction is measured by answers to the question "How dissatisfied or satisfied are you with your life overall?". The scores vary from 1 ("not satisfied at all") to 7 ("completely satisfied").

We focus on life satisfaction for two reasons: first, it has been widely used by economists to study SWB in the UK (Clark and Oswald, 1996, Booth and Van Ours, 2008, Oswald and Powdthavee, 2008, Powdthavee, 2008, Frijters and Beatton, 2012, Clark and Georgellis, 2013).[3] Second, life satisfaction has been used to study the impact of immigration on natives' well-being in previous studies (Akay et al., 2014, 2017), which offers us the opportunity to compare the results for the UK with those of Germany.

3.3 Immigration and Other Local-level Variables

We use the special license versions of BHPS/UKHLS which contain information on the local authority district (LAD) and lower super output area (LSOA) of residence of the individual in each year. This way, we can merge local-level attributes to the individual-level panel data. The key variable that we attach is the immigrant share (henceforth referred to as IM).

To construct the variables of immigration rates at the local level, we exploit three UK decennial censuses: 1991, 2001 and 2011.[4] From the censuses, we accessed the tabulations of

[2]Northern Ireland is excluded from the analysis.

[3]See also Dolan et al. (2008) for a review of cross-national studies employing life satisfaction and other measures to gauge SWB.

[4]The 1991 census covering Great Britain has been downloaded from the NOMIS website (www.nomisweb.

individuals by country of birth in each LAD and LSOA. These provide the number of UK-born people and of non-UK born people (with different level of country breakdown depending on the year of census and geographic detail required).

We define the immigrant share IM_{rt} in each area r and time t as:

$$IM_{rt} = \frac{M_{rt}}{P_{rt}}$$

where r indicates the area (LAD or LSOA). The variable M_{rt} can only be constructed for the years of the three censuses. For the remaining years, we imputed the values of M_{rt}. For the intercensal years, we impute the values of M_{rt} using linear interpolation. For years 2012 onwards, we linearly extrapolate M_{rt}. For P_{rt}, we use an identical imputation procedure.

We also obtained data about the following LAD characteristics:

- Unemployment claimants. This variable allows us to proxy for the level of deprivation in the area (see, e.g. Langella and Manning, 2016). We divide the number of unemployment claimants by the size of population in the LAD to obtain a proxy for the unemployment rate.[5]
- Annual wage. The data report the estimated yearly median wage in each LAD and aims at proxying the characteristics of the local labour market.[6]
- House price index. This index provides a measure for the house price in the LAD and aims at proxying both local prices and the quality of amenities.[7]

4 Methodology

The analysis is based on panel data methods and builds upon the model used by Akay et al. (2014, 2017). The baseline econometric specification is:

$$SWB_{irt} = \beta IM_{rt} + \mathbf{X}'_{it}\boldsymbol{\gamma} + \mathbf{L}'_{rt}\boldsymbol{\lambda} + \theta_r + \theta_t + \theta_i + \varepsilon_{irt} \tag{1}$$

where SWB_{irt} indicates the well-being (as measured by life satisfaction) of individual i living in area r at time t. As described above, IM is the immigrant share in the area and hence

co.uk). NOMIS provides also data of 2001 census and 2011 census at the local level for England and Wales. Scotland's census data for 2001 and 2011 were separately collected from the Scotland's census website (www.scotlandscensus.gov.uk). The LAD and LSOA definitions were made consistent overtime so to obtain a frozen geography.

[5]Unemployment claimants data are downloaded from the NOMIS website.

[6]Wage data are downloaded from the NOMIS website.

[7]House price data are obtained from https://www.gov.uk/government/collections/uk-house-price-index-reports#about-the-uk-hpi.

β is the key parameter of our analysis.[8] To identify the relationship of interest, we control for several characteristics, both at the individual and regional level. The matrix $\mathbf{X}$ contains individual and household level variables while $\mathbf{L}$ includes attributes of the local area. All regressions also include the number of migrants in each Government Office Regions (GOR) of England to capture regional specific time trends. We report the full set of control variables used in the analysis in Table 1.

Our preferred specification is a fixed effect model, i.e., a specification where the unobserved effects are assumed to be correlated with all covariates. Hence, we include time fixed effects (θ_t) to account for year-specific changes, area fixed effects (θ_r) to control for local unobserved time-invariant confounders and individual fixed effects (θ_i) to control for individual unobserved heterogeneity. In robustness checks, we include an individual-area specific effect (θ_{ir}) which allows individual heterogeneity depending on the area where the person lives (i.e., some individuals change address over the years). To compare our results and better understand the role of unobserved heterogeneity, we also consider pooled OLS models.

4.1 Endogeneity

While fixed effects estimates and the presence of area-specific attributes help to annihilate the role of unobserved heterogeneity, endogeneity issues related to unobservable, time-variant local factors could still persist. To address this problem, we use an instrumental variable (IV) strategy on the lines of Card (2001). The idea of this instrument is to exploit the fact that newly arrived immigrants tend to locate in areas where immigrants from the same country of birth have previously settled (Bartel, 1989). Using this fact, one could use historical shares of immigrants by country of birth in a given local area to "project" what the current number of immigrants from a certain country of birth in the local area would be if the historical shares would remain constant. In practice, we instrument the denominator of IM_{rt} with the variable Z_{rt} obtained as follows:

$$Z_{rt} = \sum_{g} \tau_{gr0} M_{gt} \tag{2}$$

where M_{gt} represents the number of immigrants from country of origin g at time t; τ_{gr0} is the fraction of immigrants that come from country of origin g, in area r from some time in the past (in most of our analyses this is 1991, a census year that predates the starting year

[8]Note that, due to the way in which life satisfaction is measured, the appropriate econometric specification should be an ordered probit model. However, the literature shows that ordered probit and linear regression provide qualitatively similar results. The advantages of linear regression are that it makes results easy to interpret and enables controlling for individual unobservable characteristics in simpler fashion. For robustness, we estimated an ordered probit model and report the results in Table A2.

of the sample). For the denominator, we use a "predicted" measure of total population (P_{rt}) constructed by summing Z_{rt} with N_{rt}, where N_{rt} is the number of British-born individuals in the area. Hence, setting $W_{rt} = \frac{Z_{rt}}{P_{rt}}$, the first stage regression would be:

$$M_{rt} = \delta W_{rt} + \mathbf{X}'_{it}\boldsymbol{\gamma} + \mathbf{L}'_{rt}\boldsymbol{\lambda} + \theta_r + \theta_t + \theta_i + \mu_{rt}. \tag{3}$$

The exclusion restriction implies that W_{rt} affects SWB_{irt} only through the immigrant share. This assumption requires that unobserved shocks in individuals' well-being are uncorrelated with the predicted immigrants shares. See Jaeger et al. (2018) for a recent discussion about the plausibility of this assumption and the potential bias generated by this type of instrumental variable.

4.2 Heterogeneity

Besides the baseline case, we analyse the effect of immigration on SWB by looking at selected characteristics of the native population, and in particular by analysing the natives' regions of residence and their socio-demographic characteristics. We also explore models where we partition the immigrant share into subgroups. In particular, we keep the same denominator and "break" the numerator in three parts: immigrant shares from the "EU-14", immigrant shares from "Other Europe" and immigrant shares from "Outside Europe".

5 Results

5.1 Summary statistics

We first present the summary statistics of our sample. Table 1 reports the key variables used in the analysis. The average level of life satisfaction is in line with existing evidence for the UK. About 54% of the sample is composed by females; the average age is 47 years; 2/3 of individuals are married and about 1/5 have higher education. The majority of individuals report either good or excellent health. About 59% report being employed.

More information about life satisfaction is reported in the Appendix. Figure A1 shows the distribution of life satisfaction, with the standard negatively skewed pattern. Figure A2 plots life satisfaction over time. The level appears quite stable, with a slight downward trend. For years 2011-2013, there is a pronounced decrease in life satisfaction, with the value returning to its average level thereafter. Figure A3 shows the well-known U-shaped pattern over the life cycle, as documented in previous studies (e.g., Frey and Stutzer, 2002, Dolan et al., 2008). Life satisfaction decreases around the age of 40-45 and then increases again.

Table 1: Summary Statistics

	Mean	SD		Mean	SD
Life satisfaction (1-7)	5.205	1.332	No children in household (D)	0.684	0.465
Female (D)	0.545	0.498	One child in household (D)	0.139	0.346
Age	46.943	18.461	Two or more children in household (D)	0.178	0.382
Single (D)	0.196	0.397	Excellent health (D)	0.294	0.456
Married (D)	0.660	0.474	Good health (D)	0.426	0.494
Separated/Divorced (D)	0.074	0.262	Fair health (D)	0.196	0.397
Widowed (D)	0.071	0.257	Poor/very poor health (D)	0.084	0.278
Higher education (D)	0.225	0.418	Employed (D)	0.589	0.492
Secondary education (D)	0.500	0.500	Unemployed (D)	0.033	0.179
No/Other education (D)	0.275	0.446	Not in labor force (D)	0.325	0.468
Household size	2.792	1.320	In school/training (D)	0.052	0.223

Number of observations: 163,984. (D) indicates a dummy variable

We now briefly discuss local characteristics. Figure 1 represents the average immigrant share measured at the LAD level for England, Scotland and Wales. Immigration steadily increased over the period of interest. However, it became more diffused across UK areas. Figure A4 in the Appendix shows that the coefficient of variation decreased over time, both at the LAD and LSOA level, meaning that immigrants progressively redistributed across localities. Table 2 reports LAD statistics by quintiles of the immigrant share in the LAD. In general, average wage and the average house prices are higher in areas with more immigrants, while the pattern of the unemployment rate is not monotonic.

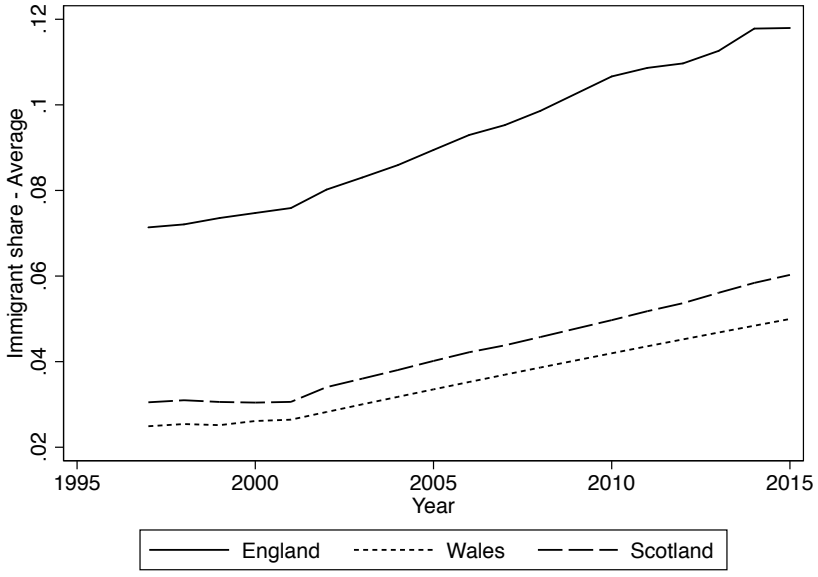

Figure 1: LAD Immigrant Share - Over Time

Table 2: LAD Characteristics by Quintiles of Immigrant Share

	1		2		3		4		5	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Log average wage	5.936	0.120	5.916	0.105	5.976	0.125	6.004	0.115	6.112	0.133
Log house price	11.327	0.300	11.604	0.292	11.729	0.279	11.715	0.377	11.974	0.424
Unemployment rate	0.019	0.006	0.015	0.006	0.012	0.006	0.014	0.007	0.018	0.009
Number of LADs	90		89		89		89		89	

5.2 Baseline regression results

Table 3 presents the baseline results at the LAD and LSOA level for 3 models: pooled OLS, fixed effects and fixed effects with instrumental variables. In the regressions, standard errors are clustered at the locality-year level. For exposition purposes, we only report the estimates for the key variable of interest IM.[9]

The coefficients at the LAD level range from 0.59 to 1.44, with the estimates significant at conventional levels. What do these magnitudes imply? It is useful to compare the estimate of the immigrant share to other local covariates included in the regression. Using the FE estimates as example and taking the coefficient at their face value, the estimate of 0.59 implies that one standard deviation increase in the immigrant share is associated with a 0.03 standard deviation increase in life satisfaction. This is larger than the standardised coefficient for the LAD unemployment rate (-0.01) but much smaller than the standardised coefficient for being in good health (0.24).

Another way to understand the magnitude is to compare how life satisfaction is associated with the immigrant share in different LADs. For example, a British-born individual who lived continuously in the London borough of Enfield during the period of interest (when the immigrant share rose from 34% to 58%) would – ceteris paribus – experience an increase in life satisfaction of 0.14. This compares to an increase of 0.04 for a British-born who lived in Bolton, where immigration increased much less (from 7% to 14%). Overall, the estimated association is positive, but of modest size.[10]

While the confidence intervals of the OLS, FE and FE-IV estimates partially overlap, it is insightful to compare the point estimates across these models. The OLS model includes indicators for the 444 LADs in the sample, therefore these estimates annihilate the potential role played by unobserved area heterogeneity. The FE estimate is somewhat smaller than the OLS, suggesting that the latter could be biased upward. In other words, there could

[9]Full estimates of the baseline model are reported in Table A1 in the Appendix.

[10]To investigate the presence of non-linear effects, we have also estimated a model that includes the quadratic of the immigrant share. However, the coefficient estimate for the square term was insignificant.

be individual fixed unobserved characteristics (e.g., personality traits) that are positively associated with both life satisfaction and the immigrant share. The point estimate of the FE-IV model is larger than the other two models. Under the assumption that the instrument is valid, this suggests a downward bias in the OLS and FE estimates. This bias might be attributable to unobserved, time-variant individual and LAD characteristics. It might also be attributed to self-selection, to the extent to which natives respond to immigration by changing residence.

Table 3: Baseline Results

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Immigrant share	0.7841***	0.5904**	1.4363***	0.2057	–0.0536	0.9996
	(0.2518)	(0.2922)	(0.3979)	(0.2213)	(0.2574)	(0.6809)
R^2	.158	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			2,917.96			1,584.02

Source.—BHPS waves 1997-2000, 2002-2008 and UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

In Table A2 we provide robustness checks where we perform additional regressions at the LAD level. In particular, we include estimates of the following models: interactive FE and interactive FE-IV, where we interact the individual and area effects; random effects, ordered probit and first differences (FD). All estimates, except the FD model confirm the baseline results. One of the reasons why the FD model generates insignificant results is that the immigrant share is linearly interpolated for most of the years, leaving first differences in the key independent variable with scarce variation.

The analysis at the LSOA level produces insignificant estimates throughout the three

models. It is important to note that the OLS and FE coefficients at the LSOA level are much smaller than the LAD level, while the standard errors are of similar magnitude. Also, the LSOA level analysis uses a much larger number of indicators (8,838) to control for the regional fixed effects. The FE-IV estimates are also insignificant, although the point estimate is closer to the LAD level.

There are several explanations behind this result. One explanation is that migration at the local level is measured with substantial error. To check this, we perform a robustness check in the Appendix. In Table A3, we compare the estimates at the LAD and LSOA level with estimates at the ward level. Wards are the level of geography between LAD and LSOA. LADs are composed of wards and wards are formed by LSOAs. There are 4,667 wards in our data, hence there are on average about 10 wards per LAD and about 2 LSOAs per ward. If measurement error was the main issue behind the small estimates at the LSOA level, one would expect small and potentially insignificant estimates also at the ward level. Instead, the results of Table A3 show that results at the ward level are close to the LAD level, suggesting that measurement error might not be an issue. Another explanation could be that migration positively influences well-being only at the district level, while it has no role (or the positive and negative effects cancel out) at the neighbourhood level. We will explore more in depth this potential explanation in the next Section when investigating the various channels.

5.3 Heterogeneity analysis

In this section, we summarise the results of the heterogeneity analysis, where we estimate models interacting IM with key dimensions such as country of residence (Table 4) and gender, age and education (Table 5). Finally, we present regression results where we break down the variable IM by broad origin of immigrants (Table 6).

As shown in Panel A of Table 4, the point estimates at the LAD level are large and statistically significant for Scotland, while for England they are smaller and never statistically significant. At the LSOA level, the pattern of result is very similar to the baseline, namely all estimates are small and statistically insignificant.

In panel B, we interact the immigrant share with the nine Government Office Regions (GOR) of England. The FE analysis at the LAD level shows that there are regions where the estimate is positive and significant (North West, Yorkshire and the Humber, East of England) and regions where it is negative and significant (North East and South West). The FE-IV analysis at the LAD level confirms this pattern, but estimates are no longer significant for the North East and the North West. The analysis at the LSOA level produces similar results, with the East of England and the South West exhibiting significant estimates for both the FE and FE-IV models and the North East only for the FE model.

Table 4: Heterogeneity: by Country and the Government Offices for the English Regions

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: By Country						
Scotland × Immigrant share	2.5066***	2.4743***	3.2069***	0.3511	0.1878	1.9756
	(0.4993)	(0.5410)	(0.7130)	(0.4343)	(0.4851)	(1.7307)
Wales × Immigrant share	0.4062	0.7452	1.8762	0.7309	–0.5711	–0.1074
	(0.9385)	(0.9753)	(1.2202)	(0.7836)	(0.9123)	(1.7160)
England × Immigrant share	0.3772	0.1272	0.6865	0.1147	–0.1162	0.4564
	(0.2765)	(0.3279)	(0.4370)	(0.2606)	(0.3053)	(0.6075)
R^2	.159	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			521.09			119.62
Panel B: By Government Offices for the English Regions						
North East × Immigrant share	–1.3682	–2.5166*	–1.6743	–4.4526***	–3.9605*	–0.5197
	(1.2602)	(1.3426)	(1.5232)	(1.6702)	(2.0466)	(3.1839)
North West × Immigrant share	1.0455**	1.1983*	1.5544	–0.1440	–0.8026	0.2537
	(0.4959)	(0.6338)	(1.0533)	(0.8887)	(0.9637)	(2.0023)
Yourkshire and Humber × Immigrant share	0.9476	1.4135*	2.8770***	–0.0896	–0.9600	0.0368
	(0.7751)	(0.8466)	(1.0739)	(0.9751)	(1.1590)	(1.8830)
East Midlands × Immigrant share	–0.2876	–0.5043	0.0680	0.6437	–0.7012	–1.3018
	(0.7451)	(1.0111)	(1.2170)	(0.8792)	(1.0018)	(2.1183)
West Midlands × Immigrant share	–0.8622	–1.1995	–1.4188	–1.1751	0.4915	2.9512
	(0.8929)	(1.1324)	(1.3902)	(0.9111)	(1.0644)	(1.9597)
East of England × Immigrant share	0.7761	1.3328**	1.9066**	1.4786**	1.1959*	2.3777*
	(0.6179)	(0.6694)	(0.8765)	(0.6862)	(0.7222)	(1.2537)
London × Immigrant share	–0.1849	–0.5594	–0.5027	0.0475	–0.2917	0.0603
	(0.4048)	(0.4700)	(0.5940)	(0.4075)	(0.4802)	(0.7622)
South East × Immigrant share	0.0236	–0.6279	0.3767	0.8263	0.3115	–0.1092
	(0.6187)	(0.7677)	(0.8827)	(0.5086)	(0.6319)	(1.2778)
South West × Immigrant share	–1.4575**	–3.5808***	–3.1013***	–1.7394**	–2.3854**	–3.3805*
	(0.6830)	(0.8522)	(1.1440)	(0.8607)	(0.9634)	(1.8033)
R^2	.149	.028	.028	.298	.024	.023
N	99,834	98,300	98,300	98,770	97,102	97,102
KP Wald F			97.26			151.25

Source.—BHPS waves 1997-2000, 2002-2008 and UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

In terms of socio-demographic characteristics, Panel A of Table 5 reveals that the estimate for the immigrant share is larger for females than for males. However, in most of the cases the estimates are not statistically different for the two groups. All estimates at the LSOA level are in general smaller and statistically insignificant. Panel B of Table 5 shows the results by age. The effect of immigrant shares at the LAD level is larger for individuals aged 36-50 and 51-65 while is smaller for younger and older groups. Nevertheless, the confidence intervals of the interaction terms substantially overlap. Once again, estimates at the LSOA level show no effect. Panel C of Table 5 contains the estimates by education level. At the LAD level, the effect is positive and statistically significant for natives with secondary or higher education. For individuals with no or other education, the estimate is negative but not significant. At the LSOA level, the only statistically significant result is for natives with higher education in the FE-IV model.

In the last set of results of this section, shown in Table 6, we break down the immigrant share in three broad origins. In practice we split the numerator of IM in three parts: migrants counts from "EU-14" (i.e. the EU-15 excluding the UK), "Other Europe" and "Outside Europe".[11] We then derive separate measures of the immigrant shares and estimate the same regression models of Table 3. There are two caveats for these models. First, omitted variable bias could affect the estimates to the extent that in each regression we use a measure for the immigrant share that accounts only for a fraction of all immigrants in the area. Second, because of the different definition, for instrumenting each immigrant share we use the respective one-year lag instead of the classic shift share instrument.[12]

The estimates for the "EU-14" immigrant shares are significant for the OLS model at the LAD level, but they become smaller and insignificant in the FE and FE-IV models. Interestingly, at the LSOA level the estimates for the "EU-14" immigrant shares are negative, albeit they are statistically significant only for the OLS and FE models. The estimates for the "Other Europe" immigrant shares are positive, but only significant for the OLS models. For the "Outside Europe" group, the estimate mimics the baseline model, in the sense that there is a positive and significant association for all models at LAD level, while estimates are small and insignificant at the LSOA level.

[11]The EU-14 are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and Sweden. The group "Other Europe" includes migrants from all countries in Europe except the EU-15. The majority of these migrants are from member states that joined the EU after 2004.

[12]We have explored several definitions of the shift-share instrument, but all of them generate implausible results for either the first or second stage.

Table 5: Heterogeneity: Demographic Characteristics

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: By Gender						
Male × Immigrant share	0.6939***	0.4312	1.1990***	0.2961	–0.1607	1.0385
	(0.2557)	(0.3092)	(0.4129)	(0.2285)	(0.2884)	(0.7061)
Female × Immigrant share	0.8434***	0.7149**	1.6302***	0.1437	0.0262	0.9691
	(0.2554)	(0.3114)	(0.4184)	(0.2265)	(0.2885)	(0.7118)
R^2	.158	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			1,459.61			792.59
Panel B: By Age Group						
Age 16-35 × Immigrant share	0.8839***	0.5713	1.6918***	0.4269*	–0.3887	0.7414
	(0.2653)	(0.3662)	(0.4986)	(0.2543)	(0.3769)	(0.9692)
Age 36-50 × Immigrant share	1.2019***	0.8948***	1.9760***	0.3649	0.0035	1.2002
	(0.2629)	(0.3177)	(0.4496)	(0.2514)	(0.3179)	(0.8644)
Age 50-65 × Immigrant share	0.4862*	0.8953***	1.8987***	–0.1162	–0.0539	1.1453
	(0.2706)	(0.3176)	(0.4319)	(0.2485)	(0.2884)	(0.7807)
Age 65+ × Immigrant share	0.6329**	0.3285	1.1360***	0.4485*	0.0201	0.7011
	(0.2721)	(0.3196)	(0.4108)	(0.2515)	(0.2835)	(0.6923)
R^2	.16	.027	.027	.29	.024	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			783.34			337.58
Panel C: By Educational Level						
Higher ed. × Immigrant share	0.8436***	1.0477***	1.9009***	0.3495	0.4189	1.6613**
	(0.2542)	(0.2995)	(0.4061)	(0.2404)	(0.3082)	(0.7155)
Secondary ed. × Immigrant share	0.8029***	0.6514**	1.3917***	0.2842	–0.0773	0.8082
	(0.2594)	(0.3101)	(0.4237)	(0.2289)	(0.2798)	(0.7020)
Other ed. × Immigrant share	0.2884	–0.5811	–0.0474	–0.1810	–0.5216	–0.3764
	(0.2807)	(0.3911)	(0.4844)	(0.2575)	(0.3311)	(0.7305)
R^2	.159	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			966.79			537.02

Source.—BHPS waves 1997-2000, 2002-2008 and UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

Table 6: Heterogeneity: Origin of Immigrants

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Immigrants from EU-14						
Immigrant share	4.8487**	3.2955	0.1904	–2.2049*	–2.5776*	–3.7618
	(2.2914)	(2.7955)	(6.9336)	(1.2065)	(1.3339)	(2.4062)
R^2	.158	.026	.026	.289	.023	.023
N	163,983	161,628	151,101	162,670	160,121	149,476
KP Wald F			214.86			605.62
Panel B: Immigrants from Other Europe						
Immigrant share	1.4187**	0.9457	0.7145	0.7842*	0.4967	0.8019
	(0.5581)	(0.6720)	(0.7608)	(0.4484)	(0.5208)	(0.6178)
R^2	.158	.026	.026	.289	.023	.023
N	163,983	161,628	151,101	162,670	160,121	149,476
KP Wald F			5,759.27			4,034.45
Panel C: Immigrants from Outside Europe						
ImImmigrant share	1.0257***	0.8536*	1.4723*	0.2649	–0.0601	–0.3177
	(0.3695)	(0.4392)	(0.7987)	(0.3482)	(0.4111)	(0.7441)
R^2	.158	.026	.026	.289	.023	.023
N	163,983	161,628	151,101	162,670	160,121	149,476
KP Wald F			547.20			766.32

Source.—BHPS waves 1997-2000, 2002-2008 and UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

6 Channels

In this section, we investigate potential channels behind our results. First, we explore various dimensions of satisfaction; we then consider the role played by internal migration and finally test how the relationship of interest varies in function of individual attitudes and voting preferences.

6.1 Well-being dimensions

In this subsection, we explore regression models where the response variable is a particular "domain" of life satisfaction. We consider four dimensions for which the BHPS and UKHLS report data: income, job, health and leisure. The LAD estimates reported in Table 7 suggest that satisfaction with health and leisure are dimensions at work, while income and job seem to be irrelevant. These results are remarkably in line with the findings for Germany of Akay et al. (2014). That natives' job satisfaction is not influenced by immigration can also be interpreted as a corollary of the finding that immigration has no effect on British-born labour market outcomes (Manacorda et al., 2012). The positive effect on health could have several interpretations. For example, Giuntella et al. (2017) find that immigration in the UK helps reducing waiting times at the NHS. Another potential explanation could be related to the large number of highly trained foreign physicians and doctors and the productivity gains that they could generate within the health sector. Concerning the leisure, one potential interpretation has to do with the positive effect that immigration could have on both the amount and "quality" of natives' free time. This could occur, for example, through a larger/cheaper supply of services/amenities (including "ethnic goods") that immigrants may provide.

At the LSOA level, only a few estimates are significant, and in particular the FE-IV estimates for satisfaction with leisure and the FE estimates for satisfaction with income. One interpretation of the positive effect on income satisfaction relates to positional concerns. The literature has put forward the idea that individual welfare also depends on how people compare their income with that of other relevant groups (e.g., Clark and Oswald, 1996, Senik, 2004). Individuals who live in areas where the reference person is relatively richer might experience a loss in subjective well-being. Similarly, an individual perceiving that the reference person is economically worse off might feel more satisfied with income. Hence, living in LSOAs with relatively more immigrants might increase satisfaction with income, to the extent that immigrants are perceived as being less wealthy than the British-born.

Table 7: Channels: Domains of Life Satisfaction

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Satisfaction with Health						
Immigrant share	0.5089*	0.8495***	0.9131*	0.0273	0.2280	0.8436
	(0.2745)	(0.3231)	(0.4725)	(0.2482)	(0.2920)	(0.7603)
R^2	.371	.106	.106	.437	.1	.1
N	164,508	162,166	162,166	163,200	160,658	160,658
KP Wald F			2,915.51			1,584.77
Panel B: Satisfaction with Income						
Immigrant share	0.4419	0.3953	0.5605	0.7823***	0.5970**	0.1066
	(0.3073)	(0.3331)	(0.4289)	(0.2687)	(0.3010)	(0.7853)
R^2	.141	.019	.019	.313	.016	.016
N	164,184	161,857	161,857	162,877	160,354	160,354
KP Wald F			2,907.49			1,588.65
Panel C: Satisfaction with Job						
Immigrant share	–0.0022	–0.2699	0.3551	–0.3522	–0.5288	–0.4942
	(0.3114)	(0.3836)	(0.5307)	(0.2979)	(0.3540)	(0.8914)
R^2	.052	.006	.006	.206	.005	.005
N	101,166	98,975	98,975	99,700	97,440	97,440
KP Wald F			3,547.38			942.75
Panel D: Satisfaction with Leisure						
Immigrant share	0.6792**	0.8835**	2.1633***	–0.0438	0.3088	3.1323***
	(0.3020)	(0.3529)	(0.4674)	(0.2605)	(0.3027)	(0.8059)
R^2	.18	.022	.022	.306	.018	.017
N	164,170	161,816	161,816	162,858	160,315	160,315
KP Wald F			2,908.52			1,585.68

Source.—BHPS waves 1997-2000, 2002-2008 and UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

6.2 Selection and mobility

A second channel that we investigate is the role of internal mobility. One of the potential mechanisms that could be behind our results (and that could also affect the size and interpretation of our estimates) is the mobility of natives between and within LADs. For example, one possibility is that natives who are unsatisfied with growing migration in the LAD move to a different LAD. If this was the case, the positive correlation observed at the LAD level in the baseline model could be the byproduct of negative selection (i.e., unhappy people moving out). Likewise, it is possible that natives do not change LAD but move to a different neighbourhood. If natives' mobility within the LAD was substantial, this would generate a "cost" at the local level that our baseline model would not be able to capture. Even though the instrumental variable procedure is helpful to mitigate the role of selection, it may not fully eliminate it.

To test more directly the role of internal mobility, in Table 8 we exclude natives that move in the year after their subjective well-being is observed (i.e., at $t + 1$), in other words "prospective" internal migrants. The rationale of this test is that if internal mobility were important, the results of the baseline analysis should substantially change when excluding the subsample of individuals who will move out from the LAD/LSOA. Note, we do not focus on the subsample of movers alone since it is too small to be analysed with our baseline regression model. The fact that this is a small sample (only 8% of natives changed LAD and only 13% changed LSOA) is already indicative that the role of mobility might not be substantial. The results of the analysis show that the estimates for the "stayers" remarkably resemble those for the full sample in Table 3. Hence, while it is not possible to rule out that natives respond to immigration in the area by moving out, this does not seem to be a factor driving the results.

6.3 Attitude towards immigrants

In this section, we explore the role played by attitudes towards migration. The literature has established that the size and composition of immigrants influence attitudes towards migrants (see e.g., Mayda, 2006). The scope of this analysis is to understand the extent to which these attitudes "mediate" the relationship between immigration and life satisfaction. To do so, we use the biennial data from the European Social Survey (ESS) for the UK from 2002 to 2014 to construct variables for the attitudes towards immigrants. Each variable takes three values, with the lowest indicating more negative attitudes and the highest more positive attitudes.

Table 8: Channels: Internal Mobility

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Stay in the same LAD						
Immigrant share	0.8500***	0.4931	1.2715***	0.0908	–0.0977	0.6065
	(0.2873)	(0.3275)	(0.4478)	(0.2473)	(0.2845)	(0.7579)
R^2	.16	.025	.025	.293	.022	.022
N	150,842	148,666	148,666	149,784	147,493	147,493
KP Wald F			2,484.25			1,361.40
Panel B: Stay in the same LSOA						
Immigrant share	0.6986**	0.3275	1.2167***	–0.0092	–0.1167	0.7442
	(0.2876)	(0.3278)	(0.4550)	(0.2556)	(0.2900)	(0.7662)
R^2	.16	.024	.024	.294	.021	.021
N	143,035	140,851	140,851	142,179	139,997	139,997
KP Wald F			2,406.73			1,335.50

Source.—BHPS waves 1997-2000, 2002-2008 and UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

We then match the values of the attitudes from the ESS with the BHPS and UKHLS data.[13]

We consider the following dimensions and values for the variables:

- Allow immigrants of different race or ethnic group: 1=none; 2=few; 3=some/many
- Allow immigrants from poorer countries outside Europe: 1=none; 2=few; 3=some/many
- Allow immigrants of same race or ethnic group: 1=none; 2=few; 3=some/many
- Immigration bad or good for economy: 1=0 to 4; 2=5 to 7; 3=8 to 10
- Immigration made the country a better place to live: 1=0 to 4; 2=5 to 7; 3=8 to 10
- Perceptions of the effects of migration on cultural life: 1=0 to 4; 2=5 to 7; 3=8 to 10

We then interact the attitude variables with the immigrant share. Results are reported in Table 9 for the first three dimensions and in Table 10 for the remaining three dimensions. The estimates increase as the level of attitudes towards immigrants become more positive, with this pattern being evident across all attitude measures. At the LAD level, the majority of the FE and FE-IV are statistically significant, albeit the confidence intervals substantially overlap. The pattern of estimates at the LSOA level is similar to the LAD level, however only a few of the FE-IV estimates are statistically significant.

6.4 The EU referendum vote

We finally explore the role of political preferences by estimating models where we interact the immigrant share with variables measuring the "intensity" of the leave vote. We obtained data at the LAD and ward level about the results of the 23 June 2016 referendum to leave the European Union and calculate the shares of leave votes in the locality.[14] We created three indicators corresponding to different thresholds of the leave vote shares: below 50%, between 50% and 65% and above 65% and interact these with the immigrant shares. We report the estimates of these models in Table 11. Panel A shows the estimates using the share of leave vote calculated at the LAD level, while Panel B uses the voting data at the ward level. Note, the ward-level data are available only for a subset of wards (1,283) in Great Britain.

[13]For the matching, we use both the exact matching on discrete covariates and the Mahalanobis distance matching on continuous covariates. In detail, we exactly match observations on four discrete covariates: GOR, gender, marital status, employment status; and we 1:1 match observations by minimising the Mahalanobis distance along the covariates of age, year of education, number of children and household size.

[14]Data at the LAD level are from https://www.electoralcommission.org.uk/our-work/our-research/electoral-data/electoral-data-files-and-reports and at the ward level from http://www.bbc.co.uk/news/uk-politics-38762034.

Table 9: Channels: Attitude Towards Immigration (I)

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Allow immigrants of different race or ethnic group						
Allow none × Immigrant share	0.5317**	0.4440	1.0312***	–0.0544	–0.2093	0.6662
	(0.2479)	(0.2835)	(0.3659)	(0.2329)	(0.2765)	(0.5362)
Allow a few × Immigrant share	0.5632**	0.5887**	1.1298***	0.0764	–0.1064	0.6396
	(0.2292)	(0.2746)	(0.3523)	(0.2064)	(0.2497)	(0.5204)
Allow many or some × Immigrant share	0.7059***	0.8129***	1.4253***	0.1605	0.1916	0.9319*
	(0.2216)	(0.2633)	(0.3371)	(0.1980)	(0.2374)	(0.5065)
R^2	.159	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			1,391.12			530.09
Panel B: Allow immigrants from poorer countries outside Europe						
Allow none × Immigrant share	0.5533**	0.1246	0.6802*	–0.0902	–0.4543*	0.2845
	(0.2453)	(0.2819)	(0.3592)	(0.2248)	(0.2684)	(0.5232)
Allow a few × Immigrant share	0.5624**	0.5244*	0.9664***	0.2090	–0.0436	0.5303
	(0.2274)	(0.2689)	(0.3417)	(0.2023)	(0.2418)	(0.5018)
Allow many or some × Immigrant share	0.7272***	0.6571**	1.1402***	0.2030	0.1450	0.7663
	(0.2240)	(0.2568)	(0.3304)	(0.1969)	(0.2361)	(0.5024)
R^2	.159	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			1,481.58			486.13
Panel C: Allow immigrants of same race or ethnic group						
Allow none × Immigrant share	0.6714**	0.4711	1.0375***	0.0646	–0.1226	0.8032
	(0.2816)	(0.3083)	(0.3871)	(0.2702)	(0.3126)	(0.5582)
Allow a few × Immigrant share	0.4177*	0.5377**	1.0197***	0.0279	–0.0856	0.6656
	(0.2260)	(0.2682)	(0.3467)	(0.2079)	(0.2494)	(0.5073)
Allow many or some × Immigrant share	0.6249***	0.6914***	1.2221***	0.0918	0.0971	0.8750*
	(0.2156)	(0.2537)	(0.3298)	(0.1958)	(0.2350)	(0.4937)
R^2	.159	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			1,480.43			552.98

Source.—BHPS waves 1997-2000, 2002-2008, UKHLS waves 2010-2015, and ESS 2002-2014 (biennial data).

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

Table 10: Channels: Attitude Towards Immigration (II)

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Immigration good for economy (0-10)						
Attitude Index (0-4) × Immigrant share	0.6750***	0.4878	1.2990***	0.1379	–0.2036	0.8391
	(0.2468)	(0.2965)	(0.4016)	(0.2215)	(0.2648)	(0.6805)
Attitude Index (5-7) × Immigrant share	0.5969**	0.5990**	1.4623***	0.1634	0.0459	1.1343*
	(0.2490)	(0.2965)	(0.4006)	(0.2223)	(0.2658)	(0.6827)
Attitude Index (8-10) × Immigrant share	0.6329**	0.6824**	1.5910***	0.2448	0.1026	1.1690
	(0.2798)	(0.3272)	(0.4284)	(0.2583)	(0.2975)	(0.7187)
R^2	.158	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			990.08			533.24
Panel B: Immigration made the country a better place to live (0-10)						
Attitude Index (0-4) × Immigrant share	0.5846**	0.4842	1.3243***	0.2034	–0.1179	0.9560
	(0.2475)	(0.2952)	(0.4008)	(0.2228)	(0.2668)	(0.6808)
Attitude Index (5-7) × Immigrant share	0.6808***	0.5659*	1.3822***	0.1085	–0.0428	0.9714
	(0.2504)	(0.2993)	(0.4007)	(0.2236)	(0.2652)	(0.6821)
Attitude Index (8-10) × Immigrant share	0.6674***	0.6925**	1.6240***	0.1687	0.0050	1.3134*
	(0.2587)	(0.3080)	(0.4153)	(0.2352)	(0.2823)	(0.7026)
R^2	.159	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			992.00			531.68
Panel C: Perceptions of the effects of migration on cultural life (0-10)						
Attitude Index (0-4) × Immigrant share	0.5323**	0.4333	1.2189***	0.1193	–0.1790	0.8660
	(0.2465)	(0.2945)	(0.4002)	(0.2238)	(0.2659)	(0.6813)
Attitude Index (5-7) × Immigrant share	0.7329***	0.5910**	1.4367***	0.1700	–0.0189	1.0795
	(0.2491)	(0.2994)	(0.4018)	(0.2214)	(0.2640)	(0.6831)
Attitude Index (8-10) × Immigrant share	0.7263***	0.8903***	1.8394***	0.2746	0.1346	1.2082*
	(0.2732)	(0.3294)	(0.4306)	(0.2457)	(0.3012)	(0.7103)
R^2	.159	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			990.69			530.04

Source.—BHPS waves 1997-2000, 2002-2008, UKHLS waves 2010-2015, and ESS 2002-2014 (biennial data).

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

The results at the LAD level show that the coefficient for the immigrant share is positive and significant mainly in areas where the share of the leave vote is below 50%, while the effect is essentially zero in areas with a very large share of leave vote. A similar pattern is observed also at the LSOA level. Remarkably, however, when voting data at the ward level are used, the estimates of the interaction terms turn negative and significant in LSOA located within wards with a high share of leave vote. These last results, however, should be interpreted cautiously, since they are based on a much smaller sample.

Table 11: Channels: Local EU Referendum Votes

		LAD level			LSOA level	
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: LAD Level EU Referendum Vote						
LAD level leave vote <50% × Immigrant share	1.2224***	0.9974***	1.5113***	0.6697**	0.2231	1.1740
	(0.2977)	(0.3281)	(0.4129)	(0.2763)	(0.3135)	(0.7153)
LAD level leave vote 50%-65% × Immigrant share	0.2612	0.0393	0.9558*	–0.3922	–0.5165	0.2087
	(0.3187)	(0.3984)	(0.5330)	(0.3212)	(0.3835)	(0.8646)
LAD level leave vote >65% × Immigrant share	–0.9112	–0.5837	–0.3804	–0.6069	0.3079	–0.4844
	(0.8182)	(1.0167)	(1.0904)	(1.0015)	(1.0567)	(1.7531)
R^2	.159	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			832.94			673.52
Panel B: Ward Level EU Referendum Vote						
Ward level leave vote <50% × Immigrant share	0.7227	1.1943*	1.8089*	0.3144	–0.1713	0.6628
	(0.5684)	(0.7126)	(0.9350)	(0.5460)	(0.6371)	(1.0880)
Ward level leave vote 50%-65% × Immigrant share	0.6209	0.7994	1.4421	–0.4037	–0.5527	–2.8306*
	(0.6059)	(0.8344)	(1.1101)	(0.7951)	(0.8844)	(1.5035)
Ward level leave vote >65% × Immigrant share	0.4891	0.0611	1.0941	–2.0897	–1.9736	–7.0355*
	(0.8779)	(1.3803)	(1.7484)	(1.3702)	(1.7807)	(4.1104)
R^2	.133	.02	.02	.282	.018	.017
N	23,547	22,933	22,933	23,287	22,675	22,675
KP Wald F			432.38			87.61

Source.—BHPS waves 1997-2000, 2002-2008, UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

7 Discussion

In this report, we investigate the impact of immigration on the subjective well-being of the British born – as measured by their life satisfaction. Merging data from the British Household Panel Survey and Understanding Society – The UK Household Longitudinal Study for the period 1997 to 2015 with the census, we estimated panel data models where the dependent

variable is individual life satisfaction and the main explanatory variable is the immigrant share in the local authority or neighbourhood. The key result is that there is a positive but negligible effect of immigration on natives' life satisfaction at the LAD level. This effect however disappears at the LSOA level. These results hold across models that control for unobserved individual heterogeneity and that address additional endogeneity issues.

While the estimates differ depending on natives' socio-demographic characteristics, the differences are not substantial in size nor statistically significant. We explore several mechanisms behind the results, finding that attitudes towards migrants and political preferences (as measured by the leave vote in the area) are likely channels that mediate the relationship between immigration and life satisfaction. Among the various satisfaction domains, health and leisure seem to be the two most relevant.

The overall conclusion of our analysis is that immigration at the local level – on average – has either no or a small positive impact on individuals' life satisfaction. Although it is not possible to pin down the exact channels, these small "welfare gains" seem to be related to favourable attitudes towards immigrants and to the positive impact that migration has on natives' leisure and health. This externality, however, disappears when relating individuals' life satisfaction with immigration in the neighbourhood. It is possible that at a more local level immigration has no impact on subjective well-being, or that gains and losses in terms of life satisfaction compensate.

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A1 Appendix: Data

A1.1 Data imputations

In the BHPS and UKHLS, many individual characteristics, such as marital status, education, and the number of children, are not collected every year. We use the following imputation strategy:

1. Impute missing values using non-missing value from the previous wave.
2. If values cannot be imputed using step 1, we impute the missing values using the information of the non-missing value from the following wave.
3. If values cannot be imputed using step 2, we search non-missing values from more distant (previous and following) waves.

A2 Appendix: Additional Figures

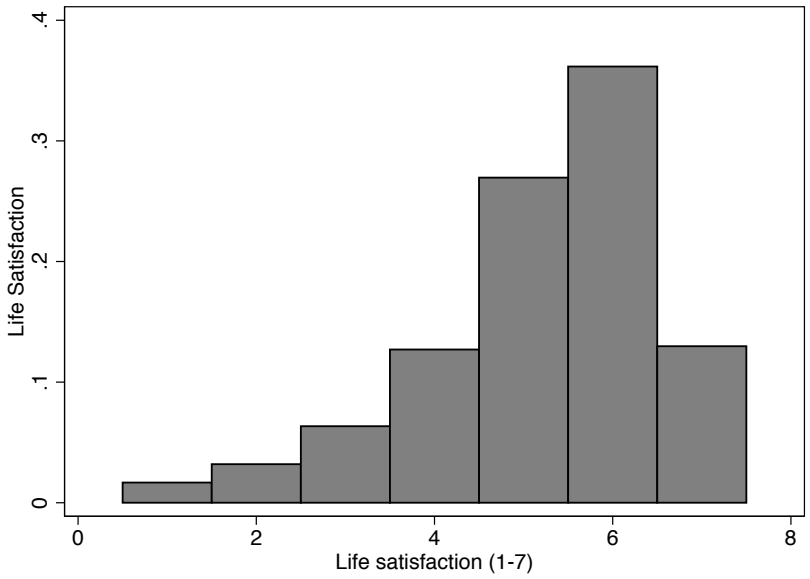

Figure A1: Life Satisfaction - Distribution

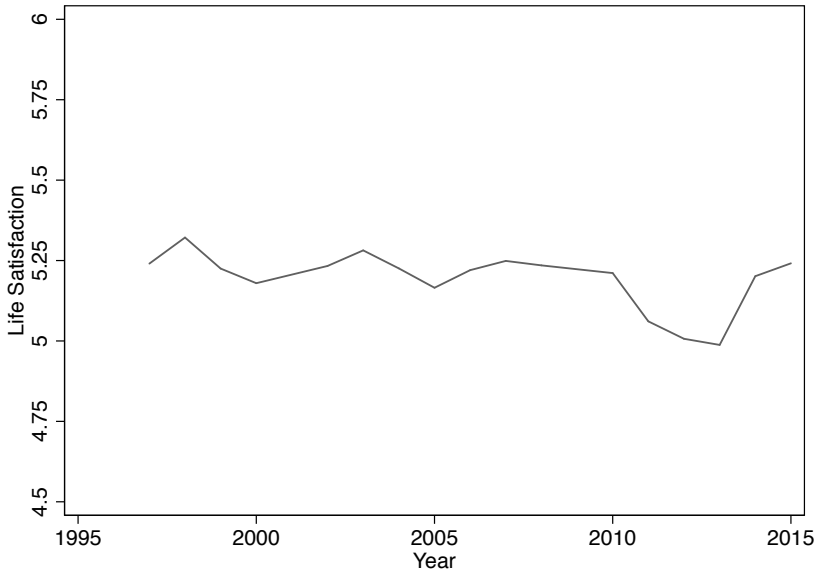

Figure A2: Life Satisfaction - Over Time

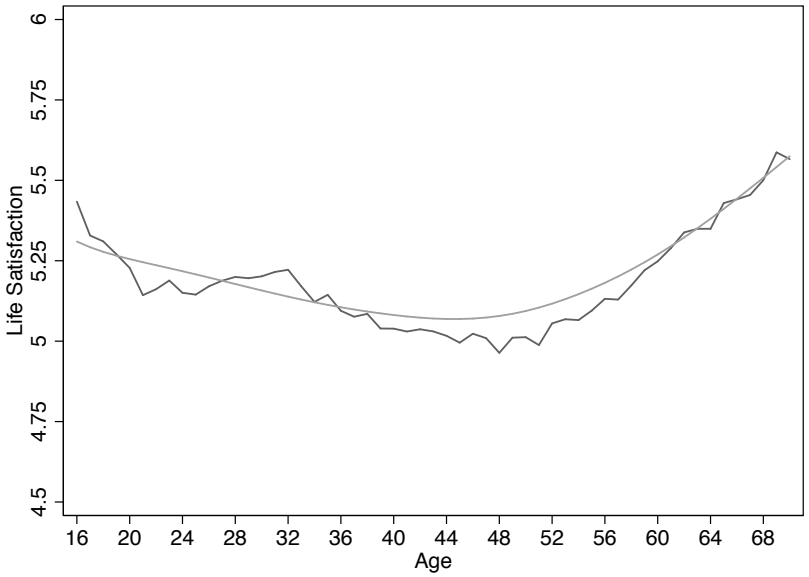

Figure A3: Life Satisfaction - Over the Life Cycle

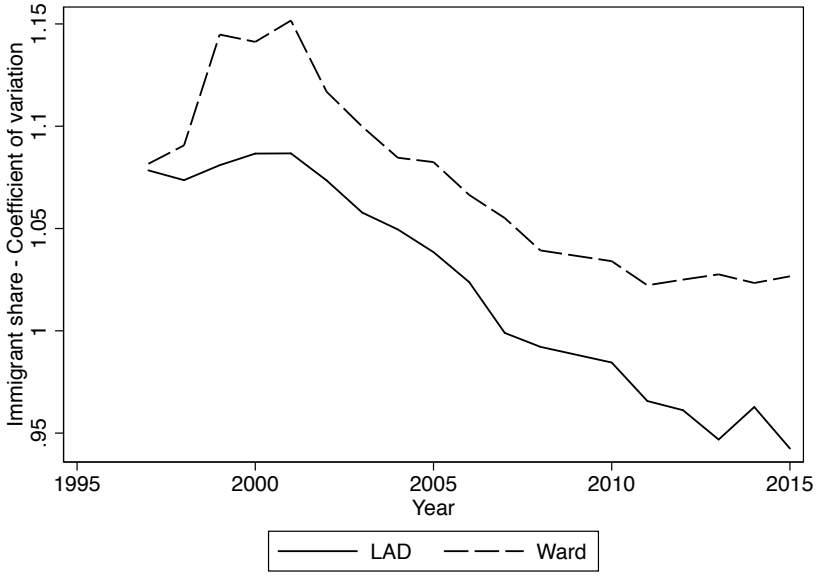

Figure A4: Immigrant Share - Coefficient of Variation

A3 Appendix: Additional Tables

Table A1: Baseline Results - Full Estimates

	LAD level			LSOA level		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)
Immigrant share	0.7841***	0.5904**	1.4363***	0.2057	–0.0536	0.9996
	(0.2518)	(0.2922)	(0.3979)	(0.2213)	(0.2574)	(0.6809)
House price (LAD)	0.0006	0.0002	0.0004	0.0003	0.0005	0.0007
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Unemployment rate (LAD)	–0.4513	–1.5391	–1.2318	–0.7641	–1.9298	–1.6160
	(1.0826)	(1.1590)	(1.1540)	(1.2350)	(1.3105)	(1.3213)
Log Wage (LAD)	0.0647	0.0441	0.0383	0.1810***	0.0728	0.0654
	(0.0452)	(0.0452)	(0.0455)	(0.0459)	(0.0487)	(0.0490)
Log number of immigrants (GOR)	–0.0131	–0.0339	–0.0358	–0.0201	–0.0483	–0.0528
	(0.0275)	(0.0286)	(0.0282)	(0.0308)	(0.0339)	(0.0341)
Higher education	–0.0467***	0.0865**	0.0854**	–0.0726***	0.0603	0.0600
	(0.0104)	(0.0338)	(0.0338)	(0.0129)	(0.0379)	(0.0379)
Secondary education	–0.0563***	0.0884***	0.0880***	–0.0722***	0.0688**	0.0688**
	(0.0093)	(0.0273)	(0.0273)	(0.0108)	(0.0294)	(0.0294)
Single	–0.0434**	0.1217***	0.1227***	–0.0187	0.1483***	0.1504***
	(0.0196)	(0.0337)	(0.0337)	(0.0231)	(0.0390)	(0.0390)
Married	0.2977***	0.2605***	0.2607***	0.2567***	0.2664***	0.2678***
	(0.0168)	(0.0293)	(0.0293)	(0.0198)	(0.0313)	(0.0314)
Separated or divorced	–0.2147***	–0.0717**	–0.0717**	–0.1980***	–0.0697*	–0.0680*
	(0.0199)	(0.0349)	(0.0349)	(0.0242)	(0.0367)	(0.0368)
Household size	–0.0096***	–0.0275***	–0.0277***	–0.0098**	–0.0455***	–0.0457***
	(0.0037)	(0.0047)	(0.0047)	(0.0048)	(0.0062)	(0.0062)
No children in household	0.1194***	0.0343**	0.0355**	0.1390***	–0.0014	–0.0007
	(0.0120)	(0.0158)	(0.0158)	(0.0145)	(0.0185)	(0.0185)
One child in household	0.0036	0.0314**	0.0324**	0.0250*	0.0030	0.0036
	(0.0121)	(0.0135)	(0.0135)	(0.0138)	(0.0150)	(0.0150)
Excellent health	1.5570***	0.7813***	0.7808***	1.3809***	0.7457***	0.7455***
	(0.0160)	(0.0180)	(0.0180)	(0.0161)	(0.0180)	(0.0181)
Good health	1.2025***	0.6365***	0.6361***	1.0731***	0.6013***	0.6010***
	(0.0156)	(0.0170)	(0.0170)	(0.0153)	(0.0166)	(0.0166)
Fair health	0.7185***	0.3922***	0.3921***	0.6486***	0.3715***	0.3714***
	(0.0164)	(0.0162)	(0.0162)	(0.0160)	(0.0162)	(0.0162)
Employed	–0.1195***	–0.1257***	–0.1270***	–0.1174***	–0.1225***	–0.1238***
	(0.0159)	(0.0190)	(0.0190)	(0.0178)	(0.0204)	(0.0204)
Unemployed	–0.5491***	–0.4020***	–0.4029***	–0.4796***	–0.3897***	–0.3907***
	(0.0252)	(0.0271)	(0.0270)	(0.0265)	(0.0281)	(0.0281)
Not in labour force	–0.1638***	–0.1664***	–0.1677***	–0.1891***	–0.1629***	–0.1644***
	(0.0186)	(0.0221)	(0.0221)	(0.0207)	(0.0239)	(0.0239)
R^2	.158	.026	.026	.289	.023	.023
N	163,983	161,628	161,628	162,670	160,121	160,121
KP Wald F			2,917.96			1,584.02

Source.—BHPS waves 1997-2000, 2002-2008 and UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

Table A2: Robustness Checks: LAD Level

	Interactive FE	**Interactive FE-IV**	**Random Effects**	**Ordered Probit**	**FD**
	(1)	(2)	(3)	(4)	(5)
Immigrant share	0.5732*	1.1691***	0.6510**	0.5441***	0.3386
	(0.2983)	(0.4318)	(0.2667)	(0.2066)	(0.9817)
R^2	.033	.033	.227	.048	.019
N	169,343	159,698	163,984	163,984	126,926
KP Wald F		2,608.73			

Source.—BHPS waves 1997-2008 and UKHLS waves 2010-2015.

Note.—Interactve FE: individual fixed effects × area fixed effects; FD: first differences. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level time fixed effects, and local fixed effects. Additional regional controls include unemployment rate, log weekly wages, and the housing index at the regional level. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistic refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.

Table A3: Baseline Results - LAD, Ward and LSOA Levels

	LAD level			**Ward level**			**LSOA level**		
	OLS	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**	**OLS**	**FE**	**FE-IV**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Immigrant share	0.7841***	0.5904**	1.4363***	0.9611***	0.4513*	1.6489***	0.2057	–0.0536	0.9996
	(0.2518)	(0.2922)	(0.3979)	(0.2176)	(0.2503)	(0.4926)	(0.2213)	(0.2574)	(0.6809)
R^2	.158	.026	.026	.225	.024	.024	.289	.023	.023
N	163,983	161,628	161,628	163,536	161,107	161,107	162,670	160,121	160,121
KP Wald F			2,917.96			1,938.30			1,584.02

Source.—BHPS waves 1997-2000, 2002-2008 and UKHLS waves 2010-2015.

Note.—OLS: ordinary least-squares; FE: fixed effects; FE-IV fixed effects with instrumental variables. All models include controls for age, age square, gender, marital status, household size, one child, two or more children, health status, educational attainment, job status, log number of immigrants at GOR×year level, time fixed effects and local fixed effects. All regressions include LAD level controls for benefit claimant rates, log weekly wages, and housing index. FE models exclude gender and age variables. Robust standard errors clustered at regions×time level are reported in parentheses. The KP F Wald statistics refers to the first stage regression in the FE-IV model.

*Statistically significant at the 10 percent level.

**Statistically significant at the 5 percent level.

***Statistically significant at the 1 percent level.