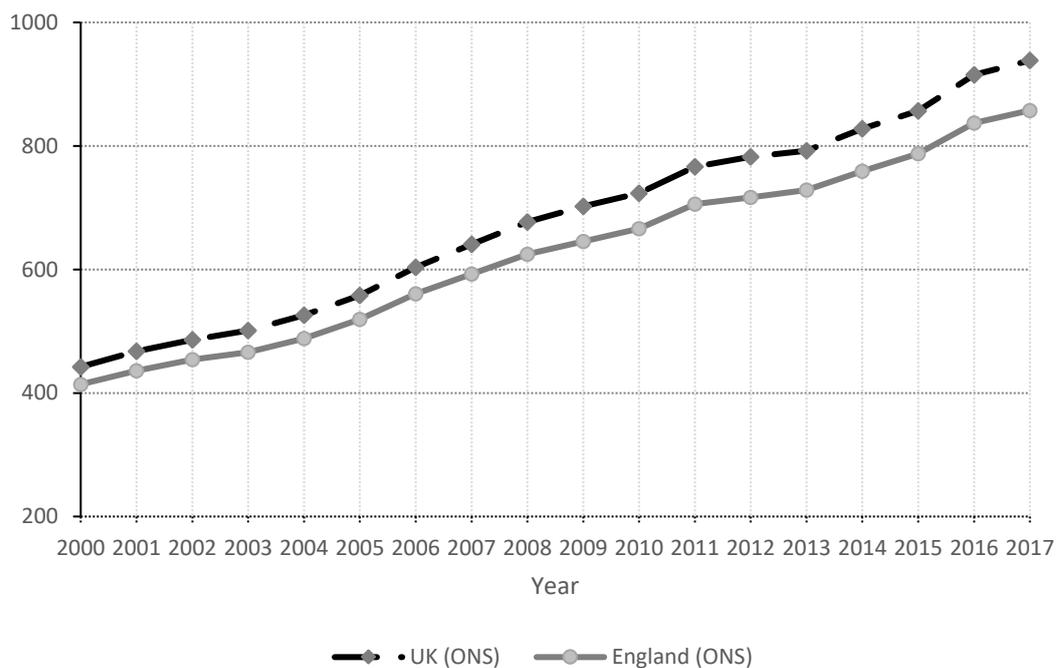


Online Appendix

Table A1: GHQ components

Lost much sleep over worry?
Felt constantly under strain?
Felt that you could not overcome your difficulties?
Been feeling unhappy and depressed?
Been able to concentrate on whatever you are doing?
Felt that you were playing a useful part in things?
Felt capable of making decisions about things?
Been able to enjoy your normal day-to-day activities?
Been able to face up to your problems?
Been feeling reasonably happy, all things considered?
Been losing self-confidence in yourself?
Been thinking of yourself as a worthless person?

Figure A1: Total number of foreign-born individuals in UK and England over 2000 – 2017 (00,000s)



Source: Data came from the Office for National Statistics (ONS, 2018)

A2 Indices of Multiple Deprivation

We merged our household survey datasets with the English Indices of Multiple Deprivation provided by the Department for Communities and Local Government.¹ These Indices of Multiple Deprivation rank each neighbourhood in England according to seven distinct measures of deprivation. The specific deprivation rankings include Income; Employment; Health and Disability; Education, Skills and Training; Crime; Barriers to Housing and Services; and Living Environment. In addition to these specific rankings, the Department for Communities and Local Government publish an amalgamated measure reflecting the overall level of deprivation in each neighbourhood. We include this amalgamated deprivation ranking as an additional covariate in order to control for any differences in the economic and social conditions across local authority areas.² These indices are published at regular intervals, i.e., 2004, 2007, 2010 and 2015.³ We extrapolated and interpolated across these intervals to obtain a measure of neighbourhood deprivation for each year of our analysis and added the resulting deprivation measure as a control variable.

¹ See DCLG (2015) for more details.

² Results are robust to different combinations of these neighbourhood level control variables

³ The indices are published in 2004, 2007, 2010 and 2015. However they typically capture information from neighbourhoods in 2002, 2005, 2008 and 2013. In addition to a relative ranking across neighbourhoods the DCLG also publish scores for each neighbourhood but these scores in contrast to the ranks are not directly comparable over time, and so are not used in the analysis.

Table A3: Summary statistics of the sample used in main models in table 1 (N=214,610)

Variable	Mean	Std. Dev.	Min	Max
Subjective well-being	24.87	5.45	0	36
Foreign-born individuals	28064	38854	1000	268000
Age	48.79	17.55	19	102
Age squared	2688.17	1804.19	361	10404
Other degree	0.11	0.32	0	1
Degree	0.22	0.41	0	1
A-levels	0.21	0.41	0	1
GCSE	0.22	0.42	0	1
Other	0.10	0.31	0	1
No formal qualifications	0.14	0.34	0	1
Male	0.45	0.50	0	1
Household income	3530.05	2780.37	-20000	86703.29
Single	0.18	0.38	0	1
Married	0.67	0.47	0	1
Divorced	0.08	0.28	0	1
Widowed	0.06	0.24	0	1
Number of children	0.53	0.93	0	9
Self-employed	0.08	0.27	0	1
Paid employment	0.52	0.50	0	1
Unemployed	0.04	0.20	0	1
Inactive	0.36	0.48	0	1
Local-authority deprivation rank	17120.98	9164.41	1	32842
National GDP	1.74	1.68	-4.3	3.7
North West Region	0.14	0.35	0	1
Yorkshire	0.11	0.31	0	1
East Midlands	0.10	0.30	0	1
West Midlands	0.11	0.31	0	1
East of England	0.11	0.31	0	1
London	0.10	0.29	0	1
South East England	0.17	0.37	0	1
South West England	0.12	0.32	0	1

Notes: Subjective well-being (GHQ) and individual characteristics are from BHPS and UKHLS (2000 – 2017). The number of foreign-born individuals at local authority level over 2000 – 2017 is from the ONS.

A4 Derivation of Instrument variables

We relied on an instrumental variable strategy based on past settlement patterns first developed by Card and DiNardo (2000) and Card (2001) and subsequently widely used in the immigration literature. For instance, focusing specifically on the UK context, Bell et al. (2013), Sa (2011), Braakman (2019) and Giuntella et al. (2016) have recently employed this instrumental variable approach to examine the impact of immigration on crime, house prices and work injury respectively. The central idea behind this instrument is that irrespective of the economic characteristics of neighbourhoods, migrants will be more likely to locate in certain areas over others based on the prior settlement patterns of past migrants. We can therefore exploit the settlement patterns evident from a past Census to generate an exogenous predicted 'migration' value that can serve as an instrument for current inflows.

To implement this approach in our study, first we obtained data relating to the concentration of migrants in each local authority area from the 2001 and 2011 Censuses. Next we use this information to obtain the 'predicted' numbers or share of foreign-born individuals in each local authority area to use as an instrument for the actual number or share of foreign-born individuals. The predicted number or share of migrants in each local authority area is simply obtained by redistributing the total numbers or share of migrants across local authority areas, based on prior settlement patterns, i.e., the migrant share evident from the 2001 and 2011 censuses respectively.⁴

To illustrate how we obtained the predicted number or share in practice, consider a local authority that had 1% of all foreign-born individuals according to the 2001 census and 2% according to the 2011 census. In the years between 2001 and 2011, the local authority would be allocated 1% of all new arrivals and post 2011 they would be allocated 2%. This would then serve as our 'predicted' value. In short, we are exploiting exogenous variation generated by prior settlement patterns of migrants. We also derived an additional predicted number of migrants figure by just using the 2001⁵ census figures which we employ as an additional sensitivity check.

A potential threat to the validity of using these 'predicted' values as an instrumental variable is if local economic shocks which initially attracted migrants persist over time as these may be correlated with individual well-being. This potential problem is substantially mitigated in our analysis by including fixed-effects as well as wave dummies (which will account for any trends) a measure of national GDP, region dummies and time-varying local controls such as neighbourhood deprivation

⁴ For years pre 2011 we redistribute the total number of migrants based on the 2001 census figures (we use actual ONS values for 2000 and actual census values for 2001). For years post 2011 we redistribute based on the figures obtained from the 2011 census (and use actual census values for 2011). Results do not change if we drop observations from 2000 and 2001 from the analysis.

⁵ Unfortunately it is not possible to use earlier census figures as boundaries have changed.

Table A5: The relationship between subjective well-being (GHQ) and foreign-born individuals - full estimates of the analysis presented in table 1

	Pooled OLS	Fixed-effects	IV
Foreign-born individuals (00,000)	0.003 (0.004)	-0.025* (0.013)	-0.032** (0.013)
Age	-0.150*** (0.005)	-0.145*** (0.050)	-0.144*** (0.043)
Age-squared	0.002*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Other higher degree	0.454*** (0.050)	0.104 (0.325)	0.104 (0.242)
Degree	0.488*** (0.047)	-0.163 (0.320)	-0.162 (0.231)
Higher secondary qualification (A-level)	0.473*** (0.046)	0.246 (0.300)	0.247 (0.213)
Lower secondary qualification (GCSE)	0.466*** (0.044)	0.192 (0.284)	0.192 (0.203)
Other	0.331*** (0.050)	-0.170 (0.239)	-0.169 (0.179)
Male	0.944*** (0.024)		
Household income (£0,000)	0.000*** (0.000)	0.000* (0.000)	0.000** (0.000)
Married	0.263*** (0.040)	0.203** (0.088)	0.203*** (0.069)
Divorced	-0.885*** (0.061)	-0.396*** (0.132)	-0.396*** (0.098)
Widowed	-0.598*** (0.066)	-0.854*** (0.167)	-0.853*** (0.126)
Number of children	-0.020 (0.015)	-0.005 (0.032)	-0.005 (0.024)
Self-employed	0.106*** (0.040)	0.087 (0.068)	0.087 (0.061)
Unemployed	-2.479*** (0.076)	-1.677*** (0.089)	-1.677*** (0.064)
Inactive	-1.343*** (0.036)	-0.528*** (0.061)	-0.529*** 0.087
Local authority deprivation rank	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)
National GDP	0.009 (0.010)	0.009 (0.009)	0.009 (0.010)
	0.000***	0.000	0.000
Wave dummies	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes
Observations	214,610	214,610	214,610

Notes: This table report full set of estimates from regressions of individual subjective well-being (GHQ) on number of foreign-born individuals. Each regression controls for wave and regional dummies that are not reported. *, **, and ***, denote statistical significance at 10%, 5% and 1% level, respectively. Clustered standard errors, adjusted for clustering at individual level, are reported in parenthesis

A6: Selection bias

Notwithstanding the longitudinal nature of our analysis it is still perhaps instructive to discuss the potential for selection bias due to residential sorting on the part of natives or migrants to affect our estimates. When it comes to migrants, one could reasonably conjecture that settlement patterns of migrants and the subjective well-being of natives could both be partly driven by the overall prosperity of an area. Our main specification should mitigate against this possibility in that the effect of inflows of *foreign-born individuals* on subjective well-being is identified only when it changes for the same individual, and after controlling for a rich-set of time-varying factors at both the individual and at the neighbourhood level (e.g. English indices of deprivation are added as controls to our specification).

A further possibility is if natives who are relatively more adversely affected by inflows of foreign-born individuals move to a residential area with less migrants, then this would undermine our ability to precisely estimate the effect of *foreign-born individuals*. As a means to gauge the likely importance of this factor, we can look at what factors are related with the probability of individuals moving in our sample. To facilitate this, using a special licence application we obtained the specific neighbourhood each individual in our sample resides in⁶ at each interview date. We then derived a simple binary indicator which captures whether individuals have switched neighbourhoods between waves. We identified 16,918 individual-wave observations and examined what factors are related with the probability of individuals changing their neighbourhood between waves using both a pooled cross-sectional logit as well as a fixed-effects panel logit model. We did not find any significant relationship between net inflows of foreign-born individuals and the probability of observing neighbourhood changes in our sample. The coefficient estimate was close to zero and not close to being statistically significant in either our fixed effects or pooled logit model⁷. This is in keeping with the literature underpinning residential mobility which suggests that factors such as age, life cycle stage and employment opportunities are the major factors underpinning residential moves.

In order to further strengthen the causal interpretation of our results, we conducted two further robustness checks which seek to mitigate any bias due to residential self-selection. The first is that we repeated the analysis in Table 1 but added an additional covariate representing those individuals who have moved neighbourhoods during our study period. The second robustness check is that we simply

⁶ Neighbourhoods here are defined at the lower super output area. These are at a very spatially refined scale as there is an average of just 1500 respondents in each lower super output area and over 32,000 of these in the UK.

⁷ Coefficient estimate from our pooled logit (0.002, $p = 0.452$) and from our panel (0.005, $p = 0.470$).

excluded all individuals who have moved neighbourhoods from our analysis. The coefficient estimates are very stable under both scenarios⁸.

⁸ When adding an additional dummy variable for movers, the coefficient for *foreign-born individuals* is -0.027 ($p = 0.036$). When excluding movers (8% of the sample) the coefficient estimate is again very similar (-0.023, $p = 0.17$). This compares to an estimate of -0.025 ($p = 0.054$) in table 1.

Table A7: The relationship between subjective well-being (GHQ) and foreign-born individuals and the relationship between subjective well-being (GHQ) and migrant share – analysis of differences across sub-groups: Comparison of IV based on 2001/2011 Censuses vs. IV based on only 2001 Census

	Foreign-born individuals				Migrant share			
	IV 2001/2011		IV 2001		IV 2001/2011		IV 2001	
	Coef.	Clustered Std. Err.	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
<i>Age</i>								
Age<=60	-0.011	0.015	-0.006	0.018	-0.008	0.011	-0.005	0.014
Age > 60	-0.116***	0.035	-0.064	0.043	-0.071***	0.022	-0.046	0.032
Age > 70	-0.183***	0.052	-0.123*	0.066	-0.128***	0.036	-0.097*	0.053
<i>Household income (quartiles)</i>								
Lowest 25%	-0.100***	0.034	-0.051	0.042	-0.079***	0.027	-0.045	0.037
Lowest 50%	-0.069***	0.022	-0.060**	0.027	-0.052***	0.017	-0.051**	0.023
Highest 50%	-0.009	0.019	-0.002	0.023	-0.006	0.013	-0.001	0.017
Highest 25%	0.001	0.028	-0.014	0.034	0.001	0.018	-0.010	0.025
<i>Education</i>								
Degree Education	-0.008	0.020	0.002	0.023	-0.006	0.014	0.002	0.019
Secondary Education	-0.024	0.022	-0.025	0.027	-0.016	0.015	-0.018	0.020
Other Education	-0.043	0.057	-0.006	0.068	-0.034	0.044	-0.006	0.063
No formal qualifications	-0.137***	0.046	-0.112*	0.057	-0.113***	0.039	-0.107*	0.055
<i>Gender</i>								
Males	-0.031*	0.018	-0.029	0.022	-0.021*	0.012	-0.022	0.016
Females	-0.031*	0.019	-0.017	0.022	0.023*	0.014	-0.014	0.018
<i>Labour market status</i>								
Unemployed	-0.214*	0.114	-0.146	0.131	-0.225*	0.120	-0.178	0.161
Employed	-0.011	0.017	-0.010	0.021	-0.008	0.012	-0.008	0.016
<i>Natives v non-UK born</i>								
Non-UK born	0.058*	0.030	0.080**	0.035	0.038*	0.020	0.062**	0.028
Natives	-0.032**	0.013	-0.027**	0.013	-0.022**	0.009	-0.021**	0.010

Notes: Each cell reports coefficients or standard errors of foreign-born individuals from separate subjective well-being (GHQ) regressions on specific sub-groups. Each regression controls for individual characteristics (age, age-squared, educational attainment dummies, gender, gross household income, marital status dummies, number of children, labour force status dummies), the local authority deprivation rank, annual GDP growth at national level, wave and region dummies. *statistically significant at 10% level, **significant at 5% level, *** significant at 1% level