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ORIGINAL PAPER

The subjective well-being of immigrants and natives during Covid-19

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Abstract

This study investigates the subjective well-being of immigrants and natives in the United Kingdom (UK) during the Covid-19 pandemic. A novel aspect of this research is that we exploit the quasi-experimental nature of the pandemic to analyse the potential causal impact of neighbourhood embeddedness in mitigating the adverse shock on subjective well-being. We proxy subjective well-being by life satisfaction and consider neighbourly support and psychological sense of community as indicators of neighbourhood embeddedness. The findings show that the pandemic negatively impacted the life satisfaction of immigrants more than that of natives. The analysis demonstrates that high neighbourhood embeddedness had a significant protective impact on the well-being of immigrants, whereas the opposite was observed for natives. Further analysis reveals that the adverse impact for natives can be attributed to their tendency to comply with Covid-19 social distancing rules, while the results for immigrants remain qualitatively consistent irrespective of their compliance or non-compliance behaviour. The overall findings in this research imply that community-based interventions should be aimed at balancing the promotion of social networking with adherence to health guidelines in a way that minimises well-being trade-offs during a health crisis.

Keywords Life satisfaction · Subjective well-being · Covid-19 · Compliance/non-compliance behaviour · Neighbourhood embeddedness · Sense of community

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1 Background

Studies on subjective well-being during the Covid-19 pandemic found that the uncertainty brought about by the global spread of the disease and social distancing measures, such as suspension of social gatherings and workplace closures, led to a decline in well-being (Fancourt et al. 2021; Kwong et al. 2021; Brodeur et al. 2021; Yamamura and Tsustsui 2021). This decline was more pronounced among ethnic minorities and immigrants compared to the majority population and native-born (Hu 2020; Proto and Quintana-Domeque 2021; Shen and Bartram 2021). The suspension of face-to-face interactions and the shift to working from home highlighted the importance of social networks at a more localised neighbourhood level. Therefore, this paper aims to study neighbourhood-level factors that may help mitigate the adverse impact of the Covid-19 pandemic on the well-being of both immigrants and natives.

We use the Covid-19 pandemic as a quasi-experiment to examine whether pre-pandemic levels of neighbourhood embeddedness mitigated the adverse impact of this unexpected exogenous shock on the well-being of immigrants and natives. The study is important because its results can inform policies to maintain well-being and promote the social integration of immigrants in society (PeConga et al. 2020; Barker 2021; Paparusso 2021; Johnston et al. 2021).

Neighbourhood embeddedness, conceptualised as support networks and sense of community formed through social ties, mutual support and shared resources, is recognised as a critical determinant of individual well-being (Schnell et al. 2012; Miltenburg 2015). Shields et al. (2009), for example, demonstrate that neighbourhood-level indicators of social support and interaction are positively correlated with high levels of individual life satisfaction. Recent research further suggests that individuals with strong social networks and a tendency towards pro-social behavioural tendencies experienced a less severe negative impact on their subjective well-being during the pandemic (Tubadji 2021; Slater 2023; Zangger 2023). Support networks serve as a significant buffer against emotional distress and the sense of isolation that negatively influence the subjective well-being (Wang et al. 2021; Snel et al. 2022; Atalay 2024).

Moreover, minority stress theory (Meyer et al. 2008) posits that minority groups often face greater challenges than the majority population in the host countries. Empirical evidence indicates that immigrants were disproportionately affected by social, economic, and well-being hardships during the Covid-19 pandemic (Hu 2020; Proto and Quintana-Domeque 2021; Shen and Bartram 2021; Lou et al. 2022). However, there remains a research gap regarding the extent to which neighbourhood embeddedness can mitigate the adverse effect of a shock such as the pandemic on well-being, and whether the protective role of neighbourhood embeddedness differs between natives and immigrants.

While high neighbourhood embeddedness likely protected the subjective well-being of individuals during Covid-19, it is plausible that the mitigating effect of neighbourhood embeddedness depended upon the tendency to comply with social distancing rules. These rules required individuals to self-isolate and limited their social activities to their place of residence. Individuals may have perceived compliance with these measures as costly, given the risk of increased loneliness and threat to well-being (Brooks et al. 2020; Stickley et al. 2021; Slater et al. 2023). Additionally, studies show that during the pandemic, socially and economically vulnerable individuals were less likely to comply with social distancing rules (Papageorge et al. 2021). Therefore, it is informative to examine whether the protective role of neighbourhood embeddedness varied between immigrants and natives with compliant vs non-compliant behavioural tendency.

Recent studies examining the compliance behaviour to Covid-19 rules typically used self-reported measures of compliance, where respondents are given the opportunity to evaluate compliance behaviour from their own point of view on a Likert scale (Kuiper et al. 2020; Wright et al. 2021). Such a measure is not available in the dataset used in this study so we proxy compliance/non-compliance using information about how often respondents had face-to-face contact with friends and family outside their household.

This paper seeks to add to the current understanding of the impact of Covid-19. First, we add to the empirical evidence showing the unequal impact on the subjective well-being of immigrants and natives in the UK. Second, we are the first to investigate whether the pre-pandemic levels of neighbourhood embeddedness played a role in mitigating the adverse impact of the pandemic on the well-being of immigrants and natives. Third, we uniquely contribute by examining whether the protective role of neighbourhood embeddedness was mediated by compliant vs non-compliant behavioural tendency.

For our empirical analysis, we use the latest wave of the UKHLS mainstage survey, and the Covid-19 survey, both conducted for the same individuals. The indicators of neighbourhood embeddedness include neighbourly support and psychological sense of community. Our findings show that immigrants suffered a larger decline in life satisfaction compared to natives during Covid-19. We also find that higher levels of pre-pandemic neighbourhood embeddedness had a protective impact on the well-being of immigrants during Covid-19 whereas it worsened the well-being of natives. Additional analysis reveals that the negative impact of high neighbourhood embeddedness on the well-being of natives is driven by their compliance behaviour, and that the positive impact on the well-being of immigrants is qualitatively the same regardless of their compliance/non-compliance behavioural tendency. In sum, these findings imply that neighbourhood embeddedness holds more significance for the well-being of immigrants than natives, during the times of crisis.

The remainder of the paper is structured as follows: Section 2 introduces the data sources, key variables of interest and summary statistics. Section 3 discusses the methodology. Section 4 presents the results, discussion, and robustness check. Finally, section 5 concludes the study.

2 Data and summary statistics

We use two high-quality, large-scale longitudinal datasets from the UKHLS. The first dataset is the mainstage survey, which was started in 2009 and collected information from around 40,000 households in the UK.[1] The second dataset used is the Covid-19 longitudinal web survey,[2] which started in April 2020 and ended in September 2021. The Covid-19 data collection was carried out monthly until July 2020 and changed to every two months from September 2020 onwards. The Covid-19 survey focuses on experiences related to the Covid-19 pandemic and collects information from households that participated in at least one of the last two waves of the mainstage survey (wave 9 or 10) before the pandemic.

For this study, we combine wave 9 of the mainstage survey (2017–2019) with the Covid-19 survey processed in May, July, September and November of 2020 and January and March of 2021. We restrict the analysis using the Covid-19 survey to March 2021 as the social distancing restrictions were completely lifted after this time. The datasets are well suited for exploring the well-being levels of UK-born and non-UK-born citizens (also called immigrants). In keeping with previous studies in the UK, we define immigrants as the non-UK born population and natives as UK-born (Casey and Dustmann 2010; Sinning 2010; Dustmann and Frattini 2011; Khattab and Lazarus 2016; Greenspan et al. 2018). The immigrant dummy takes the value 1 for immigrants (non-UK-born) and 0 for natives (UK-born).

We match respondents in the Covid-19 survey with their records in wave 9, the period before the pandemic, to ensure we can study the same individuals across time periods. We drop observations with missing information on the variables of interest described in the next section. The final sample comprises 10,657 individuals, including 9,627 natives (90%) and 1,030 immigrants (10%). To capture time before and during the Covid-19 period, we generate a Covid-19 dummy variable where wave 9 of the main survey or the period before the pandemic is coded as 0, and the waves from the Covid-19 survey are coded as 1.

2.1 Measure of subjective well-being

We use life satisfaction as the measure of subjective well-being. The life satisfaction variable is based on evaluating satisfaction with overall life on a scale ranging from 1 to 7, where 1 refers to completely dissatisfied, and 7 implies completely satisfied. The information on life satisfaction of individuals is recorded every two months starting from May 2020.

[1] University of Essex, Institute for Social and Economic Research (2020). Understanding Society: Waves 1-10, 2009-2019 and Harmonised BHPS: Waves 1-18, 1991-2009. [data collection]. 13th Edition. UK Data Service. SN: 6614, http://doi.org/10.5255/UKDA-SN-6614-14.

[2] University of Essex, Institute for Social and Economic Research (2021). Understanding Society: COVID study, 2020–2021. [data collection]. 11th Edition, UK Data Service.

2.2 Indicators of neighbourhood embeddedness

The UKHLS dataset commits an entire module to questions measuring the neighbourhood embeddedness of individuals. The question statements are designed in line with the seminal work of Buckner (1988), who studied variables that can be used to capture neighbourly support and psychological sense of community in the neighbourhood. His work is widely endorsed by researchers in the field (Woolever 1992; Wilkinson 2007; Li et al. 2011).

In the UKHLS dataset, the respondents are asked to report their level of agreement/disagreement on a host of question statements designed to capture how well they feel embedded into various aspects of neighbourhood life. The responses are recorded on a scale from 1 (strongly disagree) to 5 (strongly agree). The information for the measures of neighbourhood embeddedness is collected in wave 9. To facilitate the analysis of the relationship of pre-pandemic neighbourhood embeddedness with well-being during Covid-19, we carry forward the data from wave 9 of the mainstage survey to all subsequent Covid-19 data waves.

2.2.1 Neighbourly support

The question statements used as measures of neighbourly support include: *(1) I borrow things and exchange favours with my neighbours; (2) If I needed advice about something, I could go to someone in my neighbourhood; (3) I regularly stop and talk with people in my neighbourhood.* The responses across these three questions are summed up to create a scale representing neighbourly support.[3] The scale ranges from 1 to 15. We tested scale reliability and found a high degree of consistency in responses to the three question items used to derive the measure of neighbourly support as indicated by a Cronbach's alpha[4] of 0.80.

2.2.2 Psychological sense of community

The question statements used to capture psychological sense of community include the following: (*1) I think of myself as similar to the people that live in this neighbourhood; (2) I feel like I belong to this neighbourhood; (3) The friendships and associations I have with other people in my neighbourhood mean a lot to me.* As before, the responses across these three questions are summed up to create a scale representing psychological sense of community.[5] The scale ranges from 1 to 15. Cronbach's alpha showed that 78% of the variance in the composite scores associated with the three items is reliable.

[3] The spearman's rank-order correlation of these variables with each other is above 0.56.

[4] This is a measure of how closely related the three question items are as a group.

[5] The three variables used to create a scale for psychological sense of community through row totals have high spearman's rank-order correlation with each other, ranging from 0.46 to 0.67.

2.3 Measure of compliance/non-compliance

We take advantage of the availability of data regarding face-to-face contact the respondents have outside the household. The relevant information is collected by asking two questions. In the first question, respondents are asked: *Thinking back to earlier this year, before the outbreak of the pandemic, in January/February 2020, how often did you meet in person with friends and family who did not live with you?* In the second question, the respondents are asked: *In the last 4 weeks, how often have you met in person with friends and family who do not live with you?*

The respondents are asked to select one of these options: (1) Daily, (2) Several times per week, (3) At least once per week, (4) Several times per month, (5) A least once per month, (6) Less often and (7) Never. For interpretation and use, we combine the information obtained from the two questions mentioned above into one variable. The information from the first question is assigned to pre-pandemic wave 9,[6] and the information from the second question is assigned to the Covid-19 waves.[7] We define, compliance behavioural tendency as 'never' (i.e., option 7) meeting friends and family that do not live with you in person. We generate a compliance dummy coded 1 for option 7 and 0 for options 1 to 6 (i.e. non-compliance).

2.4 Socio-demographic controls

We control for demographic characteristics describing the socio-economic background of a respondent. The Covid-19 survey did not collect data for characteristics that are less likely to change over a short period of time. We, therefore, extracted such data from the mainstage survey. The stable socio-demographic characteristics include the variables for female (*female = 1 and male = 0*), marital status (*Never married/Single = 0, married = 1 and divorced = 2*), educational qualifications (*high degree = 4, A-level = 3, GCSE/Lower = 2 and uneducated = 1*), household size (*ranges from 1 to 12*), and good health (*no long-term illness/disability = 1, otherwise = 0*). We also account for age and current household income. The variables for age and current household income are generated by combining the mainstage survey and Covid-19 survey information. We also control for Covid-19 symptoms by generating a dummy that takes a value of 1 for having Covid-19 symptoms during the pandemic and 0 otherwise.

We recognise that employment conditions changed during Covid-19; therefore, when controlling for employment status in the regression analysis, we generate a new categorical variable for employment status. This variable combines the

[6] The first question was asked in the Covid-19 data wave 3 (June 2020).

[7] The second question was asked in Covid-19 data waves 3 (June 2020) and 6 (November 2020), and the information collected is used to impute the data in the waves used for analysis as follows: the information from wave 3 is imputed into waves 2 (May 2020), 4 (July 2020), and 5 (September 2020), while information from wave 6 is carried forward to waves 7 (January 2021) and 8 (March 2021). Our findings remain robust when applying an alternative imputation technique, such as using the average of the responses recorded in waves 3 and 6 to fill the remaining waves with missing values.

information on employment status before the pandemic (wave 9) and during the pandemic (Covid-19 data waves). The variable for employment status has four categories: *employed, unemployed, furloughed, and outside the labour market*.

The employed category is coded 1 for those who remained employed or gained employment during Covid-19. The unemployed category is coded 2 and consists of individuals who remained unemployed or became unemployed during the pandemic. The furloughed category is coded 3 and constitutes people that were employed before the pandemic (wave 9) but became furloughed during the Covid-19 pandemic. The final category is outside the labour market, which is coded 4 and includes individuals who remained outside the labour market[8] during the pandemic.

2.5 Descriptive statistics

We commence our empirical analysis by presenting an overview of the descriptive statistics displayed in Table 1, which provides a comparison of the socio-demographic characteristics of immigrants and natives in our sample. Both groups show comparable proportions of females and married individuals. However, a notable distinction is observed in health outcomes, as a higher proportion of immigrants report being healthy, evidenced by a lower prevalence of chronic illness and disabilities compared to their native counterparts. The average age in the sample is approximately 53 years, with immigrants being, on average, two years younger than natives.

With respect to educational qualifications, immigrants have a significantly higher percentage of individuals with a high degree, resulting in a 13 percentage point difference between the two groups. We observe that immigrants tend to live in larger households than natives, which, despite their higher overall household income, suggests the average individual income may be lower due to a potentially greater number of dependents. Immigrants have a higher percentage of those reporting Covid-19 symptoms, than natives. This disparity could be attributed to greater exposure linked to their sources of employment.

In terms of employment status, immigrants have a 5 percentage points higher probability of being employed but also a 4 percentage point higher probability of being unemployed, compared to natives. Additionally, we observe the two groups to be similar when it comes to furlough, with approximately 6% of immigrants and 7% of natives being furloughed. Regarding the pre-pandemic levels of neighbourhood embeddedness considered in this paper, we see that immigrants and natives have similar levels of neighbourly support and psychological sense of community. However, a statistically significant difference is observed when it comes to compliance behavioural measure, where 98% of natives and 94% of immigrants exhibit compliance behavioural tendency, implying that immigrants are about 4 percentage points less likely to refrain from social interactions.

[8] This category includes individuals who are retired, in family care or home, full-time students, long term sick or disabled, in government training schemes, unpaid, family business, on apprenticeship and doing something else.

Table 1 Descriptive statistics for main variables of interest

Variables	Natives Means/%	Immigrants Means/%	Diff
Female	0.56	0.58	−0.02
Relationship status:			
Never married/single	0.20	0.18	0.02
Married	0.73	0.74	−0.01
Divorced	0.08	0.08	0.00
Healthy (lack of long-term illness/disability)	0.64	0.70	−0.06**
Age	54	52	2
Educational qualifications:			
Uneducated	0.04	0.04	0.00
GCSE/lower	0.25	0.18	0.07***
A-level	0.21	0.15	0.06*
High degree	0.50	0.63	−0.13***
Household size	2	3	−1
Current household monthly income	3747	4040	−293***
Have Covid-19 symptoms	0.03	0.04	−0.01**
Employment status:			
Employed	0.50	0.55	−0.05***
Unemployed	0.05	0.09	−0.04***
Outside labour market	0.38	0.30	0.08*
Furloughed	0.07	0.06	0.01*
Compliance behaviour	0.98	0.94	0.04***
Neighbourly support (1–15)	9.87	9.96	−0.09
Psychological sense of community (1–15)	10.72	10.73	−0.01
Observations	28,002	2,697	
Number of individuals	9,627	1,030	

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Overall, these descriptive statistics highlight that while immigrants and natives share many similar socio-demographic characteristics and pre-pandemic levels of neighbourhood embeddedness, notable differences exist, especially in terms of compliance behavioural tendency, employment and educational qualifications that must be taken into account when conducting the empirical analysis.

To understand the changes in immigrants' subjective well-being, we plot the life satisfaction scores of immigrants and natives in Fig. 1. We compare bi-monthly average life satisfaction levels from May 2020 to March 2021 with the levels before the pandemic. In Fig. 1, we observe that the life satisfaction of immigrants and natives declined, on average, during the Covid-19 pandemic and that the gaps in life satisfaction became more pronounced in the periods between May 2020 and Nov 2020.

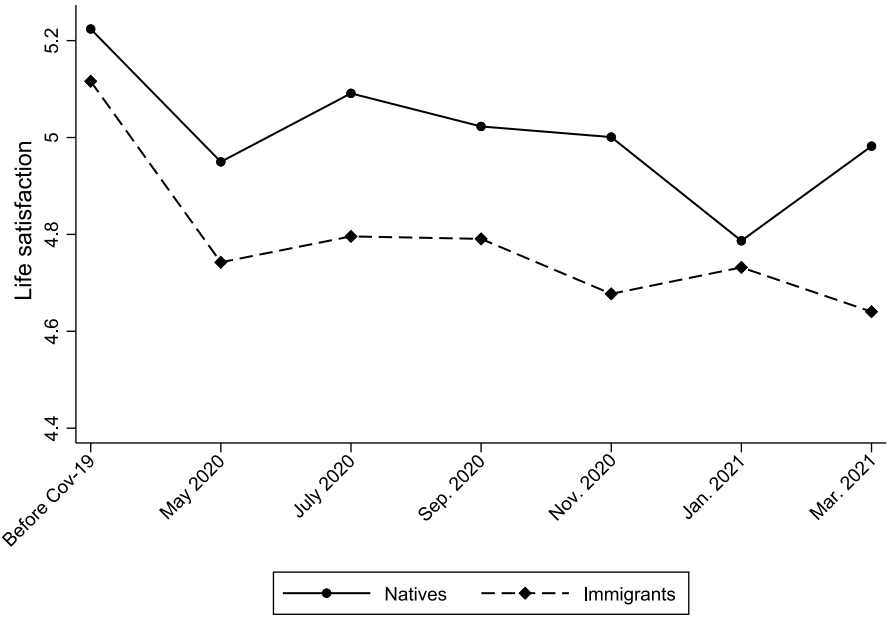

Fig. 1 Comparison of life satisfaction of immigrants and natives during and before the Covid-19 pandemic. Before Covid-19 constitutes wave 9 of the mainstage survey covering the years 2017–2019. The months of May 2020 to March 2021 represent the period for Covid-19

3 Methodology

We use the following equation to study the differences in life satisfaction of immigrants and natives:

$$Y_{it} = \beta_0 + \beta_1 Cov_t + \beta_2 Mig_i + \beta_3 (Cov_t \times Mig_i) + X_{it}\beta_4 + \mu_{it}, \quad (1)$$

where Y_{it} represents the dependent variable (i.e., life satisfaction), Mig_i is an immigrant dummy,Cov_t is a dummy variable which takes the value of '0' before the pandemic (wave 9 for years 2017–2019) and '1' indicating the Covid-19 pandemic (May 2020–March 2021). Our main variable of interest is $Cov_t \times Mig_i$ which denotes the interaction term. A significant and negative interaction term would indicate that the life satisfaction of immigrants was impacted more during the pandemic than natives. $\boldsymbol{X_{it}}$ is a vector of socio-demographic controls including gender, marital status, age/age square, health, education, and log of net household income, household size, as well as Covid-19 symptoms. μ_{it} is the composite error term consisting of unobserved individual effects (η_i) and the idiosyncratic error term (v_{it}).

Next, we examine the impact of pre-pandemic levels of neighbourhood embeddedness, (*NE*), on the well-being of immigrants and natives during Covid-19, compared to before Covid-19, by estimating the following specification:

$$\begin{aligned} Y_{it} = {} & \beta_0 + \beta_1 Cov_t + \beta_2 Mig_i + \beta_3 NE_{i0} + \beta_4 \left(Mig_i \times NE_{i0}\right) + \beta_5 (Mig_i \times Cov_t) \\ & + \beta_6 (Cov_t \times NE_{i0}) + \beta_7 \left(Mig_i \times NE_{i0} \times Cov_t\right) + X_{it}\beta_8 + \mu_{it}, \end{aligned} \tag{2}$$

where $Mig_i \times NE_{i0} \times Cov_t$ represents the three-way interaction term that allows us to study whether the pre-pandemic levels of neighbourhood embeddedness (NE_{i0}) moderated the adverse impact of the Covid-19 pandemic (Cov_t) on the subjective well-being of immigrants (Mig_i). A significant and positive interaction term implies that the indicator of neighbourhood embeddedness under examination moderated the decline in life satisfaction of immigrants during Covid-19 over and above that of natives.

The panel nature of our dataset enables us to account for time-invariant individual heterogeneity, in that some people may have reported systematically different levels of neighbourly support and psychological sense of community, for example, due to more optimistic personalities over the sample years. In this context, a fixed-effects (FE) estimator would be suitable for estimating Eqs. (1) and (2).[9] A limitation of this estimator is that it drops time-invariant variables (such as the immigrant dummy and stable socio-demographic characteristics), unless they are part of an interaction term. Since our analysis requires us to study the effect of the immigrant dummy, we consider an alternative random-effects specification with the Mundlak correction, also called the correlated random effects (CRE) estimation technique (Obućina 2013; Cai et al. 2018). This model was proposed by Mundlak (1978), who showed that the coefficient estimates from a random-effects approach approximate to those provided by the fixed-effects approach if the means of time-varying variables are included in the regression model. As a robustness check, we supplement our estimates for interaction effects from CRE with those from a fixed effects approach.

4 Results and discussion

The empirical analysis is conducted in three stages. In the first stage, we examine whether there is a differential decline in life satisfaction for immigrants and natives during the Covid-19 pandemic using Eq. (1). In the second stage, we study whether high levels of pre-pandemic neighbourhood embeddedness mitigates the decline in life satisfaction of immigrants and natives during Covid-19 using Eq. (2). In the third stage, we assess whether the mitigating role of neighbourhood embeddedness varies by compliant vs non-compliant behavioural tendency.

4.1 Life satisfaction during Covid-19

The results of our examination of the differential impact of the pandemic on the life satisfaction between natives and immigrants are presented in Table 2. In column

[9] The Hausman tests conducted using Eqs. (1) and (2) revealed that FE approach is the preferred specification.

Table 2 Comparing life satisfaction of immigrants and natives before and during Covid-19

	Life satisfaction	
	CRE	FE
	(1)	(2)
Immigrant dummy	−0.044	
	(0.055)	
Covid-19 dummy	−0.185***	
	(0.033)	
Immigrant dummy × Covid-19 dummy	−0.127**	−0.126*
	(0.063)	(0.075)
Observations	30,699	30,699
Number of individuals	10,657	10,657

The socio-demographic controls include gender, age, marital status, education, employment status, health, household income, household size, and Covid-19 symptoms. Full results available upon request. Robust standard errors in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

(1), the coefficient for the immigrant dummy shows that immigrants in our sample report slightly lower life satisfaction than natives before the pandemic, although the result is not statistically significant. The Covid-19 dummy shows that the pandemic led to an average reduction in reported well-being of 0.19 units for natives. The coefficient of our main variable of interest (the two-way interaction term between the immigrant and the Covid-19 dummy) is negative and statistically significant ($\widehat{\beta} = -0.127$, $\rho < 0.05$).[10] It indicates that immigrants suffered an additional reduction in life satisfaction of about 0.13 units during the pandemic compared to natives while controlling for socio-demographic characteristics and Covid-19 symptoms.

Our findings in this section are in line with previous studies that found immigrants suffered a larger decline in subjective well-being during Covid-19 compared to natives (Platt and Warwick 2020; Hu 2020; Proto and Quintana-Domeque 2021). While previous studies have mainly attributed the decline in subjective well-being to increased feelings of loneliness due to social distancing measures (Killgore et al. 2020; Fetzer et al. 2021; Yamamura and Tsustsui 2021), it remains to be seen which aspects of social life may have helped individuals cope with isolation and loneliness during Covid-19 (Hombrados-Mendieta et al. 2013; Ramos et al. 2017). To fill this gap, in the next section, we examine whether pre-pandemic levels of neighbourhood embeddedness protected subjective well-being during Covid-19 and if any differences emerged with regard to immigrant status. We consider neighbourly support and psychological sense of community as indicators of neighbourhood embeddedness.

[10] Similar results with fixed effects estimation approach (see column 2).

4.2 Pre-pandemic levels of neighbourhood embeddedness and life satisfaction during Covid-19

To examine whether the differential impact of Covid-19 on the well-being of immigrants and natives was conditional on pre-pandemic levels of neighbourhood embeddedness, we interact the immigrant dummy and the Covid-19 dummy with the indicators of neighbourhood embeddedness in separate regressions as represented by Eq. (2). We supplement our findings with a graphical illustration rather than simply looking at the sign and significance of the interaction terms.

4.2.1 Neighbourly support (N_0)

In Table 3 (columns 1 and 2), we study whether higher pre-pandemic neighbourly support helped mitigate the adverse impact of Covid-19 on subjective well-being. The three-way interaction term between the immigrant dummy, the Covid dummy and neighbourly support in column (1), is positive and statistically significant ($\hat{\beta} = 0.064$, $\rho < 0.00$), which indicates that a higher degree of neighbourly support mitigated the adverse impact of Covid-19 on the life satisfaction of immigrants. The findings for natives are reflected by the two-way interaction term between the Covid-19 dummy and neighbourly support, which is negative and statistically significant ($\hat{\beta} = -0.027$, $\rho < 0.00$). This implies that natives with a higher degree of pre-pandemic neighbourly support suffered a significant decline in life satisfaction during Covid-19. These findings are robust to fixed effects estimation approach presented in column (2).

The interaction terms discussed above are further illustrated by the graphs displayed in Fig. 2. The lines represent the predictions for life satisfaction at various degrees of neighbourly support before (solid line) and during Covid-19 (dashed line) based on findings reported in Table 3. We have separated the plots for immigrants and natives for ease of interpretation and exposition. Looking at the upper end of the two lines in the graph on the left-hand side, it is evident that natives with a high degree of neighbourly support experienced a significant decline in well-being during Covid-19 as compared to before. However, the opposite is observed in the graph on the right-hand side, where immigrants with a high degree of neighbourly support have similar levels of life satisfaction during and before the pandemic. These findings indicate that immigrants with high pre-pandemic neighbourly support remained more resilient to the pandemic's adverse well-being impact than their native counterparts. Now, diverting attention to the lower end of the two lines in the graph on the left-hand side, we can observe that natives with a lower degree of pre-pandemic neighbourly support were as similarly dissatisfied during Covid-19 as before. In contrast, the graph on the right-hand side shows that immigrants with low levels of pre-pandemic neighbourly support experienced a significantly larger estimated reduction in life satisfaction in response to the Covid-19 pandemic. Overall, our findings imply that high pre-pandemic neighbourly support protected the life satisfaction of immigrants while the opposite is observed for natives, perhaps indicating the negative impact of lockdown on their ability to interact socially.

Table 3 The role of pre-pandemic neighbourly support (N_0) and psychological sense of community (PSC_0) in mitigating the adverse well-being impact of Covid-19

	Life satisfaction			
	CRE	FE	CRE	FE
	(1)	(2)	(3)	(4)
Covid-19 × Immigrant dummy	−0.759***	−0.700**	−0.717**	−0.802**
	(0.236)	(0.277)	(0.302)	(0.362)
Immigrant dummy × N_0	−0.044**	−0.041**		
	(0.020)	(0.020)		
Covid-19 × N_0	−0.027***	−0.021***		
	(0.006)	(0.005)		
Immigrant dummy × Covid-19 dummy × N_0	0.064***	0.058**		
	(0.023)	(0.027)		
Immigrant dummy × PSC_0			−0.037	−0.016
			(0.023)	(0.059)
Covid-19 × PSC_0			−0.026***	−0.015*
			(0.008)	(0.009)
Immigrant dummy × Covid dummy × PSC_0			0.056**	0.063*
			(0.027)	(0.033)
Observations	30,699	30,699	30,699	30,699
Number of individuals	10,657	10,657	10,657	10,657

Regressions control for socio-demographic characteristics including gender, age, marital status, education, employment status, health, household income, household size, and Covid-19 symptoms. Full results available upon request. Robust standard errors in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

4.2.2 Psychological sense of community (PSC_0)

Table 3 (columns 3 and 4) presents the results for the analysis of psychological sense of community. The three-way interaction term (Immigrant dummy × Covid dummy × PSC_0) in column (3) is positive and statistically significant ($\widehat{\beta} = 0.056$, $\rho < 0.05$), indicating that the negative impact of Covid-19 on life satisfaction is mitigated by higher levels of psychological sense of the community for immigrants. The opposite role is observed for natives as the two-way interaction term between the Covid-19 dummy and psychological sense of community yields a negative and statistically significant result ($\widehat{\beta} = -0.026$, $\rho < 0.00$). That is, natives with a high degree of pre-pandemic psychological sense of community experienced a significant drop in life satisfaction during Covid-19 compared to before. These findings remain qualitatively the same using a fixed effects estimation approach as presented in column (4).

Figure 3 illustrates the three-way interaction effect for psychological sense of community. As before, the solid line represents the predicted life satisfaction at different levels of psychological sense of community before Covid-19, while the dashed line portrays this relationship during Covid-19.

Looking at the graph on the left, we observe that natives with a lower pre-pandemic psychological sense of community reported similar low levels of life

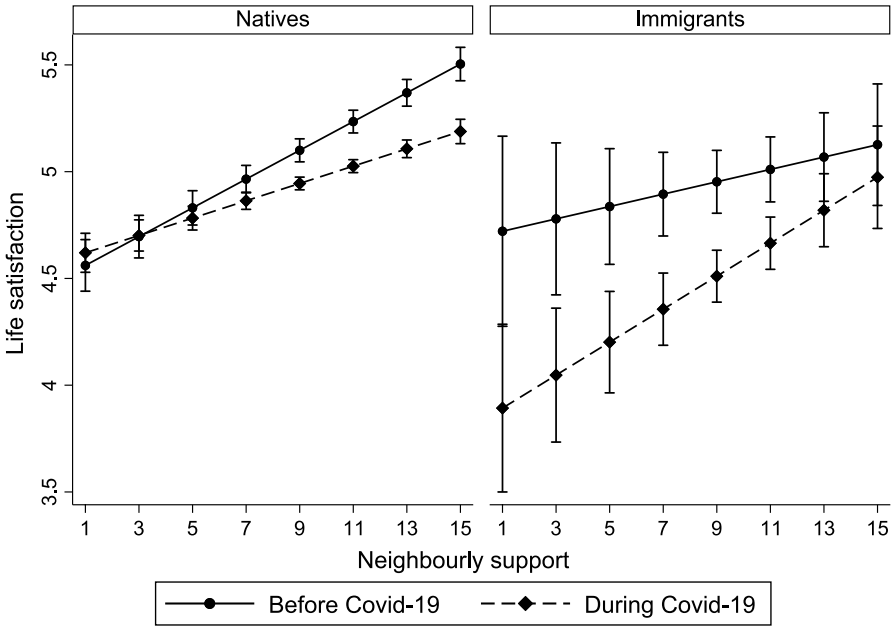

Fig. 2 The life satisfaction of immigrants and natives depending upon their pre-pandemic levels of neighbourly support during Covid-19, as compared to before Covid-19

satisfaction during the pandemic as before, while those with a higher sense of community suffered a significant decline during Covid-19 (as shown by the large gap in the upper end of the two lines). This result shows the absence of a mitigating effect of psychological sense of community for natives. When looking at the graph on the right, we observe that immigrants with low levels of psychological sense of community suffered a decline in life satisfaction during Covid-19. In contrast, immigrants with higher levels of psychological sense of community reported life satisfaction levels similar to before the Covid-19 pandemic (as indicated by the closeness of the two lines at the upper end). Our finding that high levels of psychological sense of community played a role in mitigating the adverse impact of Covid-19 on the well-being of immigrants corroborates the results for neighbourly support. These findings highlight the important role of neighbourhood embeddedness as a protective support mechanism against the negative effect of shocks on subjective well-being, especially for immigrants (Sandstrom and Dunn 2014; Appau et al. 2019; Wessendorf and Phillimore 2019; Hou et al. 2020).

4.3 Compliance/non-compliance, pre-pandemic neighbourhood embeddedness and life satisfaction during Covid-19

In this section, we extend the investigation to examine whether compliance/non-compliance with social distancing rules lends some insight into the role of

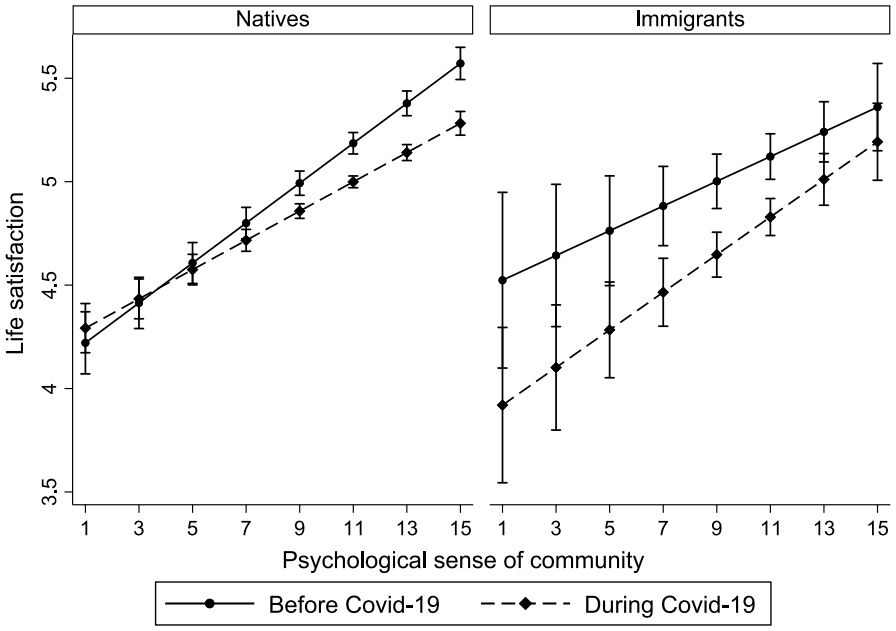

Fig. 3 The life satisfaction of immigrants and natives depending upon their pre-pandemic levels of psychological sense of community during Covid-19, as compared to before Covid-19

neighbourhood embeddedness in mitigating the negative well-being impact of Covid-19 for immigrants and natives.

Table 4(panel A) displays the results from repeated regression analysis for neighbourly support using Eq. (2) for individuals with compliance behavioural tendency in column (1) and non-compliant behavioural tendency in column (2). Our findings show that the interaction term between the Covid-19 dummy and neighbourly support in column (1) is negative and statistically significant ($\widehat{\beta} = -0.03$, $\rho < 0.00$), while it is small and not significant in column (2). These findings imply that the negative association between neighbourly support and the life satisfaction of natives during Covid-19 was driven by their compliant behaviour. In other words, natives with a higher degree of pre-pandemic neighbourly support felt significantly less satisfied with life during Covid-19, probably because compliance with social distancing rules prevented them from interacting with neighbours. This is in line with previous studies that show individuals with high social capital care for social interactions and are therefore negatively impacted by social distancing restrictions than those who do not (Slater 2023; Zangger 2023).

Next, we observe that the three way interaction term between the Covid-19 dummy, the immigrant dummy and neighbourly support is positive and statistically significant in column (1) and in column (2). These results suggest that larger neighbourly support networks are beneficial for the subjective well-being of immigrants, regardless of compliance/non-compliance to Covid-19 social distancing rules. It should be noticed that the size of the coefficient estimate for the interaction term

Table 4 The differences in the role of pre-pandemic neighbourly support (N_0) and psychological sense of community (PSC_0) in mitigating the adverse well-being impact of Covid-19 for immigrants and natives with compliant and non-compliant behavioural tendency

	Life satisfaction			
	CRE		FE	
	Compliance	Non-compliance	Compliance	Non-compliance
	(1)	(2)	(3)	(4)
Panel A: Neighbourly support (N_0)				
Covid-19 × N_0	−0.030***	0.002	−0.029***	0.002
	(0.007)	(0.050)	(0.005)	(0.031)
Immigrant dummy × Covid dummy × N_0	0.057**	0.199**	0.028*	0.002
	(0.027)	(0.100)	(0.017)	(0.051)
Panel B: Psychological sense of community (PSC_0)				
Covid-19 × PSC_0	−0.026***	−0.082	−0.018*	−0.030
	(0.008)	(0.049)	(0.010)	(0.056)
Immigrant dummy × Covid dummy × PSC_0	0.059*	0.225**	0.078**	0.238**
	(0.033)	(0.095)	(0.039)	(0.099)
Observations	27,283	3,416	27,283	3,416
Number of individuals	8,860	1,797	8,860	1,797

Regressions control for socio-demographic characteristics including gender, age, marital status, education, employment status, health, household income, household size, and Covid-19 symptoms. Full results available upon request. Robust standard errors in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

is larger in column (2) for non-compliance behaviour compared to column (1) for compliant behavioural tendency, indicating that the protective impact of large neighbourly support network is stronger for those immigrants that did not comply with social distancing rules. However, this behaviour could have come at the expense of a greater risk of catching Covid-19 — a risk realised as immigrants suffered a greater prevalence of Covid-19 cases (OECD 2020; Guadagno 2020; O Martins et al. 2022).

Further, we analyse whether our findings for the role of psychological sense of community in protecting the life satisfaction of immigrants during Covid-19 vary by the tendency of compliance vs non-compliance to social distancing rules, as depicted in Table 4(panel B). Using Eq. (2), we repeated the regression analysis for individuals with compliant and non-compliant behavioural tendency in columns (1) and (2), respectively. In column (1), the two-way interaction term between the Covid-19 dummy and the psychological sense of community is statistically significant for natives with compliance behaviour ($\widehat{\beta} = -0.026$, $\rho < 0.00$), while it is not significant for natives with non-compliant behaviour in column (2). These findings show that the negative impact of the psychological sense of community on the life satisfaction of natives during Covid-19 was driven by their compliance with social distancing rules. When it comes to immigrants, we find that the three-way interaction term between the Covid-19 dummy, immigrant dummy and psychological sense of community is statistically significant in columns (1) and (2), although the magnitude of the association is substantially larger in column (2). These results indicate

that the positive impact of psychological sense of community on the life satisfaction of immigrants during Covid-19 could have partly been due to their non-compliant behavioural tendency. Again, non-compliance may have helped to mitigate the negative impact of the pandemic on subjective well-being, but at the cost of a greater risk of illness. Our findings in columns (1) and (2) are robust to the alternative fixed effects approach reported in columns (3) and (4) for compliance and non-compliance behaviours, respectively.

4.4 Robustness check

We examined the robustness of our results for life satisfaction concerning selective attrition. We addressed the potential bias introduced by selective attrition, wherein more satisfied individuals might remain in the sample while less satisfied ones drop out in subsequent waves of data. To test for this bias, we re-estimated our models by restricting Covid-19 data to the first two (May and July 2020) and three waves (May, July and September 2020) in separate regression models. The results remain qualitatively the same (see Appendix Tables A1–A5), indicating that our findings are not influenced by panel/selective attrition.

5 Conclusion

This research contributes to the literature on the impact of Covid-19 by examining how the subjective well-being of immigrants changed compared to natives during the pandemic and by studying the role of pre-pandemic neighbourhood embeddedness in protecting or worsening their subjective well-being. Using data from the UKHLS dataset, our results indicate that immigrants and natives had similar levels of life satisfaction before the pandemic; however, a significant disparity emerged during the pandemic, with immigrants experiencing a more substantial decline in well-being than natives. These findings suggest that immigrants are a more vulnerable group during crisis.

Our study found that some of the adverse impact of Covid-19 on life satisfaction was mitigated by a high degree of pre-pandemic neighbourly support and psychological sense of community among immigrants, while the opposite trend was observed for natives. The analysis also showed that immigrants with low pre-pandemic neighbourhood embeddedness suffered a larger decline in life satisfaction than natives during Covid-19, indicating that neighbourhood embeddedness may hold more significance for the well-being of immigrants than natives. The analysis by compliance/non-compliance behavioural tendency revealed that the adverse impact of high neighbourhood embeddedness on the subjective well-being of natives was driven by their compliance with social distancing rules. For immigrants, the protective influence of high neighbourhood embeddedness on well-being remained statistically significant regardless of compliance, though the magnitude of the positive impact was larger for those who exhibited non-compliant behaviour.

Our findings indicate that neighbourhood embeddedness is uniquely salient to immigrant experience, suggesting that its protective role may remain significant even as immigrants become more culturally similar to natives over time. Immigrants tend to face unique challenges related to social integration, minority status, and heightened vulnerability to external shocks, thus making them more likely to depend on neighbourhood embeddedness as a source of emotional support and resilience, particularly in periods of crisis.

The differential compliance behaviour of immigrants and natives as observed in the study may also persist over time, as the motivation and consequences of compliance may differ. For example, immigrants' non-compliance could reflect a pragmatic adaptation strategy to maintain access to essential social networks and resources that are crucial for their well-being. In this case, neighbourhood embeddedness would continue to play a protective role for immigrants, particularly if non-compliance is a response to perceived necessity rather than a disregard for regulations. Conversely, for natives, compliance may be more closely associated with adherence to social norms, potentially generating conflict within social networks, thereby diminishing the positive effects of neighbourhood support.

The analysis in this paper is limited to studying neighbourhood embeddedness based on levels acquired before the pandemic, primarily due to the unavailability of data during the pandemic. We encourage future research in this area if suitable datasets become available. Future studies could examine how neighbourhood embeddedness changes over time and whether any differences emerge in the way immigrants and natives adapted to any large shock impacting life satisfaction.

Notwithstanding the limitations, our research uniquely contributes to the literature by establishing neighbourhood embeddedness as a protective factor against negative life events, particularly for immigrants in the UK. This study highlights the importance of neighbourly support networks and sense of community in fostering well-being resilience (i.e., the potential to maintain well-being levels during adverse life events like the Covid-19 pandemic). The evidence presented in this paper suggests that policymakers need to be aware of differential behavioural tendencies of immigrants and natives, and that in designing community-based interventions, it is crucial to balance the promotion of social ties with adherence to health guidelines in a way that minimises the well-being trade-offs.

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Data availability We use end user license dataset from understanding society that can be accessed by registering with the UK data service.

Declarations

Ethical approval Not applicable.

Conflict of interest The authors declare no competing interests.

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