Immigration has consistently rated as the most important issue the UK faces\textsuperscript{1}, to a much higher degree than the average in the EU, despite UK not being among the EU countries with the highest share of foreign born or with the highest increase in foreign born population. While UK experienced between 2002-2015 a 76% increase in immigration, at closer inspection data contradicts the stereotypical image of the immigrant so much misused during the Brexit vote: 47% of UK immigrants in the 15-64 age range have tertiary education, the highest proportion highly qualified immigrants by far among all EU countries. Additionally, non-European immigration consistently formed the majority of the immigration even after the A2 EU accession in 2007.

Methodology

Immigration dynamics: Before we assess immigration effects on the Brexit vote, we must first establish a common understanding for temporal immigration dynamics. Moreover, we need to be able to compare immigration characteristics of different areas with different referendum outcome. Looking at our data, we initially receive immigration data as yearly population percentage by ethnicity, covering a timeframe from 1998 to 2017 for over 42,000 LSOAs in the United Kingdom. We aggregate this data on the Local Authority (LA) level to enable comparability with the available referendum data. As each area follows a different trend in population development, we can apply time-series clustering to extract hidden patterns. We thus extract six-time series features to be fed into a k-means clustering algorithm. The selected features are (1) the $R^2$ value of a linear trend model, (2) the estimated linear trend and (3) the intercept, trend estimate (4) and (5 and 6) first two breakpoints of an Empirical Fluctuation Process (EFP)\textsuperscript{2}. The optimal number of clusters is selected after thorough testing and set to $k = 5$. Eventually, our methodology assigns time-series based cluster values for each ethnicity to the LA areas. Spatial analysis. Our spatial analysis focuses on spatial heterogeneity and thus complements the time series analysis of temporal irregularities. We applied the technique called ‘local spatial heteroscedasticity’ (LOSH; Ord & Getis 2012\textsuperscript{3}, Xu et al. 2014\textsuperscript{4}), which provides scores indicating the degree of spatially-weighted heterogeneity in an area. Higher scores are thus affiliated with spatial units showing less local consensus with respect to their leave votes. Smaller scores indicate homogeneous regions accordingly. The measure can be interpreted as a spatialized version of the chi-square test of the variance, comparing spatially structured variances estimates to spatially randomized ones. This way it is possible to detect zones of limited regional consensus about Brexit.

Results

Evaluating the time-series clustering output, we extract patterns in immigration dynamics and furthermore gain a deeper insight of how those dynamics vary across ethnic groups. Figure 1 maps the clustering results for non-English Whites and Commonwealth Asians by LA areas (England and Wales) and shows the characteristic population development for each cluster alongside. We can clearly see that, while the Asian population grows similarly in all clusters and is only separated by the respective start and endvalues, the White population grows exponentially stronger, the larger the population share was in the base year 1998. Regarding the spatial distribution of the clusters, we find that regions like Cornwall are relatively self-contained, whereas regions like London and South-East England are more diverse.
Analysing the diverse South East spatially (Figure 2a) with respect to the referendum outcomes reveals that London shows a dichotomous pattern divided into its northern and its southern parts. While the north of London is more homogeneous, the south shows diverse spatial patterns in the voting outcomes. This may partially be explained by the relatively restricted public transport connection segregating the area and by a high demographic diversity. The areas in the north-east of London are also indecisive, which might be explained by a mixture of traditional working class and, more recently, wealthier middle-class commuters trying to avoid expensive housing in London. Similarly, south-coast towns between Hastings and Portsmouth, forming the end points of the railway lines from London, show locally notable voting behaviours. This could again be linked to the influence of London spreading out into the countryside as more people are commuting further distances. The impression gained from applying LOSSH is that the South East seems to be gradually ‘Londonized’ as wealthier commuters extend London’s influence beyond the boundaries of the city.

Beyond the South East and London, three further regions are notable and flagged significant with respect to LOSSH (Figure 2b). One spatial outlier is the district of South Hams between Cornwall and Devon an area featuring market towns and artistic communities. Manchester shows strong and crisp boundaries to its adjacent rural areas. Further and in stark contrast to many other urban areas, Newcastle is heavily aligned with its surroundings. It can thus be considered a counterpart to the South East in that it doesn’t show the typical rural/urban divide. More complex geographic and demographic mechanisms must be involved.
CDRC-GISRUK Data Challenge 2018
SpaCular – Disclosure of spatial peculiarities of the Brexit

Joao Porto De Albuquerque1 Konstantin Klemmer2 Rene Weserholt3 Andra Sonea4
1University of Warwick, 2University of Warwick, 3University of Heidelberg, 4University of Warwick

Footnotes:

