



Harris, R., & Charlton, M. (2016). Voting out of the European Union: Exploring the geography of Leave. *Environment and Planning A*, 48(11), 2116-2128. <https://doi.org/10.1177/0308518X16665844>

Peer reviewed version

Link to published version (if available):
[10.1177/0308518X16665844](https://doi.org/10.1177/0308518X16665844)

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Commentary: Voting out of the EU: exploring the geography of Leave

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Abstract

On Thursday June 23rd, 2016, a majority of the UK electorate voted in favour of leaving the EU by a margin of 51.9% to 48.1%. Throughout the night, as the results were reported, the media spoke about London, Scotland and Northern Ireland versus the rest of country in regard to their support for the EU. In this commentary, I look at the geographical distribution of the share of the Leave votes and model it against the share of the electorate, by local authority and by region, using a multilevel framework. The model identifies both differences between countries and differences between regions but also more localised variations that depart from those trends. Areas with an older population were more likely to attract a higher share of the Leave vote, as were those with higher proportions of residents in lower supervisory and technical occupations and with residents born outside of the UK but in the EU. The referendum has revealed a less than United Kingdom, with notable differences between Scotland, Northern Ireland and much of London, and parts of the East Midlands, West Midlands and the East. However, London is not as pro-EU as might be anticipated given its social, ethnic and demographic composition, which may help explain why the Leave campaign won with a small margin.

Introduction

“A nation divided” (Headline of the *i* newspaper, Friday June 24, 2016)

On Thursday June 23rd, 2016, a majority of the UK electorate voted in favour of leaving the European Union (EU) by a slight margin of 51.9% to 48.1%. Throughout the night, as the results were reported, the media spoke in terms of London, Scotland and Northern Ireland versus the rest of country, as the Remain campaign made lower than expected headway in other regions.

The UK was not a founder member of what was the European Economic Community (EEC) but joined as one of eight other countries in 1973. A referendum on continued membership took place in 1975, with 67 per cent of those who voted in favour of it. Since that time the EU has expanded to 28 member states. Historically the Labour Party (one of the two largest parties in the UK electoral system) has been the more Eurosceptic and it was two Conservative Prime Ministers, Edward Heath and then John Major, who took the UK into the EEC and signed the Maastricht Treaty (for a more economically and politically integrated EU). However, Major's Premiership was characterised by considerable Conservative infighting about Europe, whereas 'New Labour' under Tony Blair and Gordon Brown was generally pro-Europe. The decision by the then Prime Minister, David Cameron, to hold the referendum was partly a response to the electoral successes of the UK Independence Party (UKIP, founded in 1991 as the Anti-Federalist League) which won the largest share of the votes for England, Scotland and Wales in the 2014 European election (27.5 per cent, an

increase of 11 percentage points from the 2009 election) and came third by vote share in the 2015 UK General Election (12.6 per cent, an increase of 9.5 percentage points). Over the more recent years of its membership, the UK has opted out of the single European currency (the Euro) and also the Schengen Treaty, which relaxed border controls in other parts of Europe. Although the current leader of the Labour Party, Jeremy Corbyn, supported the Remain campaign (but did not in 1975), his support has been seen as lukewarm, potentially contributing to its defeat. The majority of his 'front bench' team resigned and a vote of no confidence against him was supported by 80 per cent of the Labour MPs that voted. A leadership challenge has followed.

It was the General Election manifesto published by the Conservative party before the 2015 election that made a commitment to try and negotiate reform of the EU ("a new settlement", as Cameron described it in 2013), to be followed by an in/out referendum. The concessions sought reflected more general public concerns about the free movement of people across the EU – and especially their entitlement to welfare payments –, the diminished power of nationally elected Governments vis-à-vis the European Parliament and EU-wide legislation, and the prospect of further political union across the EU. Such concerns, and the failure to ameliorate them, proved decisive in the referendum: a survey undertaken on polling data of people who had voted revealed that the main reason why Leave voters had done so were: (1) the principle that decisions about the UK should be taken in the UK; (2) voting to leave offered the best chance for the UK to regain control over immigration and its own borders; and (3) remaining meant little or no choice about how the EU expanded its membership or powers (Ashcroft, 2016).

Nevertheless, and despite survey polls suggesting either side could win, the vote to leave appears to have come as a surprise: on the day of the referendum the pound was riding high in the currency markets in the expectation that the UK would remain in the EU. Early into the counting the leader of UKIP, Nigel Farage, appeared to concede defeat, saying "Remain will edge it." This proved to be false, and whilst a notably more buoyant Farage was to speak later of Britain's "independence day", it has also provoked a political and constitutional crisis with calls for a second referendum (because the margin of victory was so slim), the question of whether Parliament might still vote against leaving (because the referendum is not legally binding) and, more especially, the legacy of what appears to be a socially divided country, where the result has been interpreted as the reaction of a disenfranchised majority to growing inequality, the politics of austerity, and declining real wages and standards of living: "for many working-class people, this was a referendum not on the EU but on their quality of life" (Mckenzie, 2016).

Examining the geography of the Leave vote

The UK Electoral Commission has published the results for each of 382 local authorities (LAs) in England, Wales, Northern Ireland and Scotland but with Northern Ireland counted as a whole and also with the off-shore territory of Gibraltar included as part of the South West region.¹ Gibraltar is excluded from the analysis presented here because it is an

¹ The data are available from http://www.electoralcommission.org.uk/__data/assets/file/0014/212135/EU-referendum-result-data.csv

exceptional case both in terms of its location and in its support for the EU (95.9 per cent in favour of Remain on a turnout of 83.6 per cent, against an overall turnout of 72.2 per cent).² For Northern Ireland, the results by each of its eighteen Assembly constituency are available from various media outlets including BBC News online. When combined with the Electoral Commission data, there are 398 areas (LAs/constituencies) that group into the twelve Government Regions of the UK.

Although the standard nomenclature describes them as regions, it should be noted that three are actually separate countries with varying levels of devolved power and self-governance: Northern Ireland, Scotland and Wales. Whereas Remain achieved a majority of the votes cast in all of the 32 LAs in Scotland, in 11 of the 18 in Northern Ireland, and in 28 of the 33 in London, in all remaining regions the Leave campaign won with 64 per cent of the LAs/constituencies or more. These percentages are shown in Figure 1. On face value, there is strong support for Leave within the West and East Midlands, and much lower support in Scotland, London and Northern Ireland. However, the presented values do not take into consideration the turnout in each LA/constituency; nor the variation in support within regions, at the LA/constituency level.

[FIGURE 1 ABOUT HERE]

Another way to examine the results is to look at the share of the total Leave vote that was cast in each LA/constituency. If x is the number voting Leave in each location, and X is the total voting Leave across all location, then the share of the Leave vote per LA or constituency is x/X . These areas are not of equal size so the values are not immediately comparable (the share should be bigger in those that contain a larger population). We therefore compare x/X with the share of the total electorate per location, which is n/N , where n is the number of electorate (voting or otherwise) in each area and N is the total electorate across all areas. Where x/X (the observed value, O) is greater than n/N (the expected value, E) it means that the LA/constituency is attracting a share of the Leave vote that is greater than expected given its electorate size.

The 'excess' share of the Leave vote relative to the share of the electorate can be estimated as a regression model, where

$$\frac{O}{E} = \beta_0 + \beta_1 1 + \varepsilon \tag{1}$$

which, when constraining the parameters to be $\beta_0 = 0$ and $\beta_1 = 1$, gives the regression residuals as,

$$\varepsilon = \frac{O}{E} - 1 = \frac{O - E}{E} \tag{2}$$

² Its support is heightened because of its relationship with neighbouring Spain which makes a territorial claim on Gibraltar. That a relationship could become more fractious outside of the EU.

Multiplying these values by 100 expresses the share of the Leave vote as a percentage increase/decrease in the share of the electorate per location. This may seem overly convoluted but it can be extended to recognise the multilevel structure whereby LAs nest into regions, and to separate out the between region differences (v_j) from those that are within-regions and between LAs/constituencies (μ_{ij}); that is, to estimate,

$$\varepsilon = v_j + \mu_{ij} \tag{3}$$

using standard multilevel modelling software, here the lme4 library in the open source software, R.

The upper part of Figure 2 plots the regional level differences (net of the differences within regions) with a 95 per cent confidence interval drawn around each estimate.³ Any value above zero means that (at a regional level) the share of the Leave vote was greater than expected given the size of the electorate, whereas the reverse is true for a value below zero, and, on this basis, the regions are ranked in descending order of the strength of support for Leave. There are regional differences: in particular, the share of the Leave vote is, on average, 19.7 per cent greater than the share of the electorate in the East Midlands and 19.3 per cent greater in the West Midlands, and the confidence intervals associated with these estimates do not overlap with the estimates for the South East, North West and Wales. However, it is London, Scotland and Northern Ireland that most obviously stand apart from the rest with their lower-than-expected shares of the Leave vote. Recalling that Scotland and Northern Ireland are actually separate countries, the interpretation may be of differences within the United Kingdom between nations – the contrast between Scotland and Northern Ireland, and England and Wales – and differences within England, notably between London and other places but also between the Midlands and some but not all other English regions. However, even that is not the whole story because although the ‘regional’ differences account for the majority, 54.9 per cent, of the variance in ε , that leaves 45.1 per cent at the sub-regional scale. The bottom of Figure 2 adds in those sub-regional differences and reveals, for example, that whilst London did, as a whole, have a share of the Leave vote that was significantly lower than is expected given the size of its electorate, there are places within it where the opposite is true. Similarly, there is variation within the East and West Midlands.

[FIGURE 2 ABOUT HERE]

Figure 3 focuses on England and Wales, mapping how support for Leave varied across their local authorities. It highlights the places where the share of the total Leave vote was greater than expected given the share of the electorate found in those local authorities. It also shows the places where the share of the Leave vote was less. The latter group consist largely of cities and include, in decreasing order of the percentage ‘excess’ towards Remain, much of London, Cambridge, Oxford, Brighton, Manchester, Liverpool, Cardiff, Bristol, York, Norwich,

³ The estimates are scaled by the mean average of $|\varepsilon|$

Reading, Nottingham, Leicester, Birmingham, Warwick, Exeter, Cheltenham, Newcastle, Winchester, Guildford, Slough, Sheffield, Leeds, Swansea and Bradford.

Using the Department for Environment, Food & Rural Affairs' 2011 Rural/Urban classification, each local authority in England (but not Wales) can be classified into one of six types.⁴ Of the 75 in the Urban with Major Conurbation category (the most urban), 44 per cent had a share of the Leave vote that exceeded their share of the electorate; of the 9 classified as Urban with Minor Conurbation, 78 per cent did; of the 97 classed as Urban with City and Town, 80 per cent; of the 54 Urban with Significant Rural, 85 per cent; of the 41 Largely Rural, 88 per cent; and of the 50 Mainly (and most) Rural, 94 per cent. A chi-square test reveals these differences to be statistically significant ($\chi^2 = 13.9, p = 0.016$). There is therefore evidence of a 'metropolitan urban' versus 'the rest' divide but not exactly so: of the 33 Urban with Major Conurbation places where the share of the Leave vote did exceed their share of the electorate, six are in London.

[FIGURE 3 ABOUT HERE]

Figure 4 considers the difference between the values plotted in Figure 3 and what those values would be if they were equal to the regional estimates. In other words, it plots the sub-regional differences shown in the bottom of Figure 2 – the variations around the regional trend. Any place shaded in dark grey to black in this map has a share of the Leave vote that is higher than expected given both its share of the electorate and the region within which it is located. The influence on Leave's success of the Eastern coastal regions extending from around Norwich, up through the East Midlands and into East Yorkshire is evident, as is the eastern and western corners of the South East and South West, respectively, the Welsh valleys and parts of the North West.

[FIGURE 4 ABOUT HERE]

Explaining the geographical variations

Analysis by *The Guardian* newspaper (The Guardian, 2016) shows that people who have attended higher education, have a higher income, are of a higher social grade, are younger, or are not born in the UK, are more likely to be living in LAs that had increased propensity to vote Remain. In Scotland, devolution and the possibility of Scottish independence are important factors, as is the political ideology of the Scottish National Party, which has replaced the Labour Party as the opposition to the Conservatism of Westminster. The situation in Northern Ireland is complicated by the political history of the recent past and perhaps no desire to return to the restricted movement between the Republic of Ireland and itself. It, and Scotland, may be more comfortable with multiple identities (British, Scottish,

⁴ <https://www.gov.uk/government/statistics/2011-rural-urban-classification-of-local-authority-and-other-higher-level-geographies-for-statistical-purposes>

Irish and/or Northern Irish, European) and are less affected by the issues of immigration from the EU that drove much of the rhetoric of the Leave campaign.

Focusing on England and Wales, the models of Equations 1 to 3 can be extended to allow for potential predictor variables,

$$\frac{O}{E} = \beta_0 + \beta_1 1 + \gamma X + v_j + \mu_{ij} \quad (4)$$

where γX represent the predictor variables and their estimated coefficients (and β_0 and β_1 are constrained as before). Table 1 reports the results of a model that includes measures of the age, ethnicity and socio-economic composition of each LA, for which 2011 Census data and the National Statistics Socio-economic Classification are used. It also includes the percentage of the population that was born outside the UK but in the EU, and the percentage born outside the UK and not in the EU. Finally, the model explores the possibility that anti-EU sentiment arises in places that themselves have relatively low levels of immigration but share a border with places where the levels are higher: this is measured as the percentage of the population born outside of the EU, averaged for each LA's contiguous neighbours (the spatial lag), minus the percentage for the LA itself.

Statistically significant results are highlighted in the table by the strength of the effect size. The proportion of the population aged 60 to 64, and the proportion of the population in lower supervisory and technical occupations are the most important predictors of an increase vote share to Leave. It does not follow that those in this age group or social-economic class are necessarily the ones voting Leave but to assume so is consistent with post-referendum surveying (Ashcroft, 2016). Others factors are the proportion of the population born outside of the UK but in the EU, and the proportion of the population Pakistani. Predictors of a decreased vote to Leave include the proportion of the population aged 20 to 25, and the population in lower managerial, administrative and professional occupations. They also include the proportion of the population of a mixed ethnicity (which implies a more ethnically diverse population), the proportion born outside the UK and also outside the EU, and the proportion in semi-routine occupations. Such occupations include retail, bar staff and waiters, taxi drivers and so forth – that is, they include 'casual work' in service sector jobs. These suggest that the impact of immigration was complicated upon the Leave vote. Combined with knowledge of the geography of the Leave vote, the implication is that immigration was a factor towards Leave in what are less ethnically mixed areas along the East coast that are nevertheless exposed to seasonal immigration from the EU (in agriculture, for example), whereas more ethnically diverse areas, within large towns and cities, were less likely to vote Leave. However, areas with higher proportions of Indian, Pakistani, Bangladeshi or Black populations were more likely to have a higher-than-expected share of the Leave vote, albeit not always statistically significantly so. There is some evidence that places with neighbours with a higher proportion of the population born outside of the UK but within the EU than their own had an increased share of the Leave vote but, again, the result is not statistically significant at a conventional level.

[TABLE 1 ABOUT HERE]

The model explains 67.6 per cent of the variation in the response variable. The unexplained variance within regions is one fifth (0.192) of that for a model with no predictor variables; between regions it is about one third (0.327). Despite being much reduced, 53.2 per cent of the unexplained variance is between regions, 46.8 per cent within. It is, however, London that appears to have attracted a share of the Leave vote disproportionately greater than the share of the electorate and the model variables predict. But not only London as the regions (of England and Wales) appear to divide into three groups: those for where the share of the Leave vote is greater than the model predicts (London, West Midlands, East, South East and the East Midlands); those for where it is about as predicted (South West, and Yorkshire and The Humber); and those for where it is less (North East, North West, and Wales). Variations within the regions remain – Figures 5 and 6.

[FIGURE 5 ABOUT HERE]

[FIGURE 6 ABOUT HERE]

Conclusion

In terms of what the EU referendum has revealed, the UK is clearly fragmented with notable differences between people and places. There is some truth in a regional reading of the referendum results whereby London, which stands apart socially, economically and ethnically with a culturally diverse and diversifying population that is unusual for the UK (Ganesh, 2015), also stands apart from especially the East Midlands, West Midlands, the East, and Yorkshire and The Humber in terms of its (decreased) support for Leave. However, the splits are not as simple as they have sometimes been portrayed: there is variation within regions, with notable differences between large cities and towns (that attracted a smaller share of the Leave vote), and smaller towns and rural regions (a higher share). Although attention has been drawn to the Midlands and the East Coast regions in their support for Leave, parts of the South East (amongst others) were also influential. And whilst within England and Wales, much of the differences can be explained by the social, ethnic and demographic composition of the places, some attained a share of the Leave vote higher than predicted: the Midlands, East and South East but also London, in which the Remain campaign did not make the gains it had hoped for, providing one reason for why it lost the vote.

On top of these regional and sub-regional differences are the national differences, notably between Scotland and Northern Ireland and much of England and Wales. It has been said that, “metropolitan liberals have allied with Scotland against small-town England” (Rentoul, 2016), although this is to ignore the way much of Northern Ireland voted, the variations in London, and also that if there was a sense of ‘ganging-up’ then it was by a large group of

politically disenfranchised, largely (but not exclusively) white and broadly working class voters in areas of England and Wales that have seen a decline in industrial and manufacturing jobs, as well in stable employment, aligning with an older population to vote against the 'metropolitan liberals' and the EU. This alignment also does not fall neatly along traditional political lines. Although there is considerable concern in the Labour party that it has lost touch with its core voter and may be wiped out in England and Wales (as it has largely been in Scotland), one reason the referendum was held was because of Conservative concerns that it was losing its voters to UKIP. There is some evidence to support an economic interpretation of the referendum: aggregating the results up into the larger statistical regions for which estimates of the regional GDP are available, there is a relationship between decreasing per capita GDP and a greater percentage of the vote being for Leave.

Ultimately the story is perhaps less about the EU itself but one of industrial decline and growing social and economic inequality, overlapping with nationalism and political beliefs that play out very differently in Scotland (and also Northern Ireland) than they do in England and Wales. How an 'independent' UK (potentially without Scotland and with devolved power to the Northern Irish Assembly) that is dominated by London both as an engine of growth and a place of increasing ethno-cultural diversity can accommodate such deep and on-going divisions is not, at the present time, clear and may suggest a United Kingdom in name only.

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	Estimate	se	t value
Age:			
Proportion of the LA aged 20 to 25	-1.702	0.366	-4.648 *
Proportion of the LA aged 25 to 29	-1.224	0.826	-1.481
Proportion of the LA aged 30 to 44	-0.837	0.595	-1.408
Proportion of the LA aged 45 to 59	-0.840	0.646	-1.302
Proportion of the LA aged 60 to 64	3.728	1.818	2.051 *
Proportion of the LA aged 65 to 74	0.817	1.322	0.618
Proportion of the LA aged 75 to 84	-1.474	1.764	-0.836
Proportion of the LA aged 85 to 89	5.427	5.167	1.050
Proportion of the LA aged 90 or above	-8.594	6.075	-1.415
Ethnicity:			
<i>log</i> (1 – proportion of the LA population White)	-0.001	0.004	-0.271
<i>log</i> (proportion of the LA population Indian)	0.015	0.008	1.932
<i>log</i> (proportion of the LA population Pakistani)	0.011	0.004	2.908 *
<i>log</i> (proportion of the LA population Bangladeshi)	0.005	0.004	1.420
<i>log</i> (proportion of the LA population Black)	0.013	0.010	1.294
<i>log</i> (proportion of the LA population Mixed ethnicity)	-0.079	0.022	-3.529 *
Socio-economic class:			
Proportion in Higher managerial, administrative & professional occupations	-0.705	0.394	-1.790
Proportion in Lower managerial, administrative & professional occupations	-1.329	0.524	-2.537 *
Proportion in Intermediate occupations	2.969	0.353	8.403 *
Proportion in Lower supervisory and technical occupations	3.459	0.836	4.140 *
Proportion in Semi-routine occupations	-1.121	0.562	-1.994 *
Proportion in Routine occupations	0.772	0.426	1.814
Proportion in Never worked and long-term unemployed	-0.570	0.445	-1.281
Immigration:			
(a) Proportion of residents born outside UK but in the EU	2.169	0.669	3.242 *
(b) Proportion of residents born outside UK and outside the EU	-0.625	0.286	-2.190 *
Spatial lag of (a) minus (a)	0.753	0.578	1.304
Spatial lag of (b) minus (b)	-0.017	0.199	-0.084

Table 1. Showing the fixed effects estimates for a multilevel modelling predicting the ‘excess’ share of the Leave vote as a percentage increase/decrease of the share of the electorate for Local Authorities in England and Wales. * = $|t| < 0.05$ (\cong 95% confidence); rows are shaded by the strength of the effect size

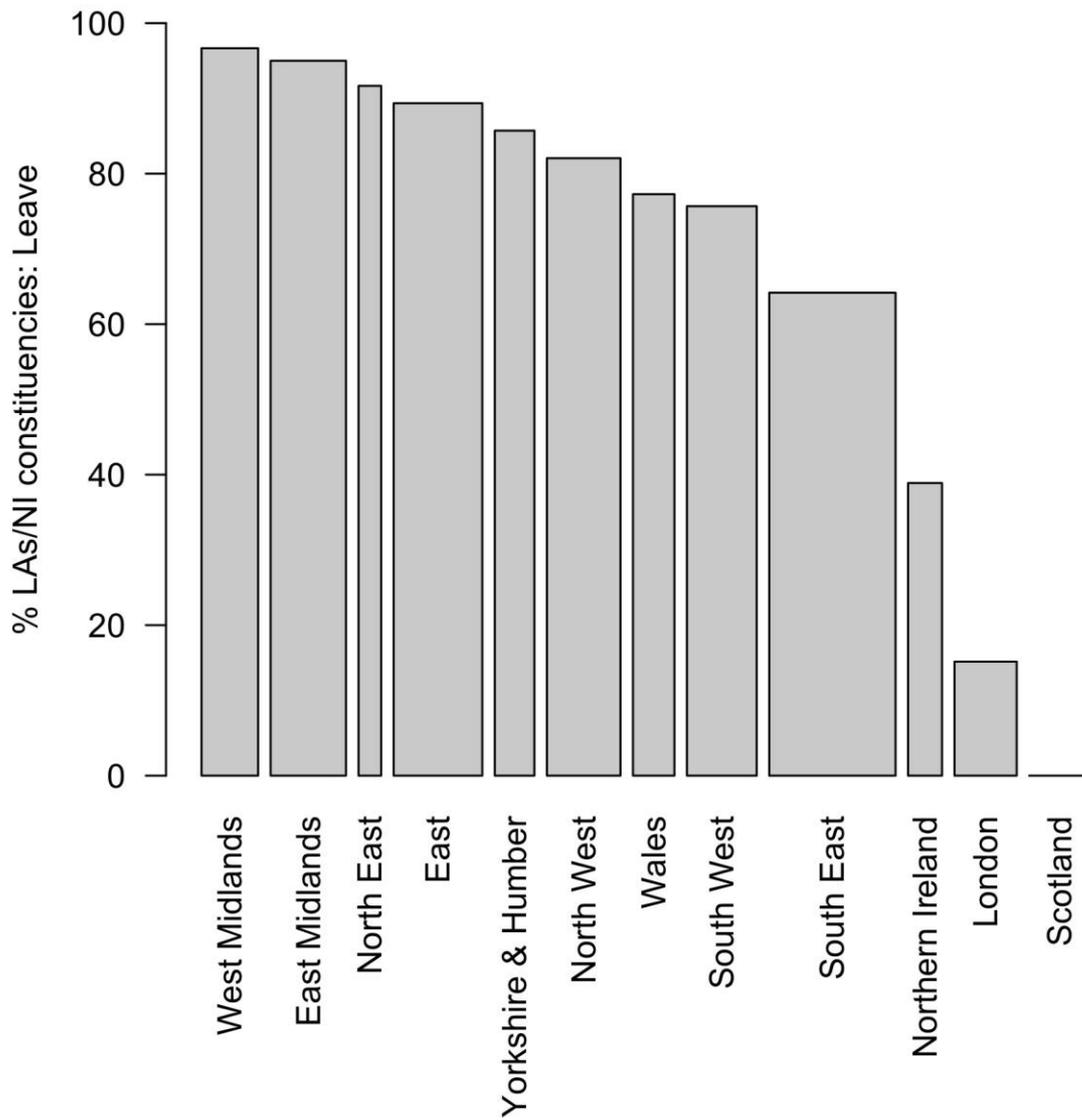


Figure 1. The percentage of local authorities (LAs) or Northern Ireland constituencies 'won' by the Leave campaign in each of the 12 UK regions. The width of the bars is proportional to the number of LAs/constituencies the region contains

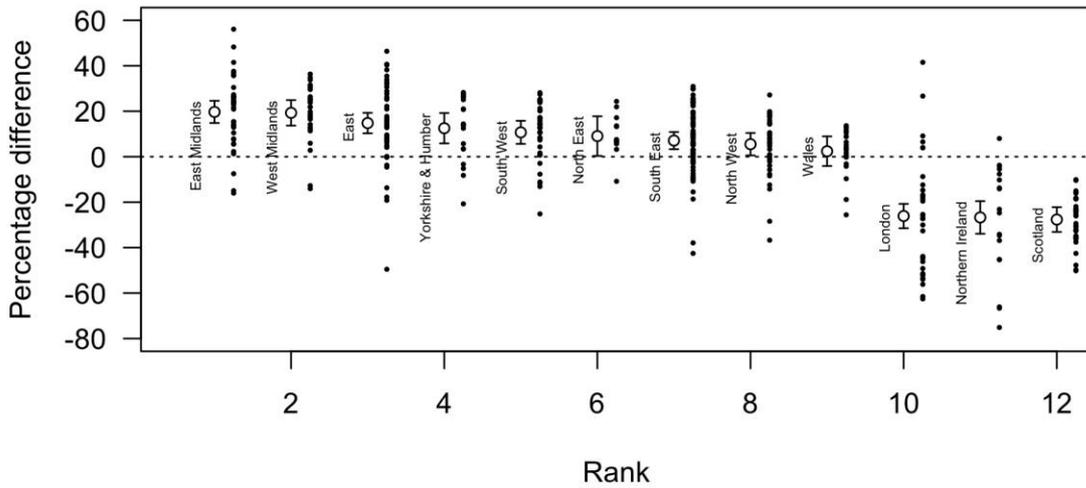
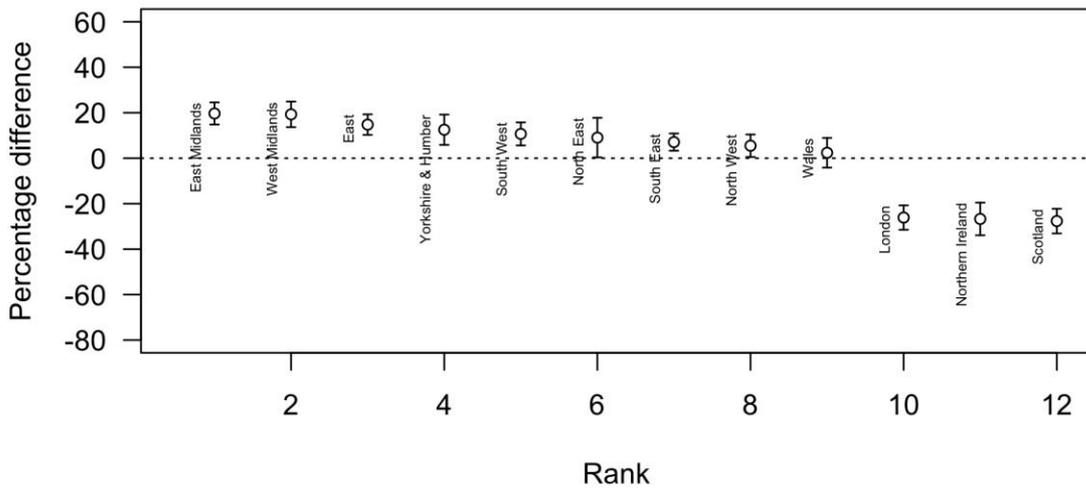


Figure 2. Caterpillar plots showing the modelled variations between regions in terms of their observed and expected share of the Leave votes, net of the variations within regions. The percentage differences are the percentage increase/decrease in the share of the Leave vote relative to the share of the electorate. The bottom plot includes the sub-regional variations, at the local authority/Northern Ireland constituency scale.

Share of Leave vote Vs share of electorate

- Highest
- Increased share
- |
- Decreased share
- Least

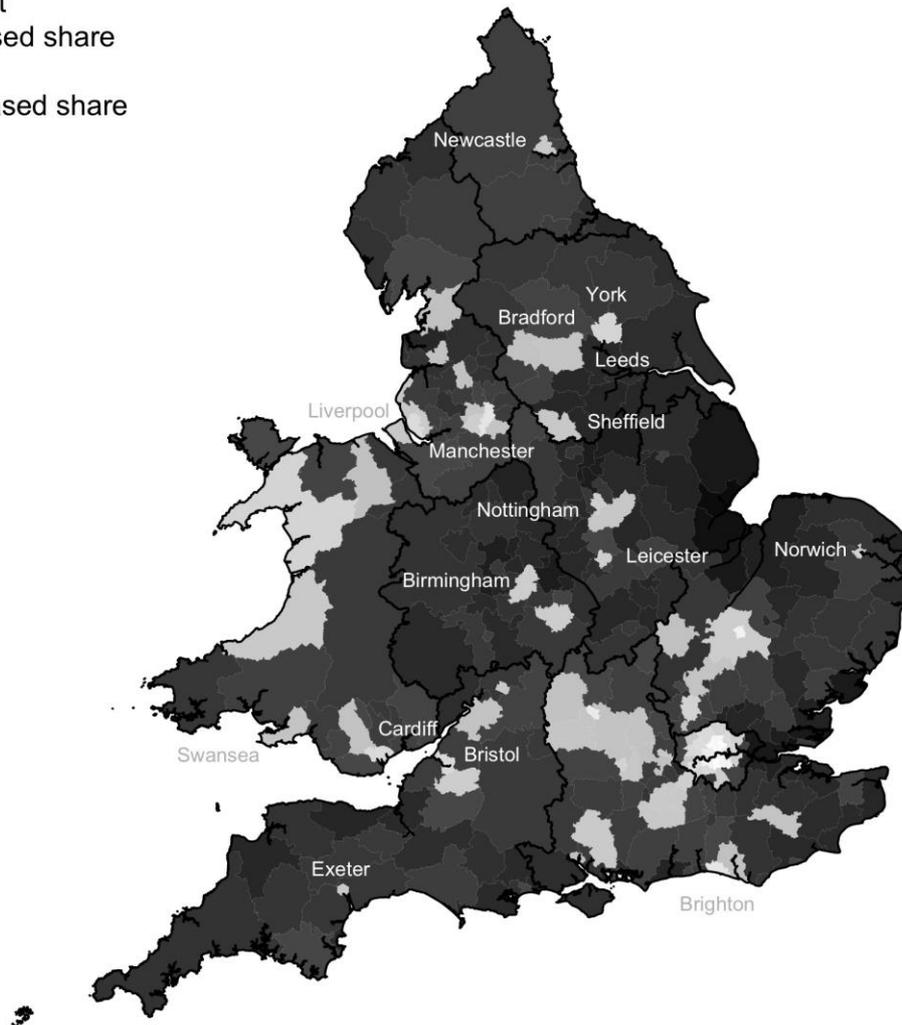


Figure 3. Showing where the share of the Leave vote was higher or lower than the share of the electorate (and shaded by the share of the Leave vote as a percentage increase/decrease in the share of the electorate)

Share of Leave vote Vs Regional prediction

- Highest
- Increased share
- |
- Decreased share
- Least

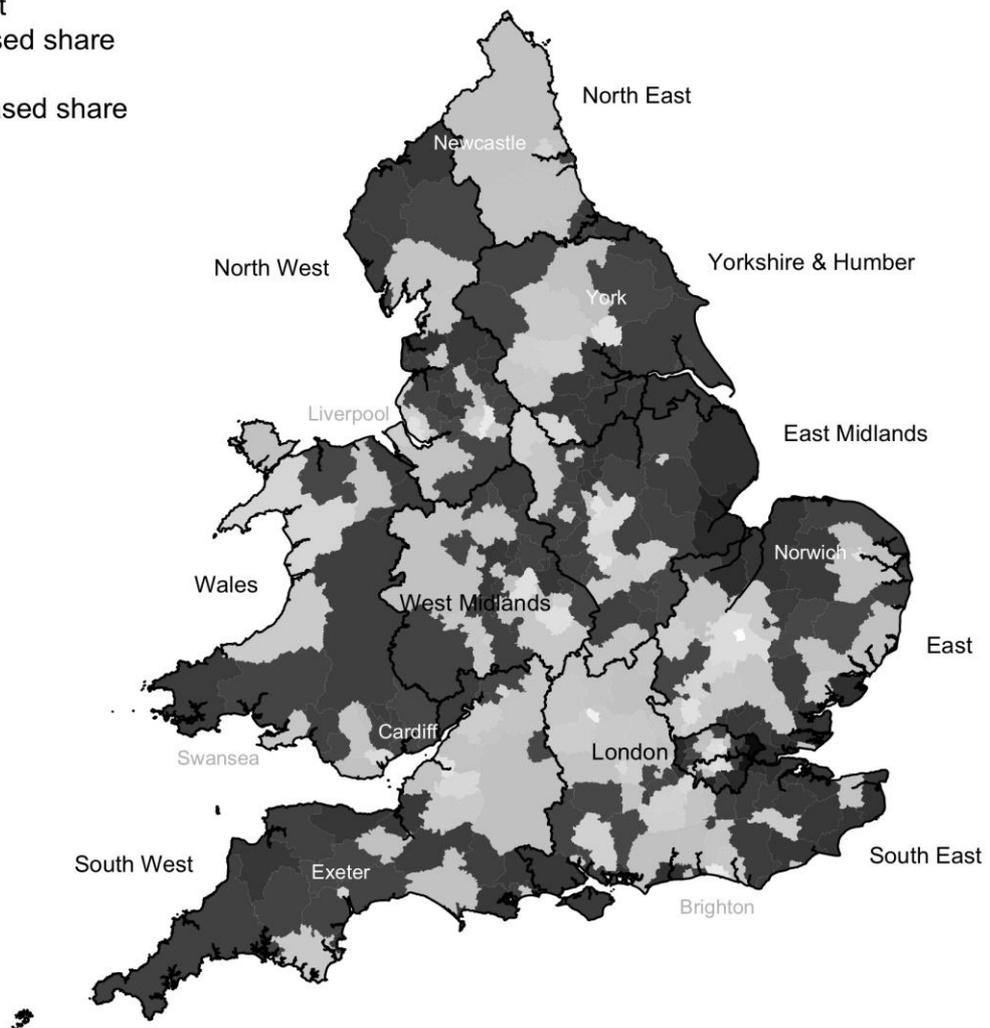


Figure 4. Showing where the share of the Leave vote was higher or lower than expected given the regional support for Leave

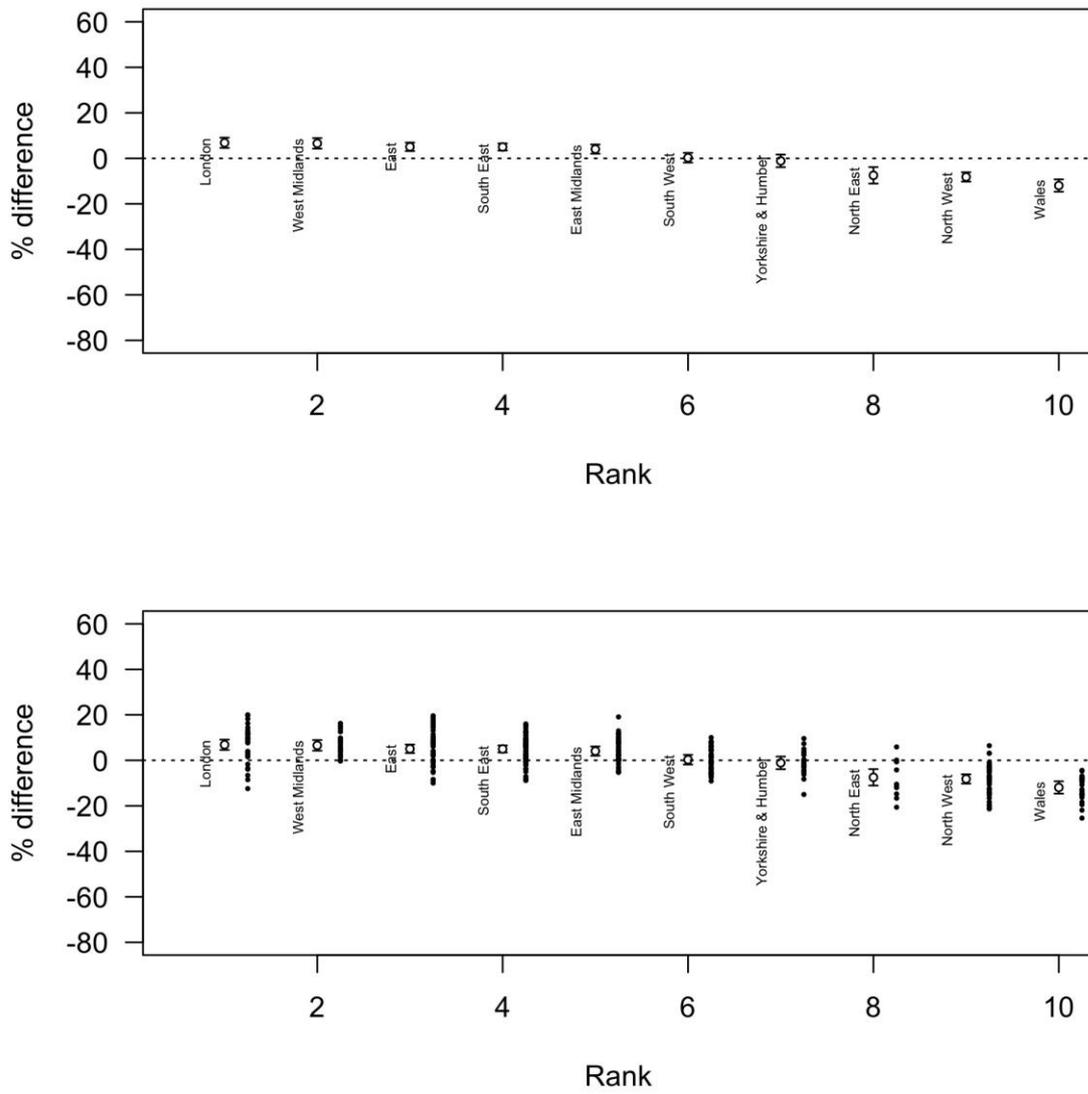


Figure 5. Caterpillar plots showing the residuals variations between and within regions in terms of their observed and expected share of the Leave votes, net of the socio-economic, demographic and ethnic composition of the local authorities they contain.

Share of Leave vote Vs Model prediction

- Highest
- Increased share
- |
- Decreased share
- Least

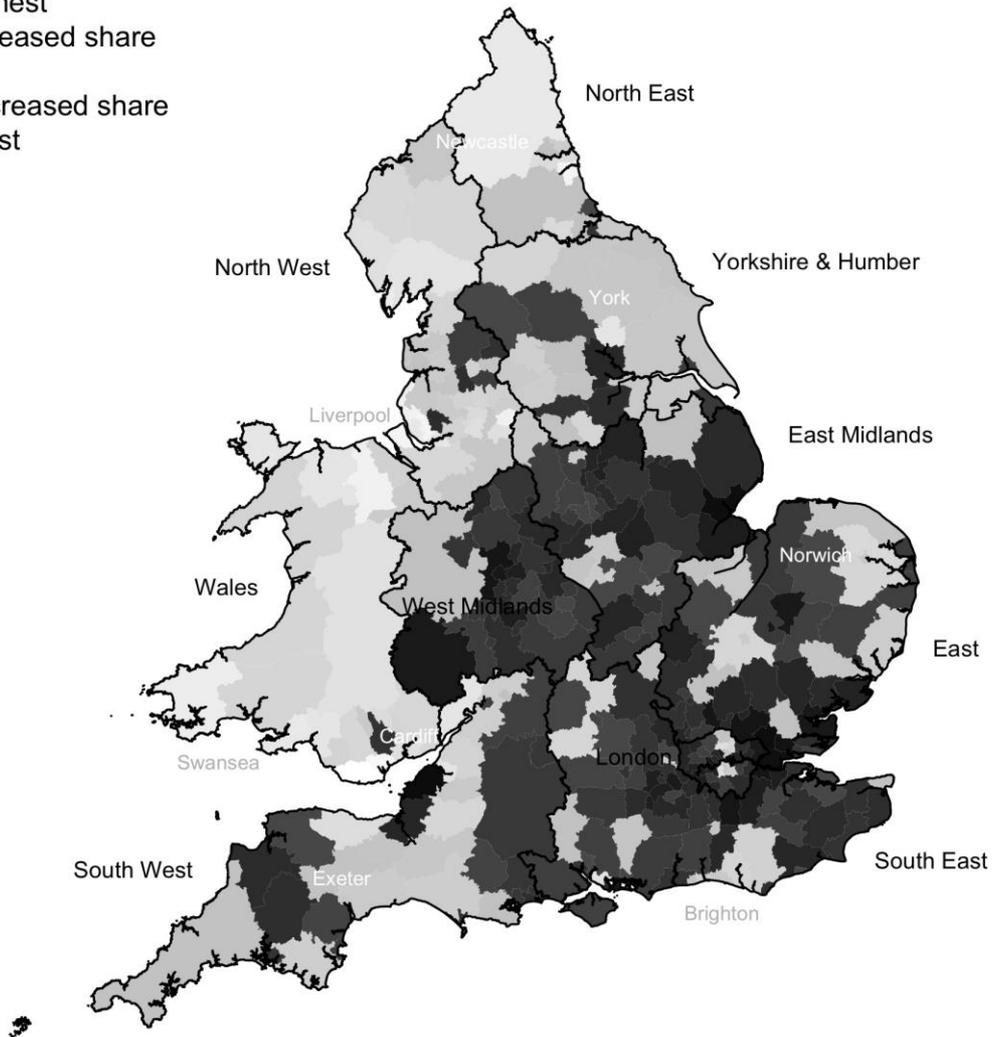


Figure 6. Showing where the share of the Leave vote was higher or lower than expected given the model prediction.