Online Appendix for ‘Turning out to turn down the EU: The mobilisation of occasional voters and Brexit’

Lukas Rudolph
Forthcoming in Journal of European Public Policy
December 11, 2019

A.1 Literature on the link between turnout and Brexit

Differential turnout is one major explanation of the Brexit vote. As Evans and Menon (2017, 33-35) discuss, electoral participation declined in the pre-referendum decades to an average of 63%. Importantly, they highlight that this decline was uneven across social classes and education groups, leading to a large participation gap between voters of different socio-demographic backgrounds. If the increase in turnout with the referendum is similarly unequal across socio-demographic strata this would imply that on the one hand the participation gap closed, but on the other hand that the turnout increase was likely consequential for the referendum outcome. Evans and Menon (2017, 80f.) highlight particularly that the gap between high and low educated voters closed. As class and education are one important predictor of Leave support, the increase in turnout could be related to Leave support. However, as noted by others (Manley et al, 2017; Dorling et al, 2016; Birch, 2016), the participation gap is as well highly prevalent with respect to young vs. old voters as young age predicts Remain support, they conclude that an increase in turnout should be related to Remain support. Consequently, empirical findings are mixed. Most published research reports a strong association between turnout and the Leave vote. Prominently, Zhang (2018) shows that turnout is strongly and positively related to the Leave vote in England and Wales (but not Scotland and Northern Ireland). He estimates that, had overall turnout increased by 7 percentage points less in England and Wales, a Remain victory would have been the likely outcome. Though not explicitly linking turnout to Leave support, Becker et al (2017, 637) analyzes determinants of referendum turnout and argues that “turnout was lower in those areas with a higher potential in favour of Remain” While criticized on methodical ground (Johnston et al, 2018), their general picture is supported by post-referendum survey data, where those leaning towards Remain reported lower turnout (Swales, 2016). Backing these findings and based on the differential success of the Leave and the Remain campaign as well as the saliency of issues, Clarke et al (2017, 209) e.g. argue “that Leavers were more motivated to vote than Remainers [...] is a plausible idea.” However, other researchers (Manley et al, 2017) report an association between higher turnout and Remain. Their estimates imply that turnout was negatively related to the Leave vote and corroborate this finding by analyzing voter registrations – voter registrations increased substantially where Remain performed well in the referendum. Goodwin and Heath (2016, 326) add a note of caution to the interpretation of these associations: While “high turnout might have helped the Leave vote, as turnout was generally higher in more pro-Leave areas [...] we should treat these results with caution, as it does not necessarily follow that it was Leave voters who were disproportionately more likely

\[18\] Among others, they note that election day rainfall and subsequent train cancellations led to a decrease in turnout, although they do not find a direct relation to electoral outcomes.
to turn out and vote. There could also have been a ‘counter-mobilisation effect’ whereby Remain supporters were more likely to vote when they were motivated by the awareness that Leave was popular in their local area.” Finally, the reported associations in turnout levels and the Leave vote also leave open the question how the increase in turnout observed with the referendum was related to Leave support. On the one hand, turnout in prior elections is strongly related to referendum turnout and hence the Leave vote (Goodwin and Heath 2016). On the other hand, mobilizing factors are unevenly distributed across the UK. E.g. (Fetzer 2018; Alabrese and Fetzer 2018) make the argument that austerity measures are related to the Brexit vote and that voters affected by austerity measures voiced their protest via the Leave decision. They relate this to the possibility of differential mobilization in areas with high and low levels of austerity. Other observers note that the preferences of abstainers and especially the age-turnout gradient likely affected results, with non-voters, especially young non-voters, likely being pro-remain on average (see e.g., Low (2016); Eichengreen et al (2018)). All in all, this literature implies that turnout is an important factor in explaining the Brexit vote and for referendum outcomes more generally. As emphasized by Clarke et al (2017, 210), simulations based on stated preferences of non-voters in survey data indicate that the outcome of the referendum could have gone either way with full participation. They argue that the odds of a Remain victory in one million uneqicoval-turnout-referendums are close to 2:1. However, in a real-world scenario with turnout below 100% these odds will to a large extent depend on the degree of voter mobilization and whether voters who latently support the one or the other referendum camp have differential participation incentives. This makes it important to better understand the role of turnout for electoral outcomes.

A.2 Summary statistics, balance and placebo tests

This appendix section provides background for the research design as discussed in the research design section in the main text.

First of all, Appendix Table A.1 provides a simple descriptive summary of the dependent, independent and control variables used in the analyses.

Second, Appendix Table A.2 provides t-tests on the means of co-determinants of turnout and Leave vote for all local authorities within the control (no rain) and treatment group (rain > 0 mm). First, one can see from the comparison that treatment and control group differ with respect to several socio-economic control variables (share of population over 60, unemployment, population density, labor market structure, migrant share, ethnic white share, region). This is to be expected as the rainfall event predominantly hit the south and east of England as well as some areas of Scotland and Northern Ireland and it is plausible that these specific areas are not directly comparable to an average local authority from the rest of the UK. Appendix Table A.2 confirms that such correlations exist, which therefore demands a research design that can take these pre-existing differences in socio-economic covariates into account. This is why we are 1) explicitly controlling for observables and 2) are drawing on first differences to implicitly control for level differences. Second, one can see from comparing the differences-in-means in the full (left panel) and adjacent sample (right panel) that for most of these covariates the difference in group means becomes smaller in the adjacent sample: Among the significant associations on the left hand, the difference in the share of unemployed and in the trend in unemployment shrinks to almost zero, the difference in high
skilled labour is reduced (though remains significant), and the difference in 2014 European Election Ukip shares halves (and becomes insignificant). All these changes support the argument that with the adjacent sample we are increasing the ex-ante comparability of the treated and control group. Note, however, that some covariate-differences barely change (e.g. population density, which is larger in the treatment group, share in low-skilled labour, which is larger in the control group, the share in the ethnic white population, which is larger in the control group and the share in the migrant population, smaller in the control group) and for one covariate the difference increases (share of population over 60). Still, the overall picture implies that within the adjacent sample treatment and control group are more comparable (cf. below and Appendix Figure A.1 for additional evidence on this argument). Given that differences remain, controlling for these observable differences is an important feature of the research design, as is a strategy relying on first differences to implicitly control for remaining imbalance between the treatment and control group.

Third, Appendix Figure A.1 supports the assumption that a geographically proximate sample (the “adjacent sample”) improves the causal interpretation of the estimated coefficients. To ascertain that this is a sensible strategy we proceed as follows: We distinguish the full sample from the adjacent sample. We then regress rainfall on various socio-demographic controls that are likely related to turnout and Leave share. With a true random event, we would expect a uniform distribution of p-values – given the geographical clustering of our case, this is unlikely, of course, but we can still assess whether the adjacent sample likely improves the inference. Appendix Figure A.1 then reports a Q-Q plot of empirically observed p-values against this theoretically ideal uniform distribution. It has two main conclusions: On the one hand, there are substantial correlations between observable local authority characteristics and rainfall. This warrants an empirical strategy where we control for the said variables. On the other hand, the statistical strength of these correlations shrinks substantially with the adjacent sample: Then, only two variables are statistically related to rainfall on the 5%-level, four on the 10%-level, compared to five on the 5%- and ten on the 10%-level for the full sample. As well, the maximum distance to the uniform distribution is still substantial with 0.45, but decreases by 27% for the adjacent sample.

Fourth, Appendix Figure A.2 depicts the descriptive trend of Ukip/Leave support in local authorities with/without rainfall over three elections. This is to support the argument that a differencing strategy is feasible. As can be seen, in the pre-treatment period, i.e. inbetween the 2009 and 2014 European Elections, the dependent variable (Ukip support) is following a parallel trend in regions with/without rain. Differences in the trend are discernible for 2016.

Fifth, while it can in principle not be tested whether rainfall is exogenous to turnout in the case at hand, we can find indications for this in placebo tests: As suggested by Angrist and Pischke (2009), we conduct a placebo test on whether referendum day rainfall is related to unaffected outcomes. For this, Appendix Table A.3 reports regressions of election day rainfall on the difference in pre-treatment postal voting applications and pre-treatment postal ballot turnout. Regressions follow the set-up of Table 1. The argument is that structural shifts in participation patterns should extend to postal voters as well, while rainfall could not affect the postal vote participation decision. The (placebo) association of the trend in both postal voting registrations (i.e. envelopes issued over total electorate) and postal ballot turnout (i.e. envelopes returned over envelopes issued) is substantially small and insignificantly related to rainfall on election day.
Table A.1: Summary statistics for variables used in the analysis

| Variable                                      | Full sample |                         | Adjacent sample |                         |
|-----------------------------------------------|-------------|--------------------------|-----------------|--------------------------|
|                                               | mean        | min          | max          | mean        | min          | max          |
| Turnout in %                                  | 73.73       | 56.25        | 83.57        | 75.13       | 59.25        | 83.57        |
| Turnout for 2014 EE                          | 35.86       | 23.74        | 51.94        | 36.61       | 23.74        | 51.77        |
| 2016 Referendum TO - 2014 EE TO               | 37.81       | 10.75        | 49.24        | 38.52       | 12.83        | 49.24        |
| Average election day rainfall (mm)            | 3.13        | 0.00         | 42.20        | 4.29        | 0.00         | 42.20        |
| Share of population aged 20-30                | 12.54       | 7.62         | 27.93        | 12.58       | 7.62         | 27.93        |
| Share of population aged 60+                  | 23.96       | 8.44         | 38.05        | 23.78       | 8.44         | 38.05        |
| Share of unemployed                           | 1.58        | 0.30         | 4.70         | 1.31        | 0.30         | 4.20         |
| Change in 2016 unemployment share             | -0.07       | -0.70        | 0.80         | -0.09       | -0.70        | 0.30         |
| Population density                            | 14.77       | 0.10         | 138.70       | 17.16       | 0.30         | 138.70       |
| Population size (log)                         | 11.82       | 7.70         | 14.41        | 11.79       | 7.70         | 13.89        |
| Share of employed in high skilled labor       | 10.90       | 6.10         | 23.30        | 11.55       | 6.60         | 23.30        |
| Share of employed in low skilled labor        | 11.02       | 3.60         | 21.10        | 10.82       | 3.60         | 21.10        |
| Share of migrants from outside UK             | 0.97        | 0.18         | 6.45         | 1.08        | 0.22         | 6.45         |
| Share of ethnic group white                   | 90.33       | 28.82        | 99.26        | 88.57       | 28.82        | 98.82        |
| Country/region==England                       | 0.77        | 0.00         | 1.00         | 0.88        | 0.00         | 1.00         |
| Country/region==Wales                         | 0.00        | 0.00         | 1.00         | 0.00        | 0.00         | 0.00         |
| Country/region==Scotland                      | 0.08        | 0.00         | 1.00         | 0.00        | 0.00         | 0.00         |
| Country/region==London                        | 0.09        | 0.00         | 1.00         | 0.12        | 0.00         | 1.00         |
| Country/region==Northern Ireland              | 0.00        | 0.00         | 1.00         | 0.00        | 0.00         | 0.00         |
| Ukip share in EE                              | 29.10       | 3.93         | 57.58        | 31.43       | 4.90         | 51.58        |
| Leave in %                                    | 53.12       | 21.38        | 75.56        | 54.08       | 21.38        | 75.56        |
| Diff in 2016 Leave - 2014 Ukip share           | 24.01       | 10.95        | 40.32        | 22.66       | 10.95        | 38.82        |
| Observations                                  | 381         |              |              | 275         |              |              |

Table displays summary statistics for all dependent, independent and control variables used in the analyses. The ‘mean’ of indicators variables for country/region denotes the share of local authorities from said country/region. Full sample: all observations from the UK; adjacent sample: English regions with at least one local authority experiencing rainfall.
Table A.2: T-test of mean difference for control variables used in the analysis between local authorities experiencing and not experiencing any rainfall on referendum day and for the full (left panel) and the adjacent sample (right panel)

| Control: No rain Group mean | Control: Rain > 0mm Group mean | Diff-In-Means (se) | Adjacent sample | Treated: No rain Group mean | Treated: Rain > 0mm Group mean | Diff-In-Means (se) |
|---------------------------|---------------------------------|-------------------|-----------------|---------------------------|---------------------------------|-------------------|
| Share of population aged 20-30 | 12.32 | 12.72 | -0.40 (0.37) | 12.08 | 12.78 | -0.70 (0.51) |
| Share of population aged 60+ | 24.92 | 23.17 | 1.75*** (0.51) | 25.56 | 23.07 | 2.49*** (0.72) |
| Share of unemployed | 1.86 | 1.34 | 0.52*** (0.09) | 1.30 | 1.31 | -0.01 (0.09) |
| Change in 2016 unemployment share | -0.04 | -0.09 | 0.05*** (0.02) | -0.10 | -0.08 | -0.02 (0.02) |
| Population density | 9.52 | 19.09 | -9.57*** (2.26) | 9.82 | 20.07 | -10.24*** (3.33) |
| Population size (log) | 11.82 | 11.82 | -0.00 (0.06) | 11.76 | 11.81 | -0.05 (0.08) |
| Share of employed in high skilled labor | 9.96 | 11.07 | -1.17*** (0.24) | 10.81 | 11.85 | -1.04*** (0.32) |
| Share of employed in low skilled labor | 11.81 | 10.47 | 1.34*** (0.24) | 11.87 | 10.41 | 1.46*** (0.35) |
| Share of migrants from outside UK | 0.71 | 1.18 | -0.47*** (0.09) | 0.77 | 1.20 | -0.44*** (0.12) |
| Share of ethnic group white | 93.93 | 87.36 | 6.57*** (1.22) | 93.23 | 86.73 | 6.50*** (1.77) |
| Country/region==England | 0.75 | 0.78 | -0.03 (0.04) | 1.00 | 0.83 | 0.17*** (0.04) |
| Country/region==Wales | 0.13 | 0.00 | 0.13*** (0.02) | 0.00 | 0.00 | 0.00 (0.00) |
| Country/region==Scotland | 0.12 | 0.05 | 0.07** (0.03) | 0.00 | 0.00 | 0.00 (0.00) |
| Country/region==London | 0.00 | 0.16 | -0.16*** (0.03) | 0.00 | 0.17 | -0.17*** (0.04) |
| Country/region==Northern Ireland | 0.00 | 0.00 | -0.00 (0.01) | 0.00 | 0.00 | 0.00 (0.00) |
| Ukip share in EE | 28.07 | 29.95 | -1.88* (0.97) | 32.09 | 31.16 | 0.92 (1.14) |

Table displays means for control and treatment group local authorities and the corresponding t-test on a difference in means for all control variables used in the analyses. The left panel displays t-tests for the full sample of local authorities in the UK, the right panel for local authorities from regions with variation in rainfall. ** (*** *) indicates p < 0.05 (0.1, 0.01)
The figure displays a Q-Q-plot of observed p-values against a uniform distribution. P-values are derived from regressions of average rainfall on the marker label (controlling for all other variables displayed in the marker labels). The upper panel displays the distribution of p-values for the full sample of local authorities in the UK, the lower panel for local authorities from regions with variation in rainfall.
Figure A.2: Descriptive trends of Ukip support (2009 and 2014 European Elections) and Leave support (2016 referendum) by local authorities (not) experiencing rainfall.

The figure displays average Leave/Ukip support in the 2009 and 2014 European Parliament Elections and the 2016 Brexit Referendum in local authorities of the UK by rainfall exposure. Upper panel splits rainfall by no and positive rainfall. Lower panel splits rainfall by no rainfall and terciles among local authorities with positive rain (in millimetres on election day). The left panel displays the distribution for the full sample of local authorities, the right panel for local authorities from regions with variation in rainfall. Total N equals 364, which is slightly lower than the 381 observations in the treatment period (4 local authorities from England and 13 local authorities from Wales could not be matched due to local authority mergers and splits).
Table A.3: Placebo regressions on trend in postal ballot registration and turnout

| DV: 2016-2014 diff. in | Full sample | Adjacent sample | Full sample | Adjacent sample |
|------------------------|-------------|-----------------|-------------|-----------------|
| Postal ballot papers issued | 0.017 (0.014) | 0.012 (0.010) | -0.021 (0.037) | -0.068* (0.035) |
| Postal voting turnout | 0.0031 (0.010) | 0.0022 (0.0090) | -0.010 (0.028) | -0.025 (0.026) |

| Variable | Full sample (1) | Adjacent sample (2) | Full sample (3) | Adjacent sample (4) |
|----------|-----------------|---------------------|-----------------|---------------------|
| Average election day rainfall (mm) | 0.21 (0.26) | 1.92*** | (0.77) | -3.96*** |
| Wales | 1.28 (0.83) | -0.21 (0.37) | 1.09 (0.99) | 0.84 (0.96) |
| Scotland | | -0.29 (0.28) | | |
| London | | | | |
| Northern Ireland | -1.67** (0.75) | -16.9*** (1.44) | | |
| Share of population aged 20-30 | 0.15 (0.090) | 0.058 (0.062) | -0.26* (0.15) | -0.17 (0.15) |
| Share of population aged 60+ | 0.069** (0.031) | 0.012 (0.021) | -0.28*** (0.070) | -0.26*** (0.075) |
| Share of unemployed | -0.47*** (0.16) | -1.17 (0.11) | -0.17 (0.36) | -0.58 (0.51) |
| Change in 2016 unemployment share | 0.75 (0.60) | 0.37 (0.39) | 1.74 (1.13) | 0.90 (1.46) |
| Population density | -0.0086 (0.0076) | -0.0087 (0.0064) | -0.041** (0.019) | -0.042** (0.019) |
| Population size (log) | 0.24 (0.22) | 0.16 (0.14) | 0.59* (0.35) | 0.36 (0.36) |
| Share of employed in high skilled labor | 0.11 (0.085) | 0.046 (0.068) | 0.50*** (0.15) | 0.53*** (0.15) |
| Share of employed in low skilled labor | -0.049 (0.063) | -0.12*** (0.041) | 0.086 (0.14) | 0.095 (0.18) |
| Share of migrants from outside UK | 0.13 (0.25) | 0.30 (0.22) | 0.061 (0.50) | -0.23 (0.48) |
| Share of ethnic group white | -0.0032 (0.012) | 0.0090 (0.011) | 0.13*** (0.037) | 0.11*** (0.039) |
| Constant | 2.88*** (0.12) | 2.93*** (0.43) | 18.8*** (0.25) | 19.5*** (0.28) |

| N | 381 | 275 | 381 | 275 |
| Adj. R2 | -0.00044 | 0.14 | 0.00011 | 0.26 |
| F | 1.51 | 8.86 | 1.27 | 9.89 |

Table reports tests for the (placebo) effect of election day rainfall on the share of postal ballots issued and the share of postal ballot turnout.

** (*,***) indicates p < 0.05 (0.1, 0.01)
A.3 Full model display of tables in main text and OLS regressions of the turnout effect

In the following we present two tables that display all coefficient for Tables 1 and 2 in the main text, where coefficient estimates for control variables were omitted for the sake of brevity (Appendix Tables A.4 and A.5). Subsequently, we present the OLS regressions referenced in the results section of the main text. Finally, we present the reduced form estimates (Appendix Table A.7) for completeness.
Table A.4: Effect of election day rainfall (in mm) on turnout – full results of Table 1

|                             | Dep. var.: 2016 Referendum - 2014 EE turnout                  | Full sample | Adjacent sample |
|-----------------------------|---------------------------------------------------------------|-------------|-----------------|
|                             |                                                               | (1)        | (2)          | (3)     | (4)     | (5)     | (6)     |
| Average election day rainfall (mm) | -0.11** -0.071** -0.14*** -0.21*** -0.098*** -0.14*** |            |               |         |         |         |         |
|                             |                                                               | (0.047)    | (0.028)     | (0.030) | (0.048) | (0.026) | (0.028) |
| Wales                       | 1.08* 2.22***                                                  |            |               |         |         |         |         |
|                             |                                                               | (0.65)     | (0.60)      |         |         |         |         |
| Scotland                    | -4.08*** 0.46                                                 |            |               |         |         |         |         |
|                             |                                                               | (1.10)     | (1.40)      |         |         |         |         |
| London                      | -2.44** -1.87**                                                |            |               |         |         |         |         |
|                             |                                                               | (0.99)     | (0.94)      | (0.97) | (0.93)  |         |         |
| Northern Ireland            | -25.6*** -19.6***                                              |            |               |         |         |         |         |
|                             |                                                               | (1.25)     | (1.58)      |         |         |         |         |
| Share of population aged 20-30 | -0.30** -0.15 -0.29** -0.15                                     |            |               |         |         |         |         |
|                             |                                                               | (0.13)     | (0.14)      | (0.14) | (0.15)  |         |         |
| Share of population aged 60+ | -0.23*** -0.24***                                              |            |               |         |         |         |         |
|                             |                                                               | (0.055)    | (0.053)     | (0.054)| (0.052) |         |         |
| Share of unemployed         | -1.45*** -1.52***                                              |            |               |         |         |         |         |
|                             |                                                               | (0.30)     | (0.29)      | (0.34) | (0.36)  |         |         |
| Change in 2016 unemployment share | 0.71 0.67 0.50 0.045                                           |            |               |         |         |         |         |
|                             |                                                               | (1.06)     | (1.01)      | (1.14) | (1.14)  |         |         |
| Population density          | -0.021 -0.017                                                 |            |               |         |         |         |         |
|                             |                                                               | (0.015)    | (0.016)     | (0.015)| (0.015) |         |         |
| Population size (log)       | -0.029 -0.038                                                 |            |               |         |         |         |         |
|                             |                                                               | (0.34)     | (0.34)      | (0.29) | (0.28)  |         |         |
| Share of employed in high skilled labor | 0.58*** 0.65*** 0.48*** 0.60***                               |            |               |         |         |         |         |
|                             |                                                               | (0.13)     | (0.13)      | (0.13) | (0.13)  |         |         |
| Share of employed in low skilled labor | 0.31*** 0.19 0.19* 0.13                                       |            |               |         |         |         |         |
|                             |                                                               | (0.12)     | (0.11)      | (0.11) | (0.11)  |         |         |
| Share of migrants from outside UK | -0.23 -0.20 -0.56 -0.57                                      |            |               |         |         |         |         |
|                             |                                                               | (0.43)     | (0.42)      | (0.41) | (0.37)  |         |         |
| Share of ethnic group white | 0.19*** 0.15***                                               |            |               |         |         |         |         |
|                             |                                                               | (0.031)    | (0.031)     | (0.031)| (0.033) |         |         |
| Ukip share in EE            | 0.19*** 0.15***                                               |            |               |         |         |         |         |
|                             |                                                               | (0.033)    | (0.036)     |         |         |         |         |
| Constant                    | 38.2*** 24.0*** 21.0*** 39.4*** 33.2*** 29.4***               |            |               |         |         |         |         |
|                             |                                                               | (0.30)     | (7.36)      | (7.10) | (8.33)  | (6.53)  | (6.28)  |
| N                           | 381 381 381 275 275 275                                       |            |               |         |         |         |         |
| r2,a                        | 0.0079 0.69 0.71 0.042 0.77 0.79                               |            |               |         |         |         |         |
| F                            | 5.84 46.7 44.8 19.2 53.4 47.8                                  |            |               |         |         |         |         |

Table reports estimates of rainfall (in mm) on difference in 2016 referendum to 2014 European Electionturnout. Robust standard errors in parantheses. Models 1, 2 and 4, 5 display the models 1, 2 and 3, 4 of Table 1 in full. Models 3 and 6 include 2014 European Election Ukip vote as additional variable to provide the correct first stage (i.e. identical variable set) for model 2 and 4 of Table A.10 as used in Appendix Section A.4. Otherwise see notes to Table 1. **(*,***) indicates p < 0.05 (0.1, 0.01)
Table A.5: Instrumental variable regression: Effect of turnout change on Leave vote/change – full results of Table 2

|                          | Full sample | Adjacent sample |
|--------------------------|-------------|-----------------|
|                          | (1)         | (2)             | (3)           | (4)           | (5)          | (6)          |
|                          | Diff. Leave - | Leave in | Diff. Leave - | Leave in | Diff. Leave - | Leave in | Diff. Leave - |
|                          | Ukip share  | %             | Ukip share   | %       | Ukip share   | %       | Ukip share   |
| 2016 Referendum TO -     | 2.60∗       | 0.66∗         | 1.63∗        | 0.78**  | 0.74***      | 0.88**  |
| 2014 EE TO               | (1.34)      | (0.29)        | (0.85)       | (0.34)  | (0.28)       | (0.39)  |
| Wales                    | -2.80∗      | -2.61         | (1.14)       | (1.89)  |
| Scotland                 | 0.018       | 8.86**        | (1.74)       | (3.92)  |
| London                   | 3.94***     | 6.91**        | 4.00***      | 4.50**  |
|                          | (1.35)      | (2.86)        | (1.46)       | (1.78)  |
| Northern Ireland         | 27.4***     | 58.5***       |             |         |
|                          | (6.81)      | (22.1)        |             |         |
| Share of population aged 20-30 | -0.55**     | -0.11         | -0.34       | -0.25   |
|                          | (0.26)      | (0.40)        | (0.25)       | (0.27)  |
| Share of population aged 60+ | 0.011       | 0.23          | 0.039       | 0.071   |
|                          | (0.11)      | (0.23)        | (0.11)       | (0.12)  |
| Share of unemployed      | 2.08***     | 3.41**        | 1.31**      | 1.33**  |
|                          | (0.59)      | (1.34)        | (0.60)       | (0.65)  |
| Change in 2016 unemployment share | 1.17     | 0.45          | -4.36***    | -4.60*** |
|                          | (1.27)      | (2.19)        | (1.54)       | (1.65)  |
| Population density       | -0.012      | 0.012         | -0.00088    | 0.0033  |
|                          | (0.029)     | (0.042)       | (0.027)      | (0.028) |
| Population size (log)    | -0.56       | -0.54         | -0.13       | -0.045  |
|                          | (0.46)      | (0.70)        | (0.50)       | (0.52)  |
| Share of employed in high skilled labor | -1.06***    | -1.53**       | -0.81***    | -0.83*** |
|                          | (0.30)      | (0.61)        | (0.28)       | (0.31)  |
| Share of employed in low skilled labor | 0.86***    | 0.43          | 0.86***     | 0.81***  |
|                          | (0.20)      | (0.40)        | (0.19)       | (0.21)  |
| Share of migrants from outside UK | -0.47       | -0.23         | -0.28       | -0.21   |
|                          | (0.82)      | (1.09)        | (0.73)       | (0.76)  |
| Share of ethnic group white | -0.19***    | -0.42**       | -0.22***    | -0.26*** |
|                          | (0.066)     | (0.18)        | (0.063)      | (0.080) |
| Ukip share in EE         | 0.79***     | 0.94***       |             |         |
|                          | (0.056)     | (0.055)       |             |         |
| Constant                 | -74.4       | 34.4***       | 8.08        | -7.56   |
|                          | (50.9)      | (10.4)        | (22.7)       | (13.0)  |
| N                        | 381         | 381           | 381         | 275     |

See notes to Table 2. ** (*,*** ) indicates p < 0.05 (0.1, 0.01)
Table A.6: Non-instrumented association between turnout increase and Leave as in Table 2.

|                          | Full sample | Adjacent sample |
|--------------------------|-------------|-----------------|
|                          | (1)         | (2)             | (3)             | (4)             | (5)             | (6)             |
| Diff. Leave - Ukip share |             |                 |                 |                 |                 |                 |
| Leave in %               | -0.28***    | -0.098          | -0.13**         | -0.17**         | -0.0077         | 0.00075         |
|                          | (0.058)     | (0.065)         | (0.062)         | (0.074)         | (0.078)         | (0.073)         |
| 2016 Referendum TO - 2014 EE TO |             |                 |                 |                 |                 |                 |
| Wales                    | -1.02       | -0.33           |                 |                 |                 |                 |
|                          | (0.77)      | (0.74)          |                 |                 |                 |                 |
| Scotland                 | -0.014      | 2.13**          |                 |                 |                 |                 |
|                          | (1.28)      | (1.03)          |                 |                 |                 |                 |
| London                   | 2.28**      | 2.41**          | 1.88*           | 1.87*           |                 |                 |
|                          | (1.00)      | (0.97)          | (0.98)          | (0.99)          |                 |                 |
| Northern Ireland         | 11.2***     | 13.0***         |                 |                 |                 |                 |
|                          | (1.99)      | (1.98)          |                 |                 |                 |                 |
| Share of population aged 20-30 | -0.67***   | -0.61***        | -0.46**         | -0.48**         |                 |                 |
|                          | (0.20)      | (0.19)          | (0.19)          | (0.19)          |                 |                 |
| Share of population aged 60+ | -0.18**    | -0.19***        | -0.15**         | -0.14**         |                 |                 |
|                          | (0.069)     | (0.069)         | (0.064)         | (0.064)         |                 |                 |
| Share of unemployed      | 1.02***     | 0.96***         | 0.37            | 0.43            |                 |                 |
|                          | (0.32)      | (0.33)          | (0.47)          | (0.45)          |                 |                 |
| Change in 2016 unemployment share | 1.96*     | 2.06*           | -4.04***        | -3.98***        |                 |                 |
|                          | (1.05)      | (1.06)          | (1.34)          | (1.33)          |                 |                 |
| Population density       | -0.027      | -0.027          | -0.015          | -0.015          |                 |                 |
|                          | (0.023)     | (0.022)         | (0.022)         | (0.022)         |                 |                 |
| Population size (log)    | -0.51       | -0.48           | -0.32           | -0.33           |                 |                 |
|                          | (0.38)      | (0.38)          | (0.43)          | (0.43)          |                 |                 |
| Share of employed in high skilled labor | -0.53***   | -0.46**         | -0.32           | -0.34*          |                 |                 |
|                          | (0.20)      | (0.19)          | (0.21)          | (0.20)          |                 |                 |
| Share of employed in low skilled labor | 1.06***    | 1.02***         | 1.02**          | 1.02**          |                 |                 |
|                          | (0.15)      | (0.15)          | (0.15)          | (0.15)          |                 |                 |
| Share of migrants from outside UK | -0.75      | -0.80           | -0.84           | -0.82           |                 |                 |
|                          | (0.66)      | (0.64)          | (0.62)          | (0.63)          |                 |                 |
| Share of ethnic group white | -0.066**  | -0.079**        | -0.11**         | -0.11***        |                 |                 |
|                          | (0.033)     | (0.033)         | (0.033)         | (0.032)         |                 |                 |
| Ukip share in EE         | 0.91***     |                 | 1.02***         |                 |                 |                 |
|                          | (0.039)     |                 | (0.045)         |                 |                 |                 |
| Constant                 | 34.8***     | 48.5***         | 47.1***         | 29.2***         | 37.6***         | 38.2***         |
|                          | (2.29)      | (6.84)          | (6.83)          | (2.93)          | (7.51)          | (7.40)          |
| N                        | 381         | 381             | 381             | 275             | 275             | 275             |

OLS regression with robust standard errors in parentheses, i.e. difference in 2016 referendum turnout and 2014 European election turnout is main independent variable. Otherwise see notes to Table 2. ** (*, *** ) indicates p < 0.05 (0.1, 0.01)
Table A.7: Reduced form estimates of the direct effect of election day rainfall on Leave support

|                           | Full sample                  | Adjacent sample               |
|---------------------------|------------------------------|--------------------------------|
|                           | (1) | (2) | (3) | (4) | (5) | (6)                          |
| Average election day rainfall (mm) | -0.29*** | -0.089*** | -0.12*** | -0.16*** | -0.10*** | -0.087***                   |
|                           |     |     |     |     |     |                               | (0.072) | (0.031) | (0.029) | (0.062) | (0.030) | (0.026) |
| Wales                     | -1.33* | -0.85  |     |     |     |                               | (0.77)  | (0.77)  |         |         |         |         |
| Scotland                  | 0.32  | 2.22** |     |     |     |                               | (1.33)  | (0.96)  |         |         |         |         |
| London                    | 2.71*** | 2.94*** |     |     | 2.10** | 2.01**                       | (1.00)  | (0.97)  | (0.94)  | (0.97)  |         |         |
| Northern Ireland          | 14.3*** | 16.8*** |     |     |     |                               | (1.71)  | (1.30)  |         |         |         |         |
| Share of population aged 20-30 | -0.65*** | -0.59*** |     | -0.45** | -0.50** |                               | (0.20)  | (0.19)  | (0.19)  | (0.20)  |         |         |
| Share of population aged 60+ | -0.15** | -0.15** |     | -0.14** | -0.14** |                               | (0.066) | (0.066) | (0.061) | (0.062) |         |         |
| Share of unemployed       | 1.08*** | 1.05*** |     | 0.31  | 0.43  |                               | (0.32)  | (0.32)  | (0.46)  | (0.44)  |         |         |
| Change in 2016 unemployment share | 1.61  | 1.60  |     | -4.33*** | -4.16*** |                               | (1.04)  | (1.05)  | (1.33)  | (1.31)  |         |         |
| Population density        | -0.024 | -0.022 |     | -0.013 | -0.015 |                               | (0.023) | (0.022) | (0.021) | (0.022) |         |         |
| Population size (log)     | -0.58  | -0.59  |     | -0.42  | -0.45  |                               | (0.39)  | (0.39)  | (0.43)  | (0.43)  |         |         |
| Share of employed in high skilled labor | -0.63*** | -0.60*** |     | -0.36* | -0.41** |                               | (0.20)  | (0.19)  | (0.20)  | (0.20)  |         |         |
| Share of employed in low skilled labor | 0.99*** | 0.93*** |     | 0.95*** | 0.97*** |                               | (0.15)  | (0.15)  | (0.15)  | (0.15)  |         |         |
| Share of migrants from outside UK | -0.61  | -0.60  |     | -0.70  | -0.70  |                               | (0.68)  | (0.65)  | (0.61)  | (0.63)  |         |         |
| Share of ethnic group white | -0.088*** | -0.11*** |     | -0.12*** | -0.11*** |                               | (0.032) | (0.032) | (0.034) | (0.032) |         |         |
| Ukip share in EE          | 0.92*** | 1.05**  |     |     |     |                               | (0.040) | (0.045) |         |         |         |         |
| Constant                  | 24.9*** | 48.3*** | 47.1*** | 23.4*** | 40.0*** | 41.3***                       | (0.33)  | (6.75)  | (6.75)  | (0.38)  | (7.20)  | (7.02)  |
| N                         | 381  | 381  | 381  | 275  | 275  | 275                          |         |         |         |         |         |         |

Table reports estimates of rainfall (in mm) on Leave support (for specification dependent variable see model header). Robust standard errors in parentheses. Otherwise see notes to Table 1.

** (*,***) indicates p < 0.05 (0.1, 0.01)
A.4 Preference Gap Calculation

The substantive relevance of the estimates can be assessed using the framework and terminology proposed by Fowler (2015). Taking our results literally, it is possible to disentangle vote preferences for regular and among occasional voters. With rainfall, only regular voters turn out to vote – they vote irrespective of weather conditions. We call the share of regular voters $S_R$. With good weather, also occasional voters are drawn to the polls – they only vote in good weather. We call the share of occasional voters $S_O$. They are identified by the effect of rainfall on electoral participation. Ultimately, we are interested in the preference gap ($P_R - P_O$) between these occasional voters ($P_O$) compared to the regular ($P_R$) voters. As shown by Fowler (2015), this can be derived from the (reduced form) treatment effect on vote shares (which we call $\Delta P$) and the quantities above.

To estimate $\Delta P$ and $P_R$ we draw on model 5 of Table 2, i.e. on the effect of rainfall on the Leave vote in the adjacent sample. To estimate $S_O$ and $S_R$ we draw on the corresponding specification of the first stage as presented in model 6 of Table A.4. We additionally compute 95% confidence intervals from bootstrapped standard errors.

Model 6 of Table A.4 allows us to predict average turnout in rainfall areas to 75.05 [74.37; 75.75]. This is $S_R$, the share of regular voters. As well, the coefficient of the turnout increase of 0.14 allows us, taken together with average rainfall of 5.99 mm, to estimate the share of occasional voters to 0.81 [0.45; 1.14].

The same exercise is applied to the reduced form equation to predict average leave support in rainfall areas to 53.32 [51.73; 54.84] percent, i.e. $P_R$, and the effect of rainfall ($\Delta V$) to 0.57 [0.29; 1.01].

The preference gap is then given by $P_M - P_R = \Delta P(1 + S_R/S_M)$ (see Fowler (2015)). We estimate the preference gap to 56.17 [24.68, 135.19] percentage points and the share of Leave voters among the occasional voter population to 109.49 [78.23, 188.39].

Note that the point estimate and upper bound of the confidence interval for the share of Leave support in the occasional voter population exceed 100%. This hints to the possibility of spill-over effects and/or direct effects of rainfall on Leave support.

Importantly, though, the large preference gap and the high amount of estimated Leave support among the occasional voter population imply that Brexit support among the occasional voter population is very heavily leaning towards Leave, the lower bound of the confidence interval beginning at 78.23 percent.

Note that these calculations invoke very strong assumptions. We should therefore not directly interpret the absolute size of the preference-gap; nonetheless, it gives numeric support that an average (weather induced) occasional voter and an average regular voter differ very much with respect to their preferences on EU membership in the case at hand and that occasional voter population consisted overproportionally of Leave supporters.

Note as well that this does not imply that only mobilization mattered and persuasion was irrelevant. The point estimates in model 5 of Table 2 suggest that a one percentage

---

19 These estimates apply only to an average English districts/boroughs in the sample at hand. Additional assumptions are invoked on the functional form of the predictions of turnout and vote shares, concerning the instrument, and (not) weighting the observations by varying population size; it is as well left aside that the referendum likely brought other occasional voters to the polls, as predicted turnout under rainfall is still higher than average general election turnout. Additionally, the uncertainty involved is large.
point increase in turnout led to around a 0.74 percentage point increase in the share of the Leave campaign. For the adjacent sample, turnout increased overall by around 38.5 percentage points from 36.6% to 75.1%; EU opposition increased by 22.7 percentage points from a Ukip share of 31.4% to a Leave share of 54.1%. Assume for a moment that persuasion did not occur, i.e. that all Ukip supporters remained in the Leave camp and vice versa. If we then assume a constant effects framework, the average increase in turnout of around 38.1 percentage points should have led to an increase in the Leave vote slightly below 30 percentage points (e.g. 28.2 [7.3, 49.7] percentage points with an ATE of 0.74 as of model 5). As we do not observe this increase, persuasion is likely an important part of the story as well. (Note the wide confidence intervals. Calculations based on these models therefore have to be treated with caution.)

A.5 Robustness tests

The following appendix tables provide results of the robustness tests referenced in the robustness section of the main text.
Table A.8: Instrument relevance and IV regression with 2016 referendum turnout

| Dependent variable                                | Instrument relevance | IV regression |
|---------------------------------------------------|----------------------|---------------|
|                                                   | Full sample (1)      | Adjacent sample (2) | Full sample (3) | Adjacent sample (4) |
| Average election day rainfall (mm)                |                      |               |                |
|                                                   |                      |               | 6.29           | 1.44**           |
|                                                   |                      |               | (6.85)         | (0.78)           |
| Referendum turnout in %                           | -0.034*              | -0.046**       | 0.87           | -0.12            |
|                                                   | (0.019)              | (0.018)        | (1.77)         | (0.35)           |
| Share of population aged 20-30                   | -0.20*               | -0.28***       | 0.17           | 0.060            |
|                                                   | (0.12)               | (0.10)         | (0.42)         | (0.13)           |
| Share of population aged 60+                      | -0.055               | -0.11***       | 16.8           | 2.84*            |
|                                                   | (0.037)              | (0.035)        | (17.3)         | (1.51)           |
| Share of unemployed                               | -2.51***             | -1.78***       | 0.13           | 0.021            |
|                                                   | (0.21)               | (0.23)         | (0.20)         | (0.038)          |
| Change in 2016 unemployment share                | 0.81                 | 2.03***        | -3.53          | -6.58***         |
|                                                   | (0.58)               | (0.73)         | (7.28)         | (2.45)           |
| Population density                                | -0.023               | -0.027**       | 0.17           | 0.060            |
|                                                   | (0.014)              | (0.012)        | (0.20)         | (0.038)          |
| Population size (log)                             | -0.069               | -0.44**        | -0.16          | 0.18             |
|                                                   | (0.21)               | (0.18)         | (1.48)         | (0.60)           |
| Share of employed in high skilled labor           | 0.39***              | 0.23**         | -2.91          | -0.82**          |
|                                                   | (0.093)              | (0.090)        | (2.67)         | (0.34)           |
| Share of employed in low skilled labor            | -0.14*               | -0.18**        | 1.63**         | 1.14***          |
|                                                   | (0.080)              | (0.078)        | (0.93)         | (0.25)           |
| Share of migrants from outside UK                 | -0.28                | -0.49*         | 1.21           | 0.025            |
|                                                   | (0.40)               | (0.29)         | (3.64)         | (0.97)           |
| Share of ethnic group                             | 0.090***             | 0.12***        | -0.73          | -0.29***         |
|                                                   | (0.023)              | (0.023)        | (0.68)         | (0.099)          |
| Wales                                             | 0.086                | 0.36           |                |
|                                                   | (0.45)               | (3.08)         |                |
| Scotland                                          | -3.17***             | 28.9           |                |
|                                                   | (0.87)               | (28.8)         |                |
| London                                            | 0.16                 | -0.092         | 2.67           | 2.84*            |
|                                                   | (0.68)               | (0.68)         | (4.69)         | (1.62)           |
| Northern Ireland                                  | -9.21***             | 82.8           |                |
|                                                   | (1.15)               | (70.5)         |                |
| Turnout for 2014 EE                               | 0.22***              | 0.29***        | -1.35          | -0.61**          |
|                                                   | (0.039)              | (0.040)        | (1.40)         | (0.24)           |
| UKIP share in EE                                  | 0.045*               | -0.023         |                |
|                                                   | (0.023)              | (0.027)        |                |
| Constant                                          | 63.3***              | 69.2***        | -357.1         | -47.6            |
|                                                   | (5.11)               | (5.26)         | (443.0)        | (53.6)           |

Left panel displays results of a regression (robust standard errors in parantheses) of average rainfall on election day on referendum turnout. Right panel displays results of an IV regression using rainfall as instrument for referendum day turnout. Dependent variables are denoted in model header. Models 1 and 3 draw on the full sample (380 local authorities in the United Kingdom). Models 2 and 4 draws on a restricted sample of observations (all local authorities from English regions that experience variation in rainfall).

** (*) (**) indicates p < 0.05 (0.1, 0.01) p < 0.01
Table A.9: Instrument relevance with binary rainfall indicator (above median rainfall): Effect of rainfall on turnout increase

|                                      | Dep. var.: 2016 Referendum - 2014 EE TO |          |          |
|--------------------------------------|----------------------------------------|----------|----------|
|                                      | Full sample                            | Adjacent sample |
|                                      | (1)                     | (2)                      | (3)                     | (4)                      |
| Above median rainfall                | -2.09*** (0.73)          | -0.90** (0.35)           | -3.43*** (0.73)         | -1.19*** (0.34)          |
| Wales                                | 1.17* (0.65)             |                       |                       |                          |
| Scotland                             | -4.05*** (1.10)          |                       |                       |                          |
| London                               | -2.52** (0.98)           | -2.98*** (0.95)         |                       |                          |
| Northern Ireland                     | -25.8*** (1.23)          |                       |                       |                          |
| Share of population aged 20-30      | -0.33** (0.13)           | -0.33** (0.13)          |                       |                          |
| Share of population aged 60+        | -0.24*** (0.055)         | -0.25*** (0.054)        |                       |                          |
| Share of unemployed                  | -1.43*** (0.30)          | -1.00*** (0.34)         |                       |                          |
| Change in 2016 unemployment share   | 0.76 (1.06)              | 0.63 (1.15)             |                       |                          |
| Population density                   | -0.019 (0.015)           | -0.017 (0.015)          |                       |                          |
| Population size (log)                | -0.040 (0.35)            | -0.47 (0.29)            |                       |                          |
| Share of employed in high skilled labor | 0.58*** (0.13)       | 0.50*** (0.12)          |                       |                          |
| Share of employed in low skilled labor | 0.30*** (0.12)       | 0.18 (0.11)             |                       |                          |
| Share of migrants from outside UK   | -0.17 (0.42)             | -0.49 (0.39)            |                       |                          |
| Share of ethnic group                | 0.19*** (0.031)          | 0.17*** (0.030)         |                       |                          |
| Constant                             | 38.4*** (0.29)           | 25.1*** (7.42)          | 39.8*** (0.29)         | 34.8*** (6.44)           |
| N                                    | 381                      | 381                     | 275                    | 275                      |
| r2,a                                 | 0.025                    | 0.69                    | 0.093                  | 0.77                     |
| F                                    | 8.13                     | 45.5                    | 21.9                   | 53.0                     |

Rainfall exposure operationalized as binary indicator (above median rainfall). Otherwise see notes to Table 1.
Table A.10: Instrumental variable regression of difference in EE to Referendum turnout on Leave share/increase in Leave vote with binary instrument (above median rainfall)

|                      | Full sample |                  | Adjacent sample |                  |
|----------------------|-------------|-----------------|-----------------|-----------------|
|                      | (1)         | (2)             | (3)             | (4)             | (5)             | (6)             |
| Diff. Leave - Ukip share | Diff. Leave in % | Diff. Leave - Ukip share | Leave in % | Diff. Leave - Ukip share | Leave in % | Diff. Leave - Ukip share | Leave in % |
| 2016 Referendum TO - 2014 EE TO | 1.78** | 0.71** | 1.41* | 0.64** | 0.71** | 0.81** |
| (0.78) | (0.36) | (0.73) | (0.26) | (0.31) | (0.38) |
| Wales                | -2.90** | 0.020 | -2.33 | 1.41 | 0.64 | 0.71** |
| (1.26) | (1.78) | (3.48) | (0.73) | (0.36) | (0.38) |
| Scotland             | 0.020 | 8.03** | 0.020 | 0.020 | 0.020 | 0.020 |
| (1.78) | (3.48) | (0.73) | (0.36) | (0.38) |
| London               | 4.04*** | 6.36** | 3.91*** | 4.27** |
| (1.45) | (2.51) | (1.51) | (1.75) |
| Northern Ireland     | 28.3*** | 52.9*** | 1.27** | 1.25* |
| (8.13) | (19.1) | (0.63) | (0.65) |
| Share of population aged 20-30 | -0.54** | -0.17 | 0.022 | 0.17 | 0.031 | 0.052 |
| (0.26) | (0.37) | (0.12) | (0.21) | (0.11) | (0.13) |
| Share of population aged 60+ | 0.022 | 0.17 | 0.022 | 0.17 | 0.031 | 0.052 |
| (0.12) | (0.21) | (0.12) | (0.21) | (0.11) | (0.13) |
| Share of unemployed | 2.15*** | 3.11*** | 1.27** | 1.25* |
| (0.67) | (1.19) | (0.63) | (0.65) |
| Change in 2016 unemployment share | 1.12 | 0.65 | 4.35*** | 4.55*** |
| (1.32) | (2.00) | (1.53) | (1.61) |
| Population density | -0.011 | 0.0070 | -0.0015 | 0.0016 | -0.0015 | 0.0016 |
| (0.030) | (0.039) | (0.027) | (0.028) |
| Population size (log) | -0.56 | -0.53 | -0.14 | -0.070 |
| (0.47) | (0.64) | (0.50) | (0.51) |
| Share of employed in high skilled labor | -1.09*** | -1.40*** | -0.79*** | -0.79*** |
| (0.33) | (0.52) | (0.28) | (0.29) |
| Share of employed in low skilled labor | 0.85*** | 0.50 | 0.86*** | 0.83*** |
| (0.21) | (0.36) | (0.19) | (0.20) |
| Share of migrants from outside UK | -0.46 | -0.30 | -0.30 | -0.26 |
| (0.83) | (0.99) | (0.71) | (0.72) |
| Share of ethnic group | -0.20*** | -0.38** | -0.22*** | -0.25*** |
| (0.073) | (0.16) | (0.063) | (0.077) |
| Ukip share in EE | 0.79*** | 0.95*** | 0.79*** | 0.95*** |
| (0.065) | (0.057) | (0.065) | (0.057) |
| Constant | -43.5 | 33.6*** | 12.9 | -1.92 | 19.1 | 14.3 |
| (29.8) | (11.4) | (20.5) | (10.2) | (13.5) | (15.8) |
| N | 381 | 381 | 381 | 275 | 275 | 275 |

Instrumental variable approach based on binary instrument (above median rainfall). Otherwise see notes to Table 2.
Table A.11: Instrument relevance and IV regression with adjacent sample expanded to include Scotland and Northern Ireland

| Instrument relevance | IV regressions |
|----------------------|----------------|
|                      | (1)            | (2)            | (3)          | (4)          | (5)          |
|                      | 2016 Referendum TO - 2014 EE TO | 2016 Referendum TO - 2014 EE TO | Diff in 2016 Leave - Leave in % | Diff in 2016 Leave - 2014 Ukip share | Diff in 2016 Leave - 2014 Ukip share |
| Average election day rainfall (mm) | -0.14*** | -0.096*** | 1.60** | 0.56** | 0.80** |
|                       | (0.048)       | (0.026)       | (0.77)    | (0.25)    | (0.37)    |
| Scotland             | -4.43***      | 3.63          |          | 7.22***    |          |
|                       | (1.20)        | (2.26)        |          | (2.15)     |          |
| London               | -2.95***      | 4.02***       | 4.94***   | 4.94***    |          |
|                       | (1.00)        | (1.31)        | (1.73)    | (1.73)     |          |
| Northern Ireland     | -25.0***      | 27.7***       | 37.0***   | 37.0***    |          |
|                       | (1.46)        | (6.29)        | (9.50)    | (9.50)     |          |
| Share of population aged 20-30 | -0.24* | -0.52** | -0.39 |          |          |
|                       | (0.14)        | (0.24)        | (0.25)    |          |          |
| Share of population aged 60+ | -0.20*** | -0.04 | -0.0018 |          |          |
|                       | (0.059)       | (0.094)       | (0.11)    |          |          |
| Share of unemployed  | -1.25***      | 1.24**        | 1.37**    | 1.37**     |          |
|                       | (0.35)        | (0.56)        | (0.66)    | (0.66)     |          |
| Change in 2016 unemployment share | 1.85 | -1.31 | -2.00 |          |          |
|                       | (1.19)        | (1.59)        | (1.79)    | (1.79)     |          |
| Population density   | -0.024        | -0.0014       | 0.0068    |          |          |
|                       | (0.015)       | (0.026)       | (0.029)   |          |          |
| Population size (log) | -0.19 | -0.12 | -0.089 |          |          |
|                       | (0.36)        | (0.45)        | (0.50)    |          |          |
| Share of employed in high skilled labor | 0.55*** | -0.81*** | -0.88*** |          |          |
|                       | (0.13)        | (0.27)        | (0.32)    |          |          |
| Share of employed in low skilled labor | 0.23* | 1.00*** | 0.91** |          |          |
|                       | (0.12)        | (0.19)        | (0.22)    |          |          |
| Share of migrants from outside UK | -0.48 | -0.27 | -0.17 |          |          |
|                       | (0.43)        | (0.72)        | (0.76)    |          |          |
| Share of ethnic group | 0.16*** | -0.17*** | -0.23*** |          |          |
|                       | (0.032)       | (0.057)       | (0.074)   |          |          |
| Ukip share in EE     | 0.91***       |          |          |          |          |
|                       | (0.054)       |          |          |          |          |
| Constant             | 38.5***       | 28.9***      | -37.7     | 24.4**    | 16.0     |
|                       | (0.36)        | (7.64)       | (29.4)    | (11.0)    | (13.8)   |

N: 308

Left panel displays results of a regression (robust standard errors in parentheses) of average rainfall on election day on referendum turnout. Right panel displays results of an IV regression using rainfall as instrument for referendum day turnout. Dependent variables are denoted in model header. Models draw on a restricted sample of observations (all local authorities from regions that experience variation in rainfall). ** (*,** *** indicates p < 0.05 (0.1, 0.01)
A.6 Survey evidence on Brexit preferences of regular and occasional voters

This Appendix Section provides supporting material for the survey evidence presented in the main paper. Appendix Table A.12 presents logistic regressions that confirm the relationships depicted in Table 3 under inclusion of control variables. Note that the interpretation of coefficients is not straightforward, as these socio-demographic and political controls are likely also mediating factors for the correlations in Table 3. Appendix Figure A.3 reproduces the average marginal effects Figure 2 without (left panel) and with (right panel) inclusion of control variables and Appendix Table A.13 presents the corresponding coefficient estimates on which these average marginal effects are based.

Figure A.3: Change in predicted probability of turnout between Ukip and non-Ukip supporters in the 12 pre-referendum weeks with and without control variables (comp. Figure 2)

Predictions for Average Marginal Effects from binary logistic regression with dependent variable self-assessed turnout intention (‘fairly likely’ or ‘very likely’) and independent variable whether respondent supported UKIP at general election, whether he/she responded 1-48 days before the referendum and interaction term. BES survey weights for representative sample of Great Britain used. 95% confidence intervals are shown. Weighted N=12,636 (left panel). Right panel (weighted N=12,551) includes control variables as in Model 2 of Appendix Table A.13.
Table A.12: Logistic regression for associations presented in Table 3. Regression on variable indicated in model header. BES survey weights used.

| Main                      | (1) Occasional voter | (2) Referendum interest very high | (3) Referendum turnout very likely | (4) Referendum turnout very likely | (5) Referendum turnout very likely |
|---------------------------|----------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Leave preference          | 0.071                | 0.34***                          | 0.36**                           | 0.36**                           | 0.36**                           |
|                           | (0.068)              | (0.13)                           | (0.15)                           | (0.15)                           | (0.15)                           |
| Sov./Imm. most important  |                      |                                  | 0.52***                          |                                  |                                  |
|                           |                      |                                  | (0.19)                           |                                  |                                  |
| Econ. most important      |                      |                                  |                                  |                                  | -0.48**                          |
|                           |                      |                                  |                                  |                                  | (0.19)                           |
| Age                       | -0.023***            | 0.0031                           | 0.0095**                         | 0.0044                           | 0.0046                           |
|                           | (0.0018)             | (0.0037)                         | (0.0042)                         | (0.0054)                         | (0.0054)                         |
| Female                    | 0.038                | 0.033                            | 0.18                             | -0.0031                          | -0.053                           |
|                           | (0.054)              | (0.11)                           | (0.11)                           | (0.16)                           | (0.16)                           |
| Scotland                  | -0.26***             | -0.54***                         | -0.071                           | -0.19                            | -0.20                            |
|                           | (0.075)              | (0.16)                           | (0.18)                           | (0.23)                           | (0.23)                           |
| Wales                     | -0.047               | 0.30                             | 0.074                            | -0.080                           | -0.057                           |
|                           | (0.098)              | (0.19)                           | (0.23)                           | (0.32)                           | (0.31)                           |
| Political attention (0-10)| -0.19***             | 0.49***                          | 0.26***                          | 0.25***                          | 0.26***                          |
|                           | (0.011)              | (0.027)                          | (0.023)                          | (0.034)                          | (0.034)                          |
| Married                   | 0.016                | 0.21*                            | 0.13                             | -0.079                           | -0.11                            |
|                           | (0.059)              | (0.11)                           | (0.13)                           | (0.17)                           | (0.17)                           |
| No dependents in HH       | -0.043               | 0.35***                          | 0.37***                          | 0.21                             | 0.21                             |
|                           | (0.060)              | (0.12)                           | (0.13)                           | (0.17)                           | (0.17)                           |
| Houseowner                | -0.49***             | -0.094                           | 0.048                            | 0.12                             | 0.15                             |
|                           | (0.059)              | (0.11)                           | (0.13)                           | (0.17)                           | (0.17)                           |
| Unemployed                | 0.15                 | -0.24                            | -0.11                            | 0.049                            | 0.092                            |
|                           | (0.15)               | (0.27)                           | (0.26)                           | (0.47)                           | (0.47)                           |
| White ethnicity           | -0.37***             | -0.22                            | 0.80***                          | 0.65***                          | 0.68***                          |
|                           | (0.090)              | (0.19)                           | (0.17)                           | (0.24)                           | (0.24)                           |
| Migrant                   | 0.59***              | 0.35                             | -0.23                            | -0.45                            | -0.45                            |
|                           | (0.14)               | (0.27)                           | (0.25)                           | (0.32)                           | (0.32)                           |
| Working class             | -0.29                | 0.42                             | 1.04*                            | -0.072                           | -0.033                           |
|                           | (0.21)               | (0.46)                           | (0.53)                           | (0.64)                           | (0.63)                           |
| Middle class              | 0.043                | -0.24**                          | -0.039                           | -0.11                            | -0.11                            |
|                           | (0.053)              | (0.10)                           | (0.11)                           | (0.16)                           | (0.16)                           |
| Like/dislike: Ukip        | 0.043***             | -0.0030                          | -0.042*                          | -0.021                           | -0.0028                          |
|                           | (0.0099)             | (0.020)                          | (0.022)                          | (0.027)                          | (0.025)                          |
| Constant                  | 1.34***              | -3.35***                         | -2.21***                         | -1.44***                         | -1.21***                         |
|                           | (0.15)               | (0.33)                           | (0.30)                           | (0.42)                           | (0.44)                           |

N 14573 2744 2413 1326 1326
Table A.13: Logistic regression on self-assessed turnout propensity by past Ukip vote and time to referendum in British Election Study

|                                | (1) Referendum turnout likely or very likely | (2) Referendum turnout likely or very likely |
|--------------------------------|--------------------------------------------|--------------------------------------------|
| Ukip vote in 2015 general election=1 | 1.12**                                     | 1.09**                                     |
|                                 | (0.49)                                     | (0.49)                                     |
| Days until referendum           | 0.0062                                     | 0.0029                                     |
|                                 | (0.0050)                                   | (0.0055)                                   |
| Ukip vote in 2015 general election=1 × Days until referendum | 0.021                                      | 0.024                                      |
|                                 | (0.015)                                    | (0.015)                                    |
| Age                             | 0.023***                                   |                                            |
|                                 | (0.0050)                                   |                                            |
| Female                          | 0.068                                      |                                            |
|                                 | (0.13)                                     |                                            |
| Scotland                        | -0.14                                      |                                            |
|                                 | (0.17)                                     |                                            |
| Wales                           | 0.39                                       |                                            |
|                                 | (0.29)                                     |                                            |
| Occasional voter               | -0.97***                                   |                                            |
|                                 | (0.14)                                     |                                            |
| Political attention (0-10)      | 0.35***                                    |                                            |
|                                 | (0.026)                                    |                                            |
| Married                         | 0.11                                       |                                            |
|                                 | (0.15)                                     |                                            |
| No dependents in HH             | 0.18                                       |                                            |
|                                 | (0.14)                                     |                                            |
| Houseowner                      | 0.077                                      |                                            |
|                                 | (0.15)                                     |                                            |
| Unemployed                      | -0.38                                      |                                            |
|                                 | (0.48)                                     |                                            |
| White ethnicity                 | 0.70***                                    |                                            |
|                                 | (0.22)                                     |                                            |
| Migrant                         | -0.12                                      |                                            |
|                                 | (0.34)                                     |                                            |
| Working class                   | 0.085                                      |                                            |
|                                 | (0.54)                                     |                                            |
| Middle class                    | -0.12                                      |                                            |
|                                 | (0.14)                                     |                                            |
| Constant                        | 3.44***                                    | -0.34                                      |
|                                 | (0.16)                                     | (0.42)                                     |
| N                               | 12636                                      | 12551                                      |
References

Alabrese E, Fetzer T (2018): Who is NOT voting for Brexit anymore? CAGE Working Paper (December).

Angrist JD, Pischke JS (2009): Mostly Harmless Econometrics: An Empiricist’s Companion. Princeton University Press.

Becker SO, Fetzer T, Novy D (2017): Who Voted for Brexit? A Comprehensive District-Level Analysis. Economic Policy 32(92):601–650.

Birch S (2016): Our New Voters: Brexit, Political Mobilisation and the Emerging Electoral Cleavage. Juncture 23(2):107–110.

Clarke HD, Goodwin M, Whiteley P (2017): Why Britain Voted for Brexit: An Individual-Level Analysis of the 2016 Referendum Vote. Parliamentary Affairs 70(3):439–464.

Dorling D, Stuart B, Stubbs J (2016): Don’t mention this around the Christmas table: Brexit, inequality and the demographic divide. LSE European Politics and Policy (EUROPP) Blog, 1–10, URL http://eprints.lse.ac.uk/70004/1/blogs.lse.ac.uk-DontmentionthisaroundtheChristmastableBrexitinequalityandthedemographicdivide.pdf.

Eichengreen B, Mari R, Thwaites G (2018): Will Brexit Age Well? URL http://www.nber.org/papers/w25219.

Evans G, Menon A (2017): Brexit and British politics. John Wiley & Sons.

Fetzer T (2018): Did Austerity Cause Brexit? Warwick Economics Research Papers 4283(1170):1–10.

Fowler A (2015): Regular Voters, Marginal Voters and the Electoral Effects of Turnout. Political Science Research and Methods 3(2):205–219.

Goodwin MJ, Heath O (2016): The 2016 Referendum, Brexit and the Left Behind: An Aggregate-level Analysis of the Result. The Political Quarterly 87(3):323–332.

Johnston R, Jones K, Manley D (2018): Predicting Who Voted for Brexit Through Ecological Analysis An Example of the Problem of Confounding, and its Resolution. SSRN Electronic Journal, 1–10.

Low A (2016): Brexit is not the will of the British people, it never has been. LSE Brexit Blog, URL http://blogs.lse.ac.uk/brexit/2016/10/24/brexit-is-not-the-will-of-the-british-people-it-never-has-been/.

Manley D, Jones K, Johnston R (2017): The Geography of Brexit – What Geography? Modelling and Predicting the Outcome Across 380 Local Authorities. Local Economy 32(3):183–203.
Swales K (2016): Understanding the leave vote. NatCen Social Research - The UK in a Changing Europe, URL [www.natcen.ac.uk](http://www.natcen.ac.uk).

Zhang A (2018): New Findings on Key Factors Influencing the UK’s Referendum on Leaving the EU. World Development 102:304–314.