# Are social media campaigns reaching young voters? Null effects of cognitive mobilisation messages on youth voter registration

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September 4, 2020

**Abstract**

Civic organisations and progressive campaigns alike regard digital campaigning as an important means of registering young voters. These campaigns often appeal to young people on the basis that their vote matters and voting is important. However, there is scepticism towards campaigns' abilities to register young voters at scale using cognitive mobilisation strategies. We provide the first large-scale randomised trial of a social media ads campaign encouraging young people to register to vote before the UK 2019 General Election. We worked with a civil society organisation to deliver online adverts on Instagram and Snapchat, assigning 879 postcode sectors located within 40 parliamentary constituencies to treatment or control. Despite high engagement rates on social media, we find no effect of the campaign on voter registration, concluding that some commonly-used digital youth voter registration strategies are ineffective.

**Keywords:** elections, voter registration, youth mobilization, social media

**JEL codes:**

*We are indebted to Vote for Your Future (VFYF), and particularly Nat Shaughnessy, for making this study possible, and to the UK Democracy Fund (Joseph Rowntree Reform Trust) for contributing funds towards the trial. Moreover, we would like to thank the Liberal Democrats Insights and Data Team, specifically Josh Townsley, for sharing de-identified register data with us. We are grateful to Vanessa Cheng-Matsuno, Theresa Bischof, Yasmina O'Sullivan, Sara Luxmoore and Peter Bristow for valuable research assistance. We would also like to thank Jessica Kennedy and Ali Goldsworthy for their encouragement and feedback, and the participants of the 2019 Nuffield CESS Social Media Workshop, particularly Ray Duch, Horacio Larreguy, and David Nickerson, for excellent comments. The study was pre-registered on https://osf.io/fyxsd/ and approved by the LSE Research Ethics Committee under REC ref. 1032.

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# 1 Introduction

Voter registration and turnout among young people are lower than for older citizens (Holbein and Hillygus, 2020). They are therefore an obvious target for non-partisan campaigns that aim to increase electoral participation. Moreover, due to an increasing age-gradient in party support, progressive campaigns also target young people to change the composition of the electorate (Foos and John, 2018; Broockman and Kalla, 2020). Left-wing candidates, such as Bernie Sanders (Broockman and Kalla, 2020) and Jeremy Corbyn (Prosser et al., 2020) hoped that youth voter mobilisation would make up for predicted losses among moderate voters. Higher turnout among young voters, often referred to as the "youth quake" hypothesis, may have contributed to Labour's unexpected strong showing in the UK 2017 General Election (Sloam and Henn, 2018), though the best available empirical evidence indicates that it probably did not (Prosser et al., 2020). But how can non-partisan and partisan campaigns alike best reach out to young people given that they are difficult to reach with conventional voter registration methods, such as canvassing and direct mail, which are also increasingly difficult to deliver in a post-COVID world. While campaigns have made large-scale attempts to register and mobilise young voters via various social media platforms, social media advertising campaigns, in general, have been shown to have, at best, small positive effects on turnout (Jungherr et al., 2020; Bond et al., 2012; Hager, 2019b; Haenschen and Jennings, 2019). Moreover, typical youth voter mobilisation campaigns are often based on a strategy of raising awareness about the efficacy of young people's vote, employing "cognitive mobilisation" messages such as "Your Vote Matters". However, there is scepticism about whether such cognitive mobilisation messages work (Holbein and Hillygus, 2020), and particularly whether they translate from social media into real-world behaviour (Hersh, 2020). Despite these concerns, a lack of robust evidence means that many campaigns keep on relying on exactly those messages using social media platforms.

We provide robust, well-powered evidence that shows that this type of social media campaign is ineffective at registering young voters. The context of the 2019 UK General Election is instructive because Labour and the Liberal Democrats hoped to benefit from a surge in youth voter registration. In collaboration with a non-party civil society organisation, we assigned 879 postcode sectors located within 40 UK parliamentary constituencies to two experimental groups: a control and one that

received voter registration video ads. These messages were targeted at young people aged between 18-35 years. We collected validated voter registration data from official registers to measure whether social media campaigns targeted towards young people increased voter registration. Despite high online engagement with the ads, we found no effect of the digital campaign on registration.

# 2 Experimental evidence on the effects of social media on youth voter mobilization

## 2.1 Political mobilisation via social media

Despite the increasing prominence of digital methods in election campaigns, and the heavy financial investments that modern campaigns make online (Jungherr et al., 2020; Fowler et al., 2020), there are no published randomized control trials that identify the effect of social media ads on registration. Randomized control trials of digital media on voter mobilization are still rare (Fowler et al., 2020), and mostly limited to the US and Germany. A seminal study of 61 million Facebook users during the 2010 midterm election in the US (Bond et al., 2012) shows that large-scale social media campaigns can have small effects of one vote produced for every 256 users targeted, but only when users are also presented with social information. A study of individually targeted banner ads raised voter turnout by .52 percentage points (Haenschen and Jennings, 2019). Facebook and Google ads only had a small positive (0.5%p) effect on vote shares and turnout in German state and federal elections (Hager, 2019a,b). Beyond turnout, studies show null effects of public or semi-public Facebook and Twitter posts on online and offline political activism (Coppock et al., 2015; Foos et al., 2020). Most research is, however, limited to Facebook and Twitter, when other platforms are increasingly popular with younger citizens, such as Instagram and Snapchat, the media used in our study.

## 2.2 Voter registration

Experimental studies of voter registration have produced mixed results. Face-to-face canvassing has been shown to have positive effects. Nickerson (2015), using door-to-door canvassing, found that streets randomly assigned to receive face-to-face canvas visits had 4.4 percent more voter registrations than streets in the control. In a similar experiment in France, Braconnier et al. (2017) found

that, on average, door-to-door visits increased the number of new registrations by 4.9 percentage points. John et al. (2015) examined the chance to win a lottery, finding significant increases in voter registration. Mann and Bryant (2020) collaborated with state election agencies in two states using post-cards aimed at increasing registration. They found statistically and substantively significant effects on registration and turnout in the subsequent election. Sweeney et al. (2018) test a variety of mailings to encourage response to the UK's mandatory annual registration canvass. Simple changes to the treatment mailers resulted in both negative and positive effects ranging from1.1 percentage points below the control group to 3.4 percentage points above the control. While some treatments increased response rates, they had no effect on registration.

### 2.3 Young voters

Studies aimed at young people also produce divergent findings. An experiment using emails to young citizens produced a null result (Nickerson, 2007). One study found that emails with links to online registration had a larger positive effect on both registration and turnout than a link to a downloadable registration form (Bennion and Nickerson, 2018). Some of the most promising interventions take place in the school context. Bennion and Nickerson (2016) worked in sixteen college campuses to test the efficacy of classroom presentations to increase voter registration, finding an increase in registration by of 6 percentage points. Addonizio (2011) also found significant increases in registration and turnout from presentations in high schools. But lower-cost interventions such as Kölle et al. (2019) who study what happens when students are asked to report by text whether they intended to register, did not find a measurable impact.

### 2.4 Cognitive and non-cognitive mobilisation

Not only is the mode of interaction important, the messaging matters. Campaigns targeting young voters tend to assume that voters need to be mobilised by making them aware of the general importance of politics and their role in it. There are good reasons to question the validity of the assumption that young voters lack the motivation to vote. Holbein and Hillygus (2020) make this argument and review the considerable evidence. Tasks like registration are not completed because they are perceived to be costly: "there are a great many citizens – young people, especially – who fail to vote even though they want and intend to do so". (Holbein and Hillygus, 2020, p.2).

According to this reasoning, common cognitive mobilisation campaigns, such as 'Rock the Vote' are run based on the assumption that the causes of low youth turnout is youth disengagement from politics. But based on many metrics, young people's interest and engagement with politics has increased in recent decades (Dalton, 2007). Young people also have a civic orientation. If people are already cognitively mobilised, then a campaign based on cognitive mobilisation would be bound to fail, especially when citizens do not have the non-cognitive skills to complete a task and go through a bureaucratic process, such as voter registration. By non-cognitive skills we mean the ability to plan, to process information, and then prepare to convert an intention into action, "For new voters, the registration requirement, in particular, is recognised as especially burdensome – it typically must be completed by a certain deadline, it must be updated with every change in address" (Holbein and Hillygus, 2020, p.33). Messages that might help individuals complete the process may be more effective, but typically campaigns run by advocacy organisations focus on cognitive mobilisation.

## 3 Research Design

We worked with a civic organisation, Vote for Your Future (VFYF, https://www.vfyf.co.uk), randomly assigning a part of its well-organised campaign to test if social media registration drives are effective at registering young people to vote in the UK 2019 General Election.[1][2] We assigned 879 postcode sectors located within 40 UK parliamentary constituencies to two groups: one control, and one that received voter registration ads from VFYF via Instagram and Snapchat. Typical example ads used by the organization are displayed in Figure A1 in the Appendix.

Ads were targeted at young people aged between 18 and 35 years. The registration messages appeared in postcode sectors assigned to the treatment group in the week before the voter registration deadline on 26 November. To avoid spillovers, ads were displayed in the mornings and

[1] It is important to emphasise that we did not evaluate the entire campaign run by VFYF. We did not randomly assign the campaign in their highest priority seats, and we did not run policy-based ads. The 40 constituencies in the experimental sample still contained large numbers of young voters and a mix of seats ranging from majorities smaller than 1% to majorities greater than 10%. We do not find that campaign effects vary conditional on marginality in the sample of seats that were included in the experimental sample.

[2] As pre-registered, we also intended to test if Get-Out-The-Vote reminders sent via social media 2-3 days before the election amplified the campaign's effect on turnout, but we were unable to obtain validated voter registration data for 37 out of 40 constituencies. Since the GOTV messages were sent after the voter registration deadline, the voter registration outcomes reported in this paper could not have been influenced by GOTV ads.

evenings only. VFYF also provided data on the successful placement of ads in each postcode sector, as well as spending, impressions, and engagement metrics at the campaign level. We summarise these online engagement statistics in Table 1.

**Table 1:** Campaign statistics

| | |
|---|---|
| Postcode sectors successfully targeted | 394/437 |
| Spend Instagram | £4423.52 |
| Spend Snapchat | £3535.09 |
| Total impressions | 2'058'431 |
| Total clicks | 18'421 |

Table 1 shows that VFYF spent almost £8,000 on Instagram and Snapchat ads over 7 days, earning more than 2 million impressions and more than 18 thousand clicks. The budget for the entire campaign was £10,000, but this was not entirely exhausted, indicating that the amount committed was enough to saturate Instagram and Snapchat for the week. As shown in Table 1 the campaign had a wide reach, and lead to a lot of online engagement from young people. The question is whether social media clicks translated into voter registration. After the election, we obtained de-identified voter registration data from the public register and matched it to our experimental assignment via the postcode column (the data was de-identified at the individual level, the smallest unit was the postcode). One of the challenges of measuring voter registration in the UK is that the denominator (the number of citizens living in a given postcode sector at a given point in time) is unknown, and we only observe the citizens who register to vote. This complicates the analysis in two ways. First, we cannot estimate effects at the individual level. We therefore count the absolute number of registered voters post-treatment in each postcode and postcode sector. Second, we need to deal with postcode sectors that have missing registration data. Data could either be missing because nobody registered in that postcode sector, or because registers are incomplete. We deal with the latter challenge by using two versions of the outcome variable. First, we impute 0s when no registration was reported in a postcode sector (under the assumption that missing data reflects no registrations), and second we drop postcode sectors that do not report registrations from the analysis (under the assumption that register data is incomplete and these sectors are not missing as a function of treatment assignment). Consistent with the latter assumption, in Appendix Table A2 we report the results of differential attrition checks, where we regress non-reporting on treatment

assignment. We find no significant differences in reporting voter registration numbers in treatment and control group, indicating that missingness is unlikely to have occurred as a function of the treatment.

### 3.1 Estimation

For the main analysis, we estimate the Intent-to-Treat (ITT) effect using linear regression with heteroskedasticity-robust (HC2) standard errors:

$Y_s = \alpha + \beta_1 RegistrationAd_s + \gamma Constituency_s + \epsilon_s$ (1)

where $Y$ is the absolute number of registered voters per postcode sector $s$, $RegistrationAd$ is whether a postcode sector $s$ was assigned to receive voter registration ads on Snapchat and Instagram, and $Constituency$ are constituency fixed effects. Recall, that the level of assignment and the level of outcome measurement overlap. We apply two strategies to improve the precision of the estimates: We report the covariate-adjusted ITT including the size of the postcode sector (4 categories from large to small), and the following pre-treatment covariates that we obtained from the 2011 census and aggregated to the postcode sector level: share of voters above 35, the proportion of voters who are BAME as estimated in the 2011 census, the proportion of voters with a university education, and population density. A descriptive summary of the variables used in the subsequent analyses is displayed in Appendix Table A1. The covariate-adjusted ITT is estimated as follows:

$Y_s = \alpha + \beta_1 RegistrationAd_s + \gamma Constituency_s + \delta X_s + \epsilon_s$ (2)

where $X$ is the N-by-k matrix of pre-treatment covariates. Second, we also run models (1) and (2) with the outcome data aggregated at the postcode level instead of the postcode sector level. This is the smallest possible unit of measurement in our case.

$Y_{p,s} = \alpha + \beta_1 RegistrationAd_{p,s} + \gamma Constituency_{p,s} + \epsilon_{p,s}$ (3)

$Y_{p,s} = \alpha + \beta_1 RegistrationAd_{p,s} + \gamma Constituency_{p,s} + \delta X_{p,s} + \epsilon_{p,s}$ (4)

In models (3) and (4) we cluster the standard errors at the level of assignment, the postcode sector $s$. As a robustness check, we log-transform the dependent variables in equations (1)-(4) and report the results in Appendix A6. In Figure A2 we display balance checks, based on a regression of treatment assignment on the covariates recorded in the 2011 census. As expected, we do not find any covariate imbalance between treatment and control groups.

# 4 Results

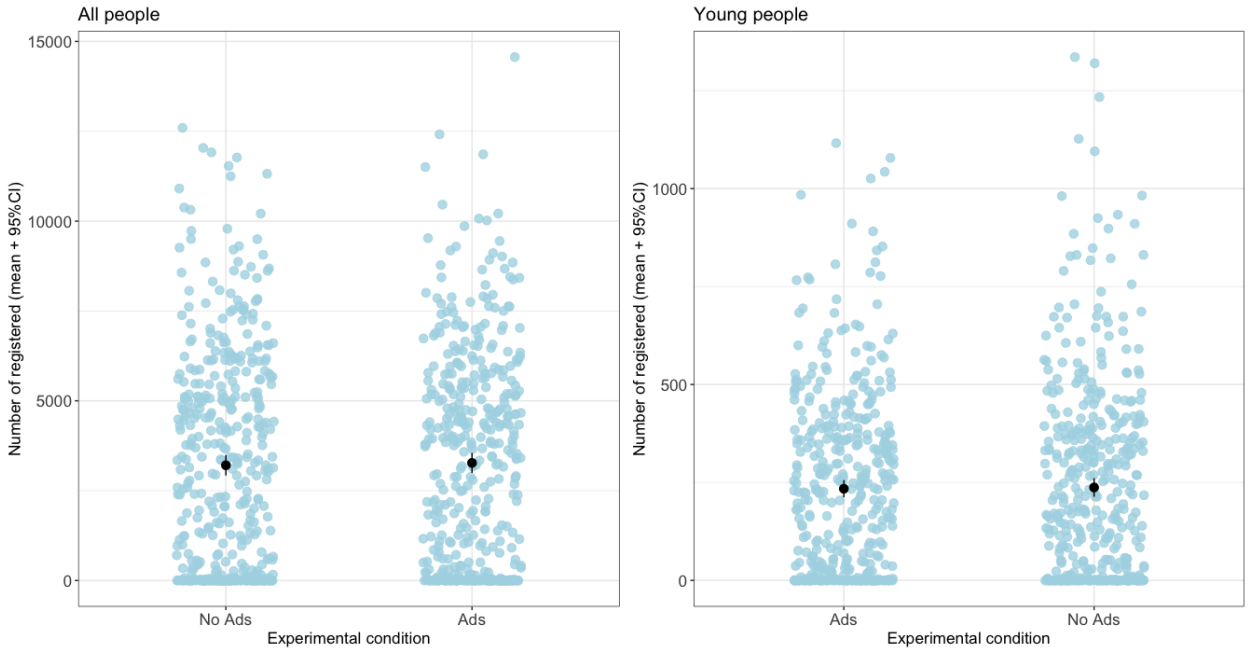


**Figure 1:** Mean plots with 95% CI; ($N = 879$).

Figure 1 displays the key results graphically. The first column in Figure 1 shows the number of voters in each postcode sector in treatment and control groups including all observations from the register, and the second column displays the absolute number of young people (18-35 years) registered in each postcode sector, based on (incomplete) age data that is included on the registers. Individual age data are only available for 20% of all registrations. Each dot on the plot represents one postcode sector. We also display the means and the surrounding 95% confidence intervals in treatment and control sectors. Figure 1 clearly shows that there are only minimal differences in the means across treatment sectors, where ads were assigned to be displayed, and control sectors, were ads were not displayed.

Table 2 confirms this result based on formal hypothesis testing. The differences-in-means estimated in Table 2 based on equations (1) and (2) are small and not statistically significant. They are consistent no matter if we drop postcode sectors that do not report registrations. As a robustness check, Table A6 in the Appendix displays the same analysis with a logged dependent variable. Again, the results are consistent with the conclusion that the campaign did not increase

**Table 2:** Number of registrations

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Excluding missing sectors | | | |
| (Intercept) | 2983.11*** | 4675.02*** | 7692.78*** | 7766.94*** |
| | (488.29) | (480.24) | (1307.23) | (1639.35) |
| Registration ads | 17.95 | −4.68 | −14.32 | −193.89 |
| | (208.09) | (188.64) | (188.61) | (1808.69) |
| Registration ads: Mean age | | | | 3.45 |
| | | | | (46.13) |
| | Including missing sectors | | | |
| (Intercept) | 2602.31*** | 4763.64*** | 8430.02*** | 8626.17*** |
| | (475.17) | (460.78) | (1272.65) | (1560.35) |
| Registration ads | 62.53 | 39.10 | 18.49 | −404.85 |
| | (198.70) | (168.09) | (164.67) | (1812.38) |
| Registration ads: Mean age | | | | 9.50 |
| | | | | (46.18) |
| Sector size covariate | No | Yes | Yes | Yes |
| Census covariates | No | No | Yes | Yes |
| Constituency fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.08 | 0.34 | 0.37 | 0.37 |
| Adj. $R^2$ | 0.04 | 0.31 | 0.34 | 0.34 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 2947.89 | 2494.09 | 2444.46 | 2446.69 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

registration. As we would expect given random assignment across 100s of postcode sectors, including pre-treatment covariates does not substantially alter the estimate of the treatment effect, but improves precision. Table 2 also shows that the interaction between mean age measured in the 2011 census and treatment assignment is positive, but small and not statistically significant by any conventional standard.

To facilitate interpretation of effect sizes and the uncertainty surrounding them, in Figure 2 we re-scale the dependent variable to have a mean of 0, and a standard deviation of 1 in the control group. That means the treatment effects plotted in Figure 2 can then be interpreted as the treatment effect in standard deviations. The panel on the left displays the results for the complete sample and the panel on the right when sub-setting the count in the dependent variable to those registrations that explicitly indicate that the registrant was 18-35 years (see also Tables A5 and A9 in the Appendix). Figure 2 shows that the estimated null effects are centered closely around 0 and

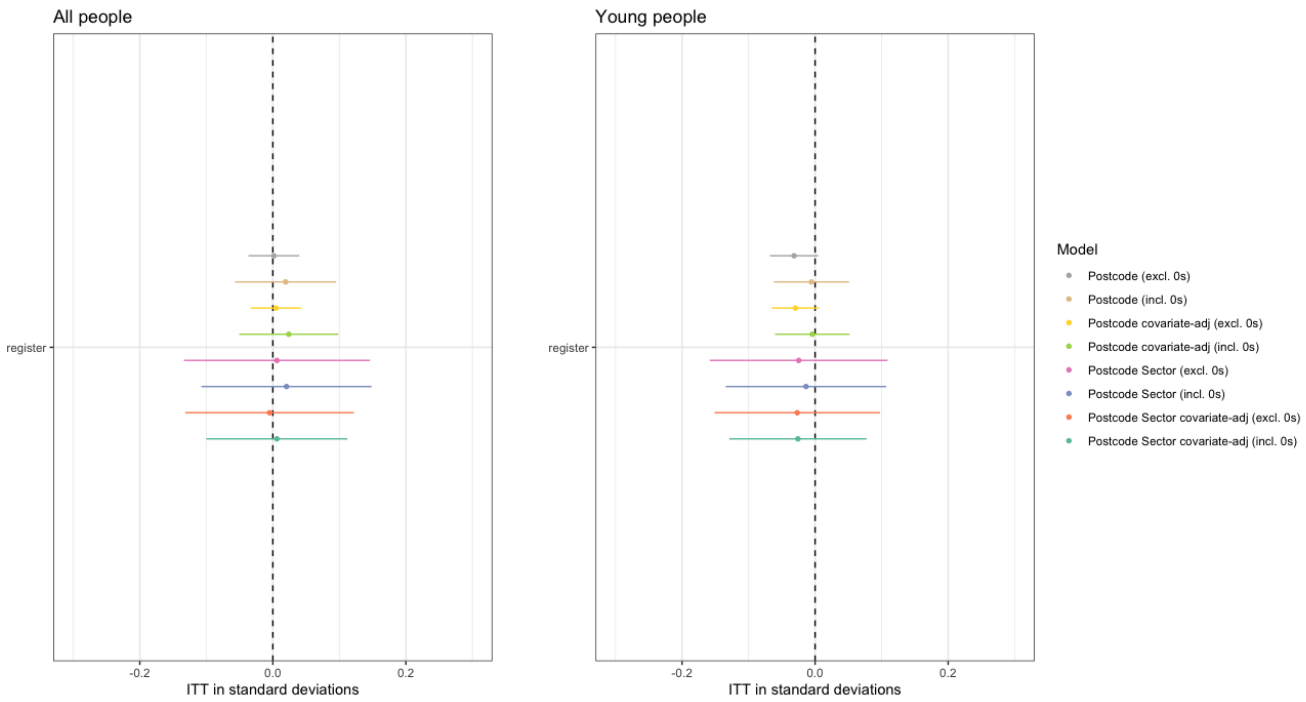


**Figure 2:** SD plot ($N = 879$)

are tightly estimated, especially at the postcode level.

## 5 Conclusion

This study provides a consistent and sobering picture of the effects of a typical and well-run social media ad campaign aimed at registering young people in a high salience election. Effects are close to zero, and tightly estimated. We make three contributions with this study. First, we make a contribution to the study of election campaigns. Our results suggest that campaigns have yet to develop an effective strategy to mobilise young voters via social media: social media-based cognitive mobilisation messages aimed at young voters were ineffective. We therefore provide causal evidence consistent with the assumption that differential mobilisation strategies based on increasing the electoral participation of young voters are unlikely to succeed, at least in General Elections (Broockman and Kalla, 2020). Of course the busy campaign environment of a General Election may have contributed to the null effects we observe because ads compete for attention with other campaign messages (Kalla and Broockman, 2017). What would speak against this hypothesis

is that the ads received a large number of online impressions and clicks. It is nevertheless possible that digital ads will prove more effective in local or regional elections.

Second, we make a contribution to the study of digital politics, which until now has focused on online activism and turnout at the expense of voter registration (Jungherr et al., 2020). By showing that voter registration rates are unaffected by digital ads aimed at young people, we add to a more complete picture of the effects of social media campaigns on electoral politics. We also use social media platforms that are particularly popular with young people, Instagram and Snapchat, which have received little attention from researchers conducting randomised campaign trials.

Third, we add to the debate surrounding cognitive mobilisation strategies. Did the campaign fail because of the medium, the message or a combination of medium and message? What we can conclude from this study is that social media ads aimed at cognitive mobilization - at increasing young people's motivation to vote - did not translate into higher registration numbers. As Holbein and Hillygus (2020) argue, there is potential for non-cognitive strategies that do not focus on increasing the motivation to vote, but on translating young people's existing motivations into political action, for instance by helping them navigate the voter registration process, and by sending them tangible reminders of deadlines. Hence, we think that before abandoning the idea of social media induced registration entirely, advocacy organisations should trial a different approach to youth voter mobilisation on social media, and elsewhere. These choices become more crucial given that the current COVID-19 crisis makes digital campaigning run via social media the natural medium of choice for many organisations.

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# Appendix

## A Voter Registration Ads

**Figure A1:** Voter Registration Ads

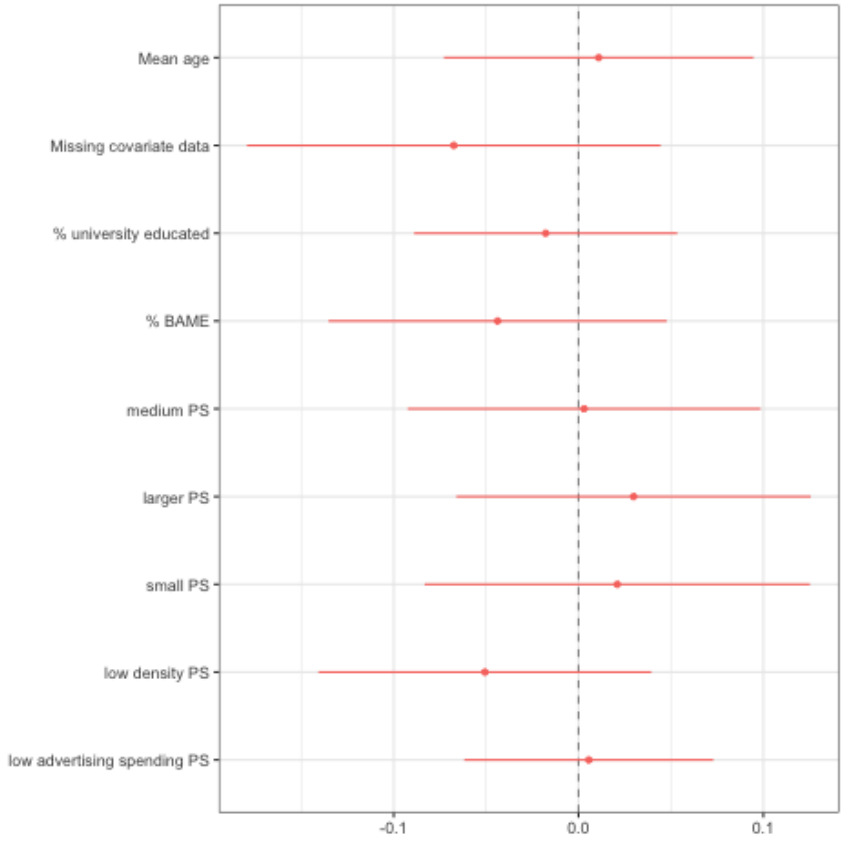
# B Descriptives

**Table A1:** Descriptive Statistics

| Statistic | N | Mean | St. Dev. | Min | Pctl(25) | Pctl(75) | Max |
|---|---|---|---|---|---|---|---|
| N | 879 | 3,239.24 | 3,002.71 | 0 | 61 | 5,391 | 14,564 |
| N young | 879 | 235.51 | 242.99 | 0 | 2.5 | 376 | 1,336 |
| N with NA | 717 | 3,971.11 | 2,854.09 | 1 | 1,426 | 5,854 | 14,564 |
| N young with NA | 684 | 302.65 | 235.69 | 1 | 117 | 423 | 1,336 |
| Postcode sector size | 879 | 169.99 | 79.24 | 1 | 135.5 | 221 | 388 |
| Advertising spending | 879 | 3,466.28 | 2,719.66 | 249.12 | 1,485.98 | 4,940.99 | 11,545.45 |
| Mean age | 879 | 38.84 | 3.86 | 26.60 | 36.60 | 41.20 | 54.90 |
| Population density | 879 | 48.81 | 49.23 | 0.06 | 11.45 | 61.20 | 344.60 |
| University educated proportion | 879 | 0.27 | 0.13 | 0.04 | 0.18 | 0.31 | 0.89 |
| White ethnicity proportion | 879 | 0.80 | 0.18 | 0.05 | 0.72 | 0.98 | 1.00 |
| BAME proportion | 879 | 0.20 | 0.18 | 0.001 | 0.02 | 0.28 | 0.95 |

# C Balance Checks

**Figure A2:** Covariate balance between treatment and control sectors with 95% CIs ($N = 879$)



# D Attrition checks

**Table A2:** Sectors with no registrations

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | 0.12 | −0.05 | −0.26* | −0.31 |
| | (0.07) | (0.07) | (0.13) | (0.16) |
| Registration ads | −0.00 | 0.00 | 0.01 | 0.10 |
| | (0.03) | (0.02) | (0.02) | (0.17) |
| Postcode sector size medium1 | | 0.05* | 0.07** | 0.07** |
| | | (0.02) | (0.02) | (0.02) |
| Postcode sector size medium2 | | 0.02 | 0.04 | 0.04 |
| | | (0.02) | (0.02) | (0.03) |
| Postcode sector size small | | 0.50*** | 0.31*** | 0.31*** |
| | | (0.04) | (0.03) | (0.03) |
| Mean age | | | 0.00 | 0.01 |
| | | | (0.00) | (0.00) |
| Missing covariate data | | | 0.47*** | 0.44*** |
| | | | (0.04) | (0.05) |
| University educated | | | 0.05 | 0.04 |
| | | | (0.10) | (0.10) |
| BAME | | | 0.00 | 0.00 |
| | | | (0.06) | (0.06) |
| Low density | | | −0.00 | −0.00 |
| | | | (0.03) | (0.03) |
| Registration ads: Mean age | | | | −0.00 |
| | | | | (0.00) |
| Registration ads: Missing covariate data | | | | 0.06 |
| | | | | (0.06) |
| Fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.10 | 0.36 | 0.50 | 0.51 |
| Adj. $R^2$ | 0.06 | 0.32 | 0.48 | 0.48 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 0.38 | 0.32 | 0.28 | 0.28 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

# E Postcode Sector Analysis

## E.1 All voters

**Table A3:** All registrations (Including missing sectors)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | 2602.31*** | 4763.64*** | 8430.02*** | 8626.17*** |
| | (475.17) | (460.78) | (1272.65) | (1560.35) |
| Registration ads | 62.53 | 39.10 | 18.49 | −404.85 |
| | (198.70) | (168.09) | (164.67) | (1812.38) |
| Postcode sector size medium1 | | −2291.59*** | −2385.12*** | −2380.30*** |
| | | (286.67) | (284.81) | (285.62) |
| Postcode sector size medium2 | | −1127.06*** | −1193.86*** | −1192.47*** |
| | | (297.63) | (295.38) | (295.58) |
| Postcode sector size small | | −4432.12*** | −3827.26*** | −3830.45*** |
| | | (265.89) | (274.93) | (275.02) |
| Mean age | | | −76.24* | −80.38* |
| | | | (30.19) | (38.11) |
| Missing covariate data | | | −1637.42*** | −1775.07*** |
| | | | (276.87) | (338.87) |
| University educated | | | −761.33 | −765.51 |
| | | | (811.28) | (815.23) |
| BAME | | | −229.80 | −246.33 |
| | | | (487.75) | (486.62) |
| Low density | | | −484.69 | −486.84 |
| | | | (262.82) | (263.24) |
| Registration ads: Mean age | | | | 9.50 |
| | | | | (46.18) |
| Registration ads: Missing covariate data | | | | 286.11 |
| | | | | (338.46) |
| $R^2$ | 0.08 | 0.34 | 0.37 | 0.37 |
| Adj. $R^2$ | 0.04 | 0.31 | 0.34 | 0.34 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 2947.89 | 2494.09 | 2444.46 | 2446.69 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

**Table A4:** All registrations (Excluding missing sectors)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | 2983.11*** | 4675.02*** | 7692.78*** | 7766.94*** |
| | (488.29) | (480.24) | (1307.23) | (1639.35) |
| Registration ads | 17.95 | −4.68 | −14.32 | −193.89 |
| | (208.09) | (188.64) | (188.61) | (1808.69) |
| Postcode sector size medium1 | | −2198.19*** | −2235.21*** | −2222.70*** |
| | | (287.51) | (286.98) | (289.15) |
| Postcode sector size medium2 | | −1064.54*** | −1072.58*** | −1073.04*** |
| | | (291.33) | (293.63) | (293.67) |
| Postcode sector size small | | −3612.91*** | −3518.50*** | −3505.89*** |
| | | (292.87) | (288.84) | (291.05) |
| Mean age | | | −59.46 | −60.91 |
| | | | (31.23) | (40.42) |
| Missing covariate data | | | −906.93* | −1143.55* |
| | | | (402.63) | (522.84) |
| University educated | | | −913.33 | −909.54 |
| | | | (897.30) | (900.30) |
| BAME | | | −444.06 | −452.05 |
| | | | (576.77) | (574.70) |
| Low density | | | −363.28 | −371.29 |
| | | | (288.16) | (289.25) |
| Registration ads: Mean age | | | | 3.45 |
| | | | | (46.13) |
| Registration ads: Missing covariate data | | | | 552.44 |
| | | | | (684.33) |
| Fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.11 | 0.27 | 0.28 | 0.28 |
| Adj. $R^2$ | 0.06 | 0.22 | 0.23 | 0.22 |
| Num. obs. | 717 | 717 | 717 | 717 |
| RMSE | 2771.07 | 2520.75 | 2511.92 | 2514.50 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

**Table A5:** All registrations (Standardized DV)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | −0.20 | 0.51*** | 1.71*** | 1.78*** |
| | (0.16) | (0.15) | (0.42) | (0.51) |
| Registration ads | 0.02 | 0.01 | 0.01 | −0.13 |
| | (0.07) | (0.06) | (0.05) | (0.59) |
| Postcode sector size medium1 | | −0.75*** | −0.78*** | −0.78*** |
| | | (0.09) | (0.09) | (0.09) |
| Postcode sector size medium2 | | −0.37*** | −0.39*** | −0.39*** |
| | | (0.10) | (0.10) | (0.10) |
| Postcode sector size small | | −1.45*** | −1.26*** | −1.26*** |
| | | (0.09) | (0.09) | (0.09) |
| Mean age | | | −0.03* | −0.03* |
| | | | (0.01) | (0.01) |
| Missing covariate data | | | −0.54*** | −0.58*** |
| | | | (0.09) | (0.11) |
| University educated | | | −0.25 | −0.25 |
| | | | (0.27) | (0.27) |
| BAME | | | −0.08 | −0.08 |
| | | | (0.16) | (0.16) |
| Low density | | | −0.16 | −0.16 |
| | | | (0.09) | (0.09) |
| Registrations ads: Mean age | | | | 0.00 |
| | | | | (0.02) |
| Registrations ads: Missing covariate data | | | | 0.09 |
| | | | | (0.11) |
| Fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.08 | 0.34 | 0.37 | 0.37 |
| Adj. $R^2$ | 0.04 | 0.31 | 0.34 | 0.34 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 0.97 | 0.82 | 0.80 | 0.80 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

**Table A6:** All registrations (Logged DV)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | 6.30*** | 7.99*** | 10.49*** | 11.35*** |
| | (0.61) | (0.61) | (1.23) | (1.46) |
| Registration ads | 0.11 | 0.08 | 0.03 | −1.79 |
| | (0.22) | (0.19) | (0.17) | (1.68) |
| Postcode sector size medium1 | | −0.74** | −0.89*** | −0.90*** |
| | | (0.25) | (0.24) | (0.25) |
| Postcode sector size medium2 | | −0.12 | −0.26 | −0.26 |
| | | (0.26) | (0.25) | (0.25) |
| Postcode sector size small | | −4.56*** | −3.14*** | −3.14*** |
| | | (0.29) | (0.29) | (0.30) |
| Mean age | | | −0.05 | −0.07 |
| | | | (0.03) | (0.04) |
| Missing covariate data | | | −3.56*** | −3.60*** |
| | | | (0.36) | (0.43) |
| University educated | | | −1.09 | −1.06 |
| | | | (0.87) | (0.87) |
| BAME | | | 0.19 | 0.15 |
| | | | (0.50) | (0.50) |
| Low density | | | −0.18 | −0.17 |
| | | | (0.26) | (0.26) |
| Registration ads: Mean age | | | | 0.05 |
| | | | | (0.04) |
| Registration ads: Missing covariate data | | | | 0.10 |
| | | | | (0.48) |
| Fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.08 | 0.36 | 0.47 | 0.47 |
| Adj. $R^2$ | 0.04 | 0.33 | 0.44 | 0.44 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 3.30 | 2.75 | 2.51 | 2.52 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

## E.2 Young voters

**Table A7:** Young voter registrations (Including missing sectors)

| | (1) | (2) | (2) | (4) |
|---|---|---|---|---|
| (Intercept) | 200.02*** | 354.41*** | 540.60*** | 600.83*** |
| | (41.86) | (41.24) | (104.06) | (125.78) |
| Registration ads | −3.46 | −5.09 | −6.54 | −133.07 |
| | (15.57) | (13.61) | (13.30) | (140.25) |
| Postcode sector size medium1 | | −162.65*** | −168.11*** | −168.11*** |
| | | (22.98) | (22.74) | (22.81) |
| Postcode sector size medium2 | | −83.34*** | −87.28*** | −87.51*** |
| | | (24.10) | (23.97) | (23.98) |
| Postcode sector size small | | −316.87*** | −269.32*** | −269.90*** |
| | | (21.47) | (22.28) | (22.32) |
| Mean age | | | −3.12 | −4.60 |
| | | | (2.43) | (3.04) |
| Missing covariate data | | | −96.49*** | −103.20*** |
| | | | (18.72) | (24.18) |
| University educated | | | −148.17* | −146.57* |
| | | | (61.84) | (62.10) |
| BAME | | | 30.66 | 27.84 |
| | | | (40.45) | (40.05) |
| Low density | | | −23.00 | −22.60 |
| | | | (23.85) | (23.85) |
| Registration ads: Mean age | | | | 3.19 |
| | | | | (3.56) |
| Registration ads: Missing covariate data | | | | 13.81 |
| | | | | (28.24) |
| Fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.14 | 0.35 | 0.37 | 0.37 |
| Adj. $R^2$ | 0.10 | 0.31 | 0.34 | 0.33 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 230.56 | 201.62 | 198.08 | 198.20 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

**Table A8:** Young voter registrations (Logged DV)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | $3.93^{***}$ | $5.16^{***}$ | $6.99^{***}$ | $7.80^{***}$ |
| | (0.48) | (0.49) | (0.98) | (1.18) |
| Registration ads | 0.08 | 0.06 | 0.02 | $-1.67$ |
| | (0.16) | (0.14) | (0.13) | (1.30) |
| Postcode sector size medium1 | | $-0.61^{**}$ | $-0.72^{***}$ | $-0.72^{***}$ |
| | | (0.20) | (0.20) | (0.20) |
| Postcode sector size medium2 | | $-0.08$ | $-0.17$ | $-0.17$ |
| | | (0.20) | (0.20) | (0.20) |
| Postcode sector size small | | $-3.27^{***}$ | $-2.32^{***}$ | $-2.33^{***}$ |
| | | (0.21) | (0.23) | (0.23) |
| Mean age | | | $-0.03$ | $-0.05$ |
| | | | (0.02) | (0.03) |
| Missing covariate data | | | $-2.13^{***}$ | $-2.21^{***}$ |
| | | | (0.23) | (0.28) |
| University educated | | | $-1.19$ | $-1.17$ |
| | | | (0.63) | (0.63) |
| BAME | | | 0.28 | 0.24 |
| | | | (0.38) | (0.38) |
| Low density | | | $-0.28$ | $-0.27$ |
| | | | (0.20) | (0.20) |
| Registration ads: Mean age | | | | 0.04 |
| | | | | (0.03) |
| Registration ads: Missing covariate data | | | | 0.17 |
| | | | | (0.33) |
| Fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.09 | 0.36 | 0.44 | 0.44 |
| Adj. $R^2$ | 0.05 | 0.32 | 0.41 | 0.41 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 2.42 | 2.04 | 1.91 | 1.91 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

**Table A9:** Young voter registrations (Standardized DV)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | −0.15 | 0.46** | 1.20** | 1.44** |
| | (0.17) | (0.16) | (0.41) | (0.50) |
| Registration ads | −0.01 | −0.02 | −0.03 | −0.53 |
| | (0.06) | (0.05) | (0.05) | (0.55) |
| Postcode sector size medium1 | | −0.64*** | −0.66*** | −0.66*** |
| | | (0.09) | (0.09) | (0.09) |
| Postcode sector size medium2 | | −0.33*** | −0.34*** | −0.35*** |
| | | (0.10) | (0.09) | (0.09) |
| Postcode sector size small | | −1.25*** | −1.06*** | −1.07*** |
| | | (0.08) | (0.09) | (0.09) |
| Mean age | | | −0.01 | −0.02 |
| | | | (0.01) | (0.01) |
| Missing covariate data | | | −0.38*** | −0.41*** |
| | | | (0.07) | (0.10) |
| University educated | | | −0.59* | −0.58* |
| | | | (0.24) | (0.25) |
| BAME | | | 0.12 | 0.11 |
| | | | (0.16) | (0.16) |
| Low density | | | −0.09 | −0.09 |
| | | | (0.09) | (0.09) |
| Registration ads: Mean age | | | | 0.01 |
| | | | | (0.01) |
| Registration ads: Missing covariate data | | | | 0.05 |
| | | | | (0.11) |
| Fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.14 | 0.35 | 0.37 | 0.37 |
| Adj. $R^2$ | 0.10 | 0.31 | 0.34 | 0.33 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 0.91 | 0.80 | 0.78 | 0.78 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

# F Interaction with Mobility (Density)

**Table A10:** All registrations (with density interaction)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | 2255.81*** | 4741.01*** | 8430.02*** | 8368.51*** |
| | (498.61) | (498.84) | (1272.65) | (1281.14) |
| Registration ads | 62.90 | 39.16 | 18.49 | 171.05 |
| | (198.28) | (168.21) | (164.67) | (320.41) |
| Low density | 541.12* | 32.07 | −484.69 | −309.87 |
| | (247.96) | (207.16) | (262.82) | (337.07) |
| Postcode sector size medium1 | | −2290.18*** | −2385.12*** | −2388.68*** |
| | | (287.76) | (284.81) | (285.33) |
| Postcode sector size medium2 | | −1126.37*** | −1193.86*** | −1194.01*** |
| | | (298.11) | (295.38) | (295.24) |
| Postcode sector size small | | −4427.04*** | −3827.26*** | −3834.07*** |
| | | (271.77) | (274.93) | (274.79) |
| Mean age | | | −76.24* | −76.82* |
| | | | (30.19) | (30.20) |
| Missing covariate data | | | −1637.42*** | −1676.55*** |
| | | | (276.87) | (363.94) |
| University educated | | | −761.33 | −778.62 |
| | | | (811.28) | (811.43) |
| BAME | | | −229.80 | −220.66 |
| | | | (487.75) | (488.65) |
| Registration ads: Low density | | | | −342.76 |
| | | | | (396.71) |
| Registration ads: Missing covariate data | | | | 103.55 |
| | | | | (408.94) |
| Fixed effects | Yes | Yes | Yes | Yes |
| $R^2$ | 0.09 | 0.34 | 0.37 | 0.37 |
| Adj. $R^2$ | 0.04 | 0.31 | 0.34 | 0.34 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 2940.83 | 2495.55 | 2444.46 | 2445.50 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

# G Interaction with Advertising Spending

**Table A11:** All registrations (with advertising interaction)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| (Intercept) | 3242.11*** | 5156.34*** | 8456.22*** | 8430.21*** |
| | (180.92) | (282.10) | (1232.55) | (1234.18) |
| Registration ads | 65.17 | 43.12 | 26.45 | 126.14 |
| | (202.73) | (171.44) | (167.50) | (238.33) |
| Low advertising | −69.67 | −72.66 | −113.97 | −16.77 |
| | (202.92) | (171.41) | (171.63) | (244.65) |
| Postcode sector size medium1 | | −2230.22*** | −2383.99*** | −2380.47*** |
| | | (284.86) | (283.06) | (283.63) |
| Postcode sector size medium2 | | −1004.86*** | −1125.47*** | −1122.60*** |
| | | (300.91) | (297.48) | (297.37) |
| Postcode sector size small | | −4327.33*** | −3776.59*** | −3774.65*** |
| | | (261.42) | (272.95) | (273.56) |
| Mean age | | | −68.10* | −68.96* |
| | | | (29.16) | (29.31) |
| Missing covariate data | | | −1576.76*** | −1566.36*** |
| | | | (264.14) | (266.03) |
| University educated | | | −670.85 | −658.41 |
| | | | (670.10) | (671.58) |
| BAME | | | 44.30 | 40.72 |
| | | | (380.25) | (380.03) |
| Low density | | | −467.52 | −459.68 |
| | | | (241.14) | (242.49) |
| Registration ads: Low advertising | | | | −196.32 |
| | | | | (338.05) |
| Fixed effects | No | No | No | No |
| $R^2$ | 0.00 | 0.29 | 0.33 | 0.33 |
| Adj. $R^2$ | -0.00 | 0.28 | 0.32 | 0.32 |
| Num. obs. | 879 | 879 | 879 | 879 |
| RMSE | 3005.76 | 2541.41 | 2479.80 | 2480.74 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

# H Analysis At the Postcode Level

## H.1 All voters

**Table A12:** All registrations at postcode level

| | (1): n with NA | (2): n with imputed 0s | (3): logged n |
|---|---|---|---|
| (Intercept) | 27.39*** | 15.09*** | 1.67*** |
| | (1.01) | (2.54) | (0.27) |
| Registration ads | 0.04 | 0.48 | 0.06 |
| | (0.49) | (0.96) | (0.09) |
| Fixed effects | Yes | Yes | Yes |
| $R^2$ | 0.06 | 0.03 | 0.04 |
| Adj. $R^2$ | 0.06 | 0.03 | 0.04 |
| Num. obs. | 90678 | 149240 | 149240 |
| RMSE | 24.30 | 24.51 | 1.65 |
| N Clusters | 717 | 878 | 878 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

**Table A13:** All registrations at postcode level

| | (1) | (2) | (3) |
|---|---|---|---|
| (Intercept) | 15.09*** | 51.42*** | 56.38*** |
| | (2.54) | (7.47) | (9.16) |
| Registration ads | 0.48 | 0.60 | −10.84 |
| | (0.96) | (0.94) | (11.83) |
| Mean age | | −0.72*** | −0.83*** |
| | | (0.16) | (0.20) |
| Missing covariate data | | 4.30* | 3.94 |
| | | (2.08) | (2.33) |
| University educated | | −7.12 | −7.32 |
| | | (6.61) | (6.67) |
| BAME | | −17.85** | −17.85** |
| | | (6.34) | (6.32) |
| Low density | | −8.02*** | −8.02*** |
| | | (1.38) | (1.38) |
| Registration ads: Mean age | | | 0.27 |
| | | | (0.30) |
| Registration ads: Missing covariate data | | | 0.50 |
| | | | (2.08) |
| Fixed effects | Yes | Yes | Yes |
| $R^2$ | 0.03 | 0.04 | 0.04 |
| Adj. $R^2$ | 0.03 | 0.04 | 0.04 |
| Num. obs. | 149240 | 149240 | 149240 |
| RMSE | 24.51 | 24.38 | 24.37 |
| N Clusters | 878 | 878 | 878 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

## H.2 Young voters

**Table A14:** Young voter registrations at postcode level

| | (1): n with NA | (2): n with imputed 0s | (3): logged n |
|---|---|---|---|
| (Intercept) | $3.60^{***}$ | $1.16^{***}$ | $0.43^{***}$ |
| | (0.17) | (0.23) | (0.08) |
| Registration ads | −0.10 | −0.01 | 0.00 |
| | (0.06) | (0.08) | (0.03) |
| Fixed effects | Yes | Yes | Yes |
| $R^2$ | 0.06 | 0.03 | 0.04 |
| Adj. $R^2$ | 0.06 | 0.03 | 0.04 |
| Num. obs. | 56074 | 149240 | 149240 |
| RMSE | 3.09 | 2.60 | 0.74 |
| N Clusters | 684 | 878 | 878 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

**Table A15:** Young voter registrations at postcode level

| | (1) | (2) | (3) |
|---|---|---|---|
| (Intercept) | $1.16^{***}$ | $3.34^{***}$ | $3.79^{***}$ |
| | (0.23) | (0.55) | (0.64) |
| Registration ads | $-0.01$ | $-0.01$ | $-1.02$ |
| | (0.08) | (0.08) | (0.84) |
| Mean age | | $-0.04^{***}$ | $-0.05^{***}$ |
| | | (0.01) | (0.01) |
| Missing covariate data | | 0.29 | 0.29 |
| | | (0.15) | (0.17) |
| University educated | | $-1.48^{**}$ | $-1.50^{**}$ |
| | | (0.46) | (0.46) |
| BAME | | $-0.39$ | $-0.40$ |
| | | (0.49) | (0.48) |
| Low density | | $-0.44^{***}$ | $-0.45^{***}$ |
| | | (0.10) | (0.10) |
| Registration ads: Mean age | | | 0.03 |
| | | | (0.02) |
| Registration ads: Missing covariate data | | | $-0.03$ |
| | | | (0.15) |
| Fixed effects | Yes | Yes | Yes |
| $R^2$ | 0.03 | 0.04 | 0.04 |
| Adj. $R^2$ | 0.03 | 0.04 | 0.04 |
| Num. obs. | 149240 | 149240 | 149240 |
| RMSE | 2.60 | 2.60 | 2.60 |
| N Clusters | 878 | 878 | 878 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

# I Complier Average Causal Effect (CACE)

**Table A16:** 2SLS regression with successful ad placement as endogeneous variable

| | (1) | (2) |
|---|---|---|
| Successful ad placement | 69.24 | 64.02 |
| | (219.75) | (185.08) |
| Postcode sector size medium1 | | $-2324.15^{***}$ |
| | | (286.94) |
| Postcode sector size medium2 | | $-1153.97^{***}$ |
| | | (298.24) |
| Postcode sector size small | | $-4358.56^{***}$ |
| | | (273.83) |
| Mean age | | $-73.28^{*}$ |
| | | (30.45) |
| University educated | | 71.67 |
| | | (801.97) |
| BAME | | 305.67 |
| | | (475.74) |
| Low density | | 147.99 |
| | | (211.54) |
| Fixed effects | Yes | Yes |
| $R^2$ | 0.08 | 0.35 |
| Adj. $R^2$ | 0.04 | 0.32 |
| Num. obs. | 879 | 879 |
| RMSE | 2944.10 | 2483.63 |

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Note: Exogenous variable: assignment, endogenous variable: compliance.

# J Covariate Data Visuals

**Figure A3:** Mean age by Constituency ($N = 40$)

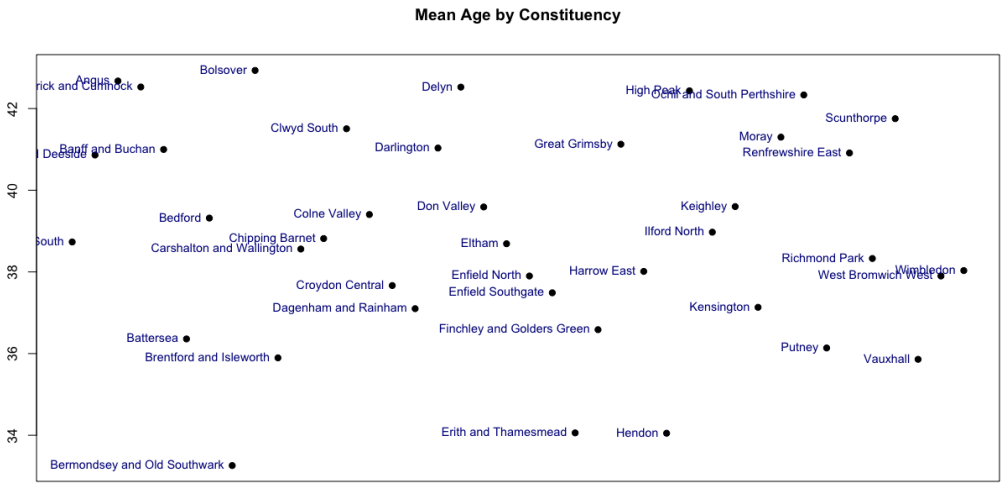



**Figure A4:** University Education by Constituency ($N = 40$)

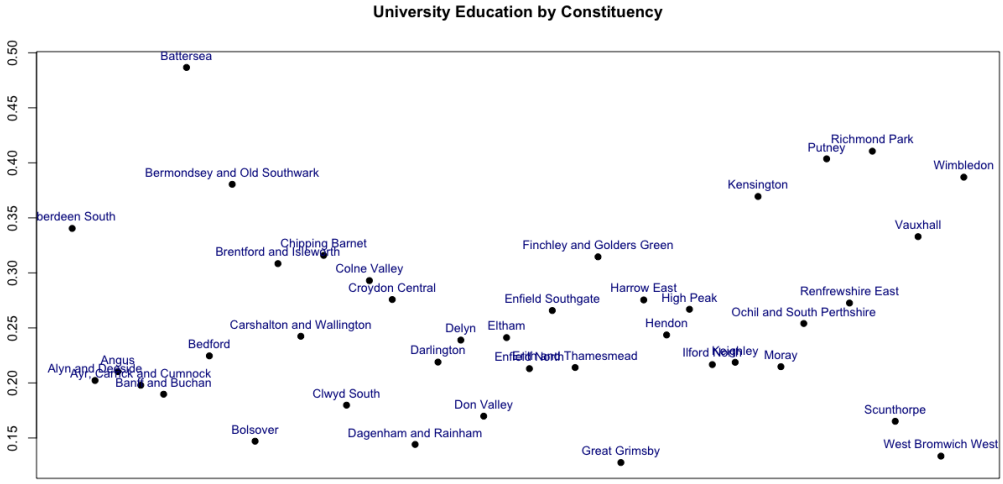
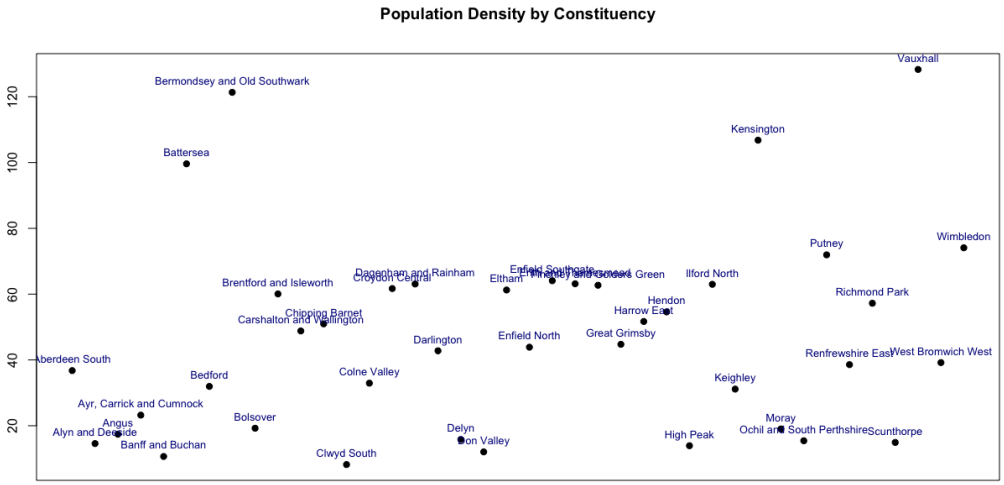


**Figure A5:** Population Density by Constituency ($N = 40$)



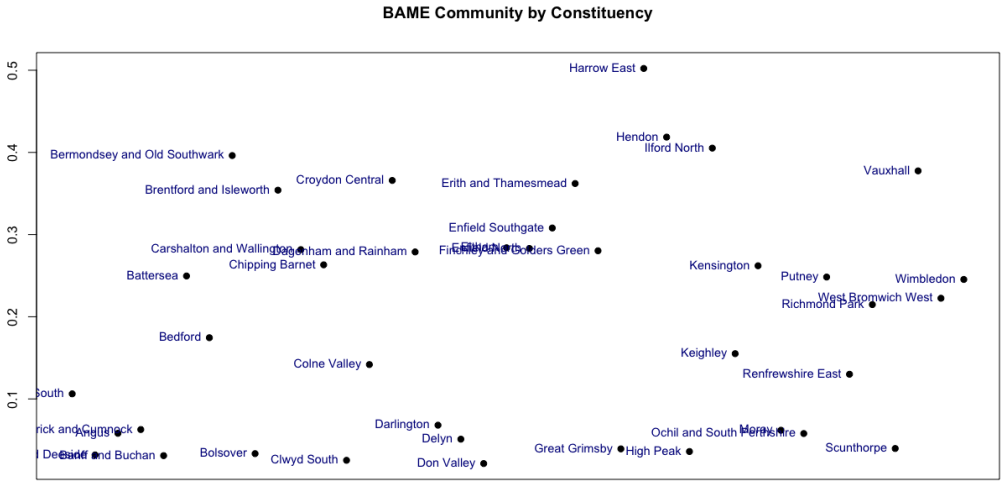


**Figure A6:** BAME Community by Constituency ($N = 40$)