

# The impact of education on civic engagement: Evidence from the 1972 British compulsory education reform

**Abstract:** This dissertation reviews the impact of education on civic engagement using the 1972 compulsory education reform as an instrumental variable for the level of education. It advances existing literature by assessing voting and volunteering participation which have jointly been studied in the US but not in the UK. This dissertation also updates the literature on British education and voting which has previously only investigated the 1947 compulsory education reform as an instrument. The results show that an additional year of education increases the probability of voting significantly but has no statistically significant effect on the probability of volunteering.

**Word Count:** 7360

## **1. Introduction**

On February 13<sup>th</sup> 2019, Selwyn College announced that they were to divest from all direct holdings in fossil fuel investments (“Selwyn sells all fossil fuel direct investments,” n.d.). The announcement came partly as a response to numerous protests by Cambridge University Zero Carbon Society, highlighting the importance of civic engagement in shaping institutional decisions. On a much broader scale, Friedman (1955) notes that civic engagement is essential for the basic functioning of any stable democratic system.

From a policy perspective, if a causal link between education and civic indicators can be determined, further support should be provided for government intervention in education. Dee (2004) highlights that there is market failure in education provision because individuals only consider the private benefits of education and not the third-party civic engagement benefits that arise from education (social benefits outweigh private benefits). Under Dee’s logic, government spending on education should be increased and possibly directed to tertiary education as the UK ranks 35 out of 36 OECD countries with respect to tertiary education spending as a proportion of GDP (“Education resources - Public spending on education - OECD Data,” n.d.). This spending could be used to reinstate maintenance grants for the poorest students or lower the tuition fee cap by subsidising universities.

The impact of education on voter participation and volunteering, along with differences across gender, socioeconomic status and income, have been researched heavily in the US by Dee (2004) and Doyle and Skinner (2017). In the UK, Milligan et al. (2004) have used the 1947 compulsory education reform to identify the impact of education on political indicators.

My dissertation makes contributions to the existing literature in two ways. Firstly, I focus on a composite measure of voting and volunteering decisions which have not been researched together using UK data. Secondly, I examine the impact of education on civic engagement using the 1972 compulsory education reform in the UK discovering whether the findings from an older cohort in the UK (Milligan et al., 2004) still hold true for a cohort 25 years younger.

The results from this dissertation highlight that the number of years of education causally affected the probability of *voting* in the 2005 general election (at a 1% level of statistical significance). For an additional year of education, the probability of voting rose by 39.7% (IV-probit estimate) which was much higher than the original probit estimate. However, the

number of years of education was not found to have a statistically significant causal impact on the probability of *volunteering*.

This dissertation proceeds as follows: Section 2 reviews the literature of civic engagement and the impact of education on different civic indicators. Section 3 provides theoretical reasoning as to why education is likely to increase civic participation. Section 4 describes the data used from the British Household Panel Survey. Section 5 explains the instrumental variable two-stage least square (IV 2SLS) approach taken to find a causal link between education and the civic indicators. Section 6 examines the results, Section 7 discusses the statistical and economic robustness of my results and Section 8 concludes.

## **2. Literature review**

Verba and Nie (1987) & Wolfinger and Rosenstone (1980) provide two early attempts to identify the factors influencing civic outcomes. Verba and Nie (1987) find that individuals with higher levels of education are more likely to participate in political actions such as voting, campaigning or interacting with a public official. Likewise, Wolfinger and Rosenstone (1980) find that after controlling for a variety of factors such as age, sex, race and marriage, the impact of education on the probability of voting was strong; for individuals with annual earnings over \$25,000 dollars, having 12 years of education increased the probability of voting by 21%, relative to those with less than 5 years of education.

A limitation to both papers is the failure to establish a causal relationship between education and civic indicators. Verba and Nie (1987) use a factor analysis which looks at the relationship between factors such as socioeconomic status, race, education and income with measures of political participation. The limitation in this method is that a correlation between these factors and political participation doesn't necessarily translate into causal inference. Wolfinger and Rosenstone (1980) take a different approach, using a probit model. This limitation here is the potential omitted variable bias; there may be unobserved factors that cannot be accounted for such as unobserved family characteristics including the parent's voting behaviour or their interest in politics. Smets and van Ham (2013) develop a socialisation model which suggests that having politically active parents could socialise children into being more politically active themselves.

In response to endogeneity concerns of the probit regression model, more recent literature on the outcomes of education has evolved to incorporate the use of instrumental variables (IV). Wooldridge (2008) states that the ability to use IV's to generate unbiased and consistent estimates relies heavily on both the relevance and exogeneity conditions holding. Angrist and Krueger (1990) explore the rate of return of an additional year of education and the impact of compulsory education using quarter of birth as an IV. Quarter of birth is an effective instrument in the United States as it is correlated with the years of education (relevance condition) but uncorrelated with any other factor that could influence earnings (exogeneity condition). Card (1993) similarly uses an IV approach to estimate the rate of return to an additional year of education. Geographical proximity to college is used as an instrument as it is correlated with years of education (relevance condition); those living closer to college face a lower cost of attending college (Dee (2004) shows there is a positive correlation between

college proximity and years of education). Geographical proximity to college is also assumed to be uncorrelated with any other factor that could influence earnings (exogeneity condition).

The instrumental variable literature on education has since been expanded to investigate the impact of education on civic outcomes. Dee (2004) uses geographic proximity of junior and community colleges as an instrument which is similar to that of Card (1993). He finds that US college entrance increases the probability of having voted in the last 12 months by 17.6% (marginal effect, significant at 5% level) yet it decreases the probability of having volunteered in the last 12 months by 4.7% (marginal effect, not significant). In the UK, Milligan et al. (2004), uses the 1947 compulsory education reform as an instrument which increased the age at which you could leave school from 14 years old to 15 years old. They find that the age at which you left full-time education increased the probability of voting in the last general election by 6% (marginal effect, not significant).

The literature is further developed by Doyle and Skinner (2017) who find that an additional year of postsecondary education increases the probability of voting in the 2010 United States general election by 7.7%. However, the authors find only a very small impact of an additional year of postsecondary education on volunteering decisions; “it would take an additional 6 years of postsecondary education to induce a change in volunteering from 1 to 4 times per year to volunteering 5 to 11 times per year” (Doyle and Skinner, 2017, p.884). This methodology involved a more complex geographical instrument (inverse log distance to public in-state two-year colleges) relative to the simpler college proximity IV used by Dee (2004) and Card (1993).

My dissertation makes two important contributions to the literature. Firstly, it builds on the work of Dee (2004) and Doyle and Skinner (2017) who have researched a composite measure of civic indicators using US data. Dee (2004) studies the impact of education on adult voting and volunteering participation, group memberships, attitudes towards free speech and frequency of newspaper readership while Doyle and Skinner (2017) study the impact of education on voting, volunteering and donation decisions. This dissertation is the first time that the impact of education on voting *and volunteering* decisions has been researched in the UK. Milligan et al. (2004) only uses UK data to research the impact of education on a set of political indicators. Secondly, my dissertation uses the 1972 British compulsory education reform as an IV which has not been used before to investigate civic outcomes. The previously used IV was the much older 1947 compulsory education reform used by Milligan et al.

(2004). Taking advantage of recently published UK data, I am able to use the 1972 compulsory education reform and update the results on voting participation from Milligan et al. (2004).

### 3. A theoretical perspective

Quoting Anthony Downs (1957 as cited in Wolfinger and Rosenstone, 1980, p.6): “Every rational man decides to vote just as he makes all other decisions: if the returns outweigh the costs, he votes; if not, he abstains”. Using the model from Gerber et al. (2008), let  $D$  represent the benefits from a civic activity and  $C$  represent the costs. In addition, benefits from civic activities can be either intrinsic ( $D_I$ ) or extrinsic ( $D_E$ ). Doyle and Skinner (2017) define intrinsic benefits as those that arise from internal satisfaction whereas extrinsic benefits arise from an improvement in external reputation. ‘Civic’ represents a dummy variable equal to 1 if the individual participates in the civic activity and 0 if they do not.

$$Civic = \begin{cases} 1 & \text{if } D > C \\ 0 & \text{if } D \leq C \end{cases}$$

$$D = U(D_I, D_E)$$

An increase in an individual’s level of education could increase the probability of *voting* by impacting both the benefits and costs. Firstly, Wolfinger and Rosenstone (1980) indicate that it may reduce the internal cost of voting if education improves their knowledge on political parties and the registration process. As a result, individuals reduce their decision-making time (which has an opportunity cost). Secondly, it may increase both the intrinsic and extrinsic benefits to voting: (Doyle and Skinner, 2017) highlight that an increase in education may increase the perceived importance of voting for a well-functioning democratic system (intrinsic benefit) and potentially increase social status (extrinsic benefit). Wolfinger and Rosenstone (1980) also make the argument that an intrinsic benefit could also rise from an understanding of the importance of voting for a specific reference group such as ethnic minorities.

For *volunteering* decisions, Doyle and Skinner (2017) believe higher education may increase the probability of volunteering primarily through increasing the intrinsic and extrinsic benefits. Greater intrinsic benefit could arise from the understanding that some organisations lack sufficient government support to operate independently and thus require volunteers to achieve their admirable objectives. If supporting the objectives of non-governmental organisations (NGOs) increases individual utility, then higher education may increase awareness of the importance of volunteering. Secondly, similar to the extrinsic benefit that arises with voting, Doyle and Skinner (2017) indicate that education may increase the social status that arises when volunteering.

#### 4. Data

This dissertation uses the latest (wave 18) of the (Special Access) British Household Panel Survey (BHPS). The BHPS is an annual survey of a nationally representative sample of adults (16+ years old) from 5,000 households (“UK Data Service › Series,” n.d.). This dataset provides a variety of indicators related to politics, local community and individual level demographics. The special access dataset was required to obtain each individual’s month of birth which was not present in the openly accessible BHPS. As explained in the next section, this is required to separate people who were affected by the 1972 compulsory education reform and those who were not.

The data was manipulated in a couple of ways to improve the ease at which the analysis could be carried out.

Firstly, the socioeconomic status indicator in the dataset had a range of values from 1-7 based on the occupation e.g. professional, skilled manual, unskilled etc. To simplify the analysis, two dummy variables were created from this variable. *SES1* is equal to 1 if the individual is in a “Professional Occupation” or a “Managerial & Technical Occupation” and 0 otherwise. *SES2* is equal to 1 if the individual is in a “Skilled Non-Manual” or “Skilled Manual” occupation and 0 otherwise.

Secondly, the volunteering indicator in the dataset was also a categorical variable based on the number of times the individual volunteered during the year (e.g. at least one a week, at least one a month etc.). To use a probit model to find a marginal effect of one additional year of education on the probability of volunteering, this categorical volunteering indicator was converted into a dummy called *Volunteered* which equals 1 if the individual has volunteered at least once or more in the past year and 0 if they have not volunteered in the past year. Therefore, the interpretation of the probit/IV-probit with *Volunteered* is the same as the *Voted* variable.

A full definition of all variables is available in Table 4 in the Appendix.



## 5. Estimation strategy/design

### 5.1. Naïve probit model and endogeneity

Initially, a naïve probit model is estimated to find the marginal impact of an additional year of education for both voting and volunteering, controlling for a variety of factors such as age, sex and income. For example, the probit model for voting is:

$$\begin{aligned} Voted_i = & \gamma_0 + \gamma_1 Education_{yrs}_i + \gamma_2 Age_i + \gamma_3 Sex_i + \gamma_4 Ln(Income)_i + \gamma_5 Married_i \\ & + \gamma_6 Supportsaparty_i + \gamma_7 SES1_i + \gamma_8 SES2_i + u_i \end{aligned}$$

However, a limitation of this model is that there are a variety of unobserved factors in the error term which may drive bias in the estimates. For the voting regression, attenuation bias may lead to downward bias while ability bias, unobserved socialisation and unrecorded race could drive upward bias in the probit estimates. For the volunteering regression, attenuation bias and ability bias may drive downward bias while unobserved socialisation and race could drive upward bias in the probit estimates. Each factor will be explained in turn.

Firstly, Dee (2004) believes that attenuation bias may drive a downward bias in the probit estimates. The level of education reported in the BHPS data is self-reported (“BHPS Questionnaires and Survey Documents - Wave 18 - Institute for Social and Economic Research (ISER),” n.d.) which means that individual may have over-reported their own level of education. Ashenfelter and Krueger (1994) conducted a twin study to measure the impact of measurement error when estimating the effect of education on earnings. They conducted their experiment by asking both twins in the questionnaire what their own level of education was and what their twin’s level of education was. As a result, Ashenfelter and Krueger (1994) are able to find that 8-12% of the measured variance in education levels is error and show that there is downward bias when estimating the effect of education on earnings. Therefore, there could be downward bias when estimating the effect of education on voter and volunteering participation.

Secondly, Dee (2004) hypothesises that unobserved ability may lead to downward bias in the probit estimates. This could be the case if unobserved ability is positively correlated with the level of education and unobserved ability is correlated negatively with the civic indicator. This argument is likely to be stronger with the volunteering as there is a much large time commitment involved and individuals with higher ability are likely to have to a larger opportunity cost to their time through their wage earnings. In contrast, ability is more likely

to be positively correlated with voting participation as the time commitment is minimal and if anything, as suggested by Wolfinger and Rosenstone (1980), higher ability individuals are likely to face a lower cost of voting if they have more political knowledge and have a greater interest in politics.

Unobserved factors which are part of the socialisation model presented by Smets and van Ham (2013) may lead to an upward bias. Consider a hypothetical variable called *unobserved socialisation* which depends on the level of civic participation by *parents* of individuals in the sample. Parents who have a high level of participation in these activities will have a higher level of the variable *unobserved socialisation*. This variable is likely to be positively correlated with the individual's (child's) level of civic participation and positively correlated with the individual's level of education. Hence, the coefficient of *educationyrs* in the standard probit model can be biased upwards by this factor.

The lack of a race variable such as 'black' in the regressions (due to data availability) may lead to upward bias. This is the case if there is a negative correlation between being black and the individual's level of education as well as a negative correlation between being black and voting/volunteering. However, the estimated impact of race on voting and volunteering is ambiguous among the studies in the meta-analysis conducted by Smets and van Ham (2013) and Niebuur et al. (2018).

## **5.2. Conditions required to implement an IV**

For an IV quasi-experimental approach to work, Wooldridge (2008) mentions that the exogeneity and relevance condition must hold.

$$\textit{Exogeneity Condition: } \text{Cov}(\textit{Policy change}, u) = 0$$

$$\textit{Relevance Condition: } \text{Cov}(\textit{Policy change}, \textit{Education}) \neq 0$$

The exogeneity condition states that the 1972 policy change must have no correlation with any unobserved factors that could influence voting or volunteering participation.

The relevance condition states that the 1972 policy change must be correlated with the level of education. Therefore, the policy change only has an impact on voting or volunteering participation through education. Theoretically, this condition should hold as the policy change forces all individuals born after 1<sup>st</sup> September 1957 into an additional year of compulsory education.

Section 7.1 will assess the strength of this IV with regards to these conditions.

### **5.3. Design**

On the 1<sup>st</sup> of September 1972, as highlighted by Jung (2015), the age at which children in the UK could leave compulsory education increased from 15 years old to 16 years old. Therefore, individuals born before the 1<sup>st</sup> of September 1957 were not affected by this policy change while those born after 1<sup>st</sup> of September 1957 were affected. This provides a source of exogenous variation. Similarly, Milligan et al. (2004) use the 1947 compulsory education reform in the UK as a quasi-experiment when the age of compulsory education increased from 14 to 15 years old.

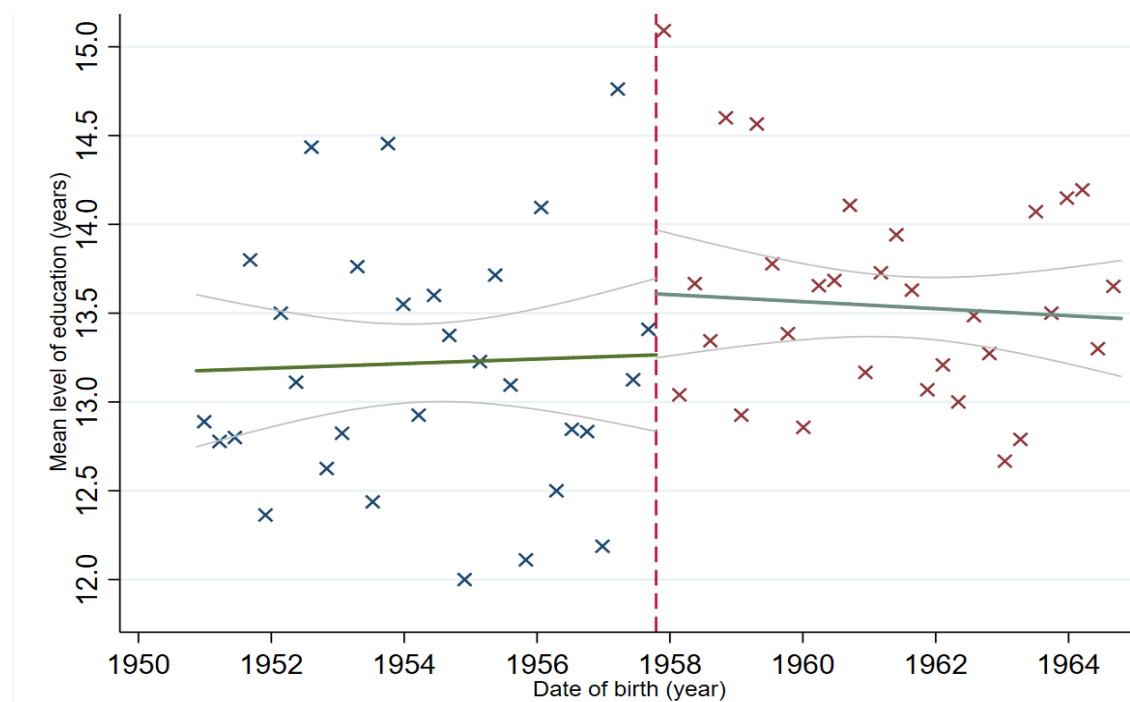
The sample for my analysis is constructed from individuals in the BHPS dataset six years either side of the policy change. By taking individuals only six years either side of the 1<sup>st</sup> September 1957, I assume that there were no other major changes during this time which could have influenced those born after 1<sup>st</sup> September 1957 to have a higher level of education on average. Six years either side of the policy change also provides a large enough sample with 511 individuals before the change and 637 after the change. In addition, I assume that because individuals in my sample range from 56-68 years old, their career is unlikely to change and so their current job is a good indicator of socioeconomic status.

Figure 1 highlights the average years of education before and after the policy change. The six years of data on each side of the September 1<sup>st</sup> 1957 is split into 30 discrete time periods with a mean level of education calculated for each discrete period. As shown by the graph, the mean level of education after the change is higher at 13.463 years compared with 13.286 years before. A reason for the post-policy mean level of education being less than a 1-year increase from the pre-policy mean is that many individuals have taken above the compulsory level of education and hence the policy has not impacted their educational choice. This can also explain the overlapping confidence intervals pre and post the policy change and why the one-tailed p-value for the difference of the education mean is approximately 0.1271 (insufficient to reject equality of means at 5% level of significance - calculated using Welch's t-test from Table 1).

Another couple of interesting findings in Table 1 are the comparisons of voting and volunteering means before and after the reform. Contradictory to the theoretical prediction, the mean level of voter participation is higher pre-policy change at 0.777 and slightly lower at 0.755 post policy change. However, when a Welch t-test is conducted on the difference

between these two means, there is insufficient evidence to reject equality at 5% (P-value of 0.1894). In contrast, the mean level of volunteering after the policy (0.214) is statistically higher than before the change (0.162) at a 5% level of significance (p-value = 0.0119). This is expected from the theoretical predictions.

**Figure 1: Mean years of education conditional on date of birth (pre/post the policy change)**



**Table 1: Summary Statistics**

Variables	Pre-Policy Change		Post-Policy Change	
	Mean	Standard Deviation	Mean	Standard Deviation
<b>Voted</b>	0.777	0.417	0.755	0.430
<b>Volunteered</b>	0.162	0.369	0.214	0.410
<b>Educationyrs</b>	13.286	2.723	13.463	2.452
<b>Age</b>	63.659	1.780	57.641	1.662
<b>Sex</b>	0.454	0.498	0.502	0.500
<b>Income</b>	25103.060	27700.820	25989.840	19388.790
<b>Married</b>	0.705	0.457	0.677	0.468
<b>Supportsaparty</b>	0.387	0.488	0.375	0.485
<b>SES1</b>	0.452	0.498	0.484	0.500
<b>SES2</b>	0.346	0.476	0.336	0.473
<b>Observations</b>	511		637	

Notes: Mean and standard deviation values recorded to 3dp

#### **5.4. Model Specification**

This dissertation's main approach to solve the limitations of the aforementioned naïve probit model is a two-stage-least squares (2SLS) approach to find the IV-probit estimates in Table 2.

First stage for voter participation:

$$\begin{aligned}\widehat{Educationyrs}_i \\ &= \gamma_0 + \gamma_1 Policy_i + \gamma_2 Age_i + \gamma_3 Sex_i + \gamma_4 Ln(Income)_i + \gamma_5 Married_i \\ &+ \gamma_6 Supportsaparty_i + \gamma_7 SES1_i + \gamma_8 SES2_i + u_i\end{aligned}$$

Second stage for voter participation:

$$\begin{aligned}Voted_i &= \beta_0 + \beta_1 \widehat{Educationyrs}_i + \beta_2 Age_i + \beta_3 Sex_i + \beta_4 Ln(Income)_i + \beta_5 Married_i \\ &+ \beta_6 Supportsaparty_i + \beta_7 SES1_i + \beta_8 SES2_i + v_i\end{aligned}$$

The first and second stage equations for volunteering are identical to the voting equations above but exclude the *Supportsaparty* variable.

## **6. Results**

### **6.1. Voter participation results**

The probit estimate of the impact of education on voter participation (Table 2 column 1) shows a marginal effect of 8.16% relative to the 39.7% in the IV-probit estimate (Table 2 column 2) which highlights a downward bias. Using Section 5.1, this can be explained if the attenuation bias outweighs both the ability bias and unobserved socialisation leading to a net downward bias.

As Table 2 column 2 shows, the IV-probit estimate of the impact of years of education on voting in the 2005 general election is positive and significant at the 1% level. An additional year of education increases the probability of voting in the 2005 general election by 39.7% and this effect is causal, supporting the theory outlined in Section 3. Furthermore, the estimate is much greater than the comparable 6% (not statistically significant) rise in the probability of voting generated from the 1947 compulsory education reform by Milligan et al. (2004). In the US, Doyle and Skinner (2017) find that an additional year of postsecondary education increased the probability of voting in the 2010 US general election by 7.7% which is also much lower than my estimate. My estimate is much closer to that of Dee (2004) who estimates that college entrance increases the probability of having voted in the last 12 months by 17.6% (statistically significant at 5%). A possibility as to why my estimate is much higher compared to the rest of the literature may pertain to the specific data on the 2005 general election used in this paper. My dissertation focused only on a specific election and hence the strength of the effect of education on voter participation may be particularly strong at this point in time.

Other significant results from Table 2 column 2 involve marriage, supporting a political party and socioeconomic status.

Firstly, being married increases the probability of having voted in the 2005 general election by 27.2% (statistically significant at the 5% level). Marriage is incorporated in 30 out of 90 studies in the meta-analysis of voter turnout conducted by Smets and van Ham (2013) and provides a positive effect on voter turnout which is in line with my results. From a theoretical point of view, Stoker and Jennings (1995) find that marriage may increase voter participation due to the strong effect of one partner's participation in influencing the other partner.

Marriage may also increase residential stability (as suggested by Smets and van Ham (2013)) which could increase the expected benefit of participation; a couple who know they are going

to be living in one location for the foreseeable future are more likely to be engaged in community issues which are influenced by the political landscape.

Secondly, supporting a political party increases the probability of having voted in the 2005 general election by 75.5% (statistically significant at the 10% level). This is rather intuitive and supporting a political party provides an indicator of political interest and knowledge. Smets and van Ham (2013) find that the average impact of party identification and political knowledge is 72-85% which is in line with my finding.

Finally, being in a 'professional' or 'managerial and technical' occupation (*after controlling for education*) reduces the probability of having voted in the 2005 general election by 86.6% relative to all other individuals who are not in these professions (statistically significant at the 10% level). A potential cause for this may be because individual's in these professions have a high opportunity cost of time with these occupations and hence the cost of voting is too high to justify. However, the Smets and van Ham (2013) meta-analysis largely refutes the idea that occupational status has an impact on voter participation.

## **6.2. Volunteering participation results**

Similar to voter participation, the probit estimate (Table 2 column 4) highlights the marginal effect of education is 11.2% relative to the 24.7% predicted by the IV-probit model (Table 2 column 5). Using Section 5.1, this can be explained if the attenuation bias and ability bias outweigh the observed socialisation leading to a net downward bias.

As Table 2 column 5 shows, the marginal effect of an additional year of education on volunteering participation is 24.7% although this is statistically insignificant. The impact of this specific civic indicator has not been studied in the UK so comparisons from the existing literature cannot be made. However, in the US, Dee (2004) finds that college entrance decreased the probability of having volunteered in the last 12 months by 4.7%. Like my findings, this result was not significant. Similarly, Doyle and Skinner (2017) find in the US that there is only a very small impact of an additional year of postsecondary education on volunteering decisions.

Other significant results from Table 2 Column 5 involve age and marriage.

From Table 2 column 5, an increase in an individual's age by a year decreases the probability of volunteering by 3.24% (statistically significant at the 5% level). This supports the meta-analysis conducted by Niebuur et al. (2018) where 6 out of 11 studies highlighted that older



individuals are less likely to volunteer. This may be explained by rising work commitments as you get older and the higher opportunity cost of time. A functional form check was also conducted by changing the form of the regression to include an 'age squared' regressor but this was not significant; volunteering participation doesn't have a convex relationship with respect to age.

Table 2 column 5 also shows that being married increases the probability of volunteering by 17.4% (statistically significant at the 10% level). One explanation by Smets and van Ham, (2013) could be linked to the concept that married couples are more residentially stable and hence are more likely to volunteer in their local communities. However, the results from the existing literature in the meta-analysis by Niebuur et al. (2018) vary and show no clear link.

**Table 2: Probit and IV-probit estimates of factors influencing voting and volunteering decisions**

Independent Variables	Probit	IV-Probit		Probit	IV-Probit	
	Voted (1)	Second Stage Voted (2)	First Stage Educationyrs (3)	Volunteered (4)	Second Stage Volunteered (5)	First Stage Educationyrs (6)
Educationyrs	0.0816*** (0.0214)	0.397*** (0.141)		0.112*** (0.0213)	0.247 (0.319)	
Age	0.0165 (0.0128)	0.00762 (0.0134)	0.0693* (0.0354)	-0.0319** (0.0131)	-0.0324** (0.0129)	0.0708** (0.0354)
Sex	-0.142 (0.0920)	0.0173 (0.133)	-0.354*** (0.127)	-0.0847 (0.0924)	-0.0335 (0.162)	-0.343*** (0.127)
Ln(Income)	0.0334 (0.0576)	-0.128 (0.100)	0.453*** (0.0800)	-0.00867 (0.0578)	-0.0723 (0.165)	0.456*** (0.0800)
Married	0.299*** (0.0935)	0.272** (0.108)	-0.179 (0.133)	0.158 (0.0979)	0.174* (0.0979)	-0.171 (0.133)
Supportsaparty	1.147*** (0.112)	0.755* (0.431)	0.193 (0.127)			
SES1	0.0983 (0.139)	-0.866* (0.511)	2.756*** (0.184)	0.175 (0.150)	-0.220 (1.001)	2.775*** (0.184)
SES2	0.0955 (0.121)	-0.0162 (0.128)	0.241 (0.178)	-0.117 (0.142)	-0.146 (0.149)	0.238 (0.178)
Policy			0.462* (0.246)			0.465* (0.247)
Constant	-2.183** (0.980)	-3.943*** (0.944)	3.317 (2.387)	-0.547 (0.981)	-1.492 (2.457)	3.251 (2.389)
Observations	1,142	1,142	1,142	1,142	1,142	1,142

Notes: Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Variable Definitions: See Table 4, F statistic for first-stage of 2SLS voting probit: F(8, 1133) = 78.14 Prob > F = 0.0000, F statistic for first-stage of 2SLS volunteering probit: F(7, 1134) = 88.88, Prob > F = 0.0000

## 7. Robustness

### 7.1. Strength of the 1972 compulsory education reform as an IV

The relevance and exogeneity conditions must hold for the compulsory education reform to be considered a strong IV.

$$\text{Relevance Condition: } \text{Cov}(\text{Policy change}, \text{Education}) \neq 0$$

$$\text{Exogeneity Condition: } \text{Cov}(\text{Policy change}, u) = 0$$

There is strong evidence for the relevance condition from the first stage regressions of both voter and volunteering participation. As Table 2 column 3 shows, the policy change has a positive and significant impact on years of education. Being born after the policy change leads to individuals having 0.462 additional years of education compared to those born before the change (statistically significant at the 10% level). The coefficient in Table 2 column 6 is slightly different (0.465) from Table 2 column 3 (because the first stage regression on voting incorporated the *supportsaparty* variable which the volunteering first stage regression did not). In addition, the F statistic for the first stage regression of voter participation is  $F(8,1133) = 78.14$  and for the first stage regression of volunteering participation is  $F(7,1134) = 88.88$ . Both of the F statistics are large enough to reject the null hypothesis that the explanatory variables are not jointly significant. Hence, the relevance condition is satisfied for both voting and volunteering participation.

On the other hand, there is no formal way of testing the exogeneity condition. This relies on economic intuition that the 1972 policy change would not impact any factors in the error term that influence both voting decisions and volunteering decisions. As this reform was a natural experiment, I have assumed that it not correlated with error term in either of these regressions.

### 7.2. Data Limitations

A limitation with the BHPS dataset is that the specific number of years of education for each person is not provided. This has led to the conversion of the highest educational qualification into an estimate of the years of education *Educationyrs*. An issue with this approach is that there are a number of categories (Apprenticeship, Commercial QF, Other Higher QF, Other QF and Still At School/No QF) that have to be dropped from the analysis as I cannot accurately infer the number of years of education for these individuals. Another potential

issue with this approach is that for some categories, it is difficult to estimate the number of years of education and hence assumptions have been made. For example, those classified in the data as having a “Higher Degree” could have any form of additional degree past their Bachelor’s (e.g. a Master’s degree, PhD etc.). As a result, a lower bound assumption has been made that “Higher Degree” adds an additional year of education on top of a “First Degree”. Another assumption made is that a “First Degree” contributes an additional 3 years of education because most bachelor courses in the UK are 3 years long. Table 3 in the Appendix provides further information regarding these assumptions.

Another potential limitation with this dataset is the lack of variable such as race and parental status. Smets and van Ham (2013) highlight that individuals of ethnic minorities have been hypothesised to have fewer resources and skills and hence a reason why they are less likely to vote (even if the impact of race on voter participation is heterogeneous from 90 studies). Likewise, Niebuur et al. (2018) find that parental status has a positive link between having children and participation in voluntary work (in 3 out of 5 previous studies looking at voluntary participation). Without these variables in the regression analysis, omitted variable bias could be present when estimating the impact of education on voting and volunteering participation. However, the IV approach in this paper rectifies this limitation.

### **7.3. Heteroskedasticity**

The variable addition version of the LM test has been conducted to test for heteroskedasticity as suggested by Wooldridge (2010 as cited in “test for heteroskedasticity in logit/ probit models - Statalist,” n.d.). The chi-squared value for voting is 14.28 with a p-value of 0.0756. The chi-squared value for volunteering is 6.19 with a p-value of 0.5179. Therefore, the null hypothesis of homoskedasticity is not rejected in both cases at the 5% level of significance. As a result, heteroskedastic robust standard errors have not been used.

### **7.4. Placebo Testing**

In order to confirm that the level of education is only impacted at the time of the policy change, two placebo tests have been conducted. Placebo 1 is conducted for individuals born 6 years either side of September 1<sup>st</sup> 1965 and placebo 2 is conducted for individuals born 6 years either side of September 1<sup>st</sup> 1949 (6 years was used to maintain consistency with the original regressions). As there was no policy change during both periods, there should be no change in the level of education 6 years either side of these dates. As Table 5 shows, the impact of

the policy variable on years of education (first stage regressions in column 2,4,6 and 8) is statistically insignificant in all cases which is what is expected.

## **8. Conclusions**

In the age of social media, civic engagement within our local communities is at risk.

Increasing levels of volunteering provides greater support for the most vulnerable individuals in society and increasing voter turnout ensures that a stable democratic system is maintained. However, the average number of hours volunteered per person in the UK between 2005 and 2015 has fallen by 21.5% (Ainsworth, 2017) and voter apathy continues to be a concern in the UK with turnout in every general election since 1997 below 70% (“Voter turnout at UK general elections 1945 – 2017 | UK Political Info,” n.d.).

Using the 1972 compulsory education reform in the UK, this dissertation has shown that education has a large and significant impact on voter participation in the UK’s 2005 general election but has an insignificant impact on volunteering decisions. An additional year of education increases the probability of voting by 39.7% (statistically significant at the 1% level) and increases the probability of volunteering at least once a year by 24.7% (not statistically significant).

As my results highlight, education provides strong third-party civic benefits in voting decisions (but not necessarily volunteering decisions). Friedman (1955) expresses the importance of education in providing democratic values, a basic level of understanding of the political system and a basic level of literature, all of which are required for a democratic system to function. Hence, education is a social good from a civic perspective and this has been overlooked in previous studies of the societal benefits of education. Existing research has been conducted on the human capital externalities that arise from education. Acemoglu and Angrist (1999) use quarter of birth and compulsory schooling legislation to estimate the size of human capital externalities (social return) at less than 1%. In the UK, Kirby and Riley (2008) found that for a specific subgroup of the population, a 1 year increase in the industry average level of schooling leads to a 2.6-3.9% rise in individual wages (social return). By focusing on the human capital externalities from education, these studies provide only a narrow lense through which the social return on education is investigated. This dissertation provides support that the overall social benefit of education may be higher than these studies suggest.

Given that the positive externality of education may have been underestimated by previous studies, this dissertation lends support to the argument that British policymakers should invest more in education. Using OECD data (“Education resources - Public spending on

education - OECD Data,” n.d.), in primary to post-secondary non-tertiary education, the UK spent 3.783% of GDP and ranked 8 out of the 36 OECD countries in 2016. However, in tertiary education, the UK only spent 0.467% of GDP which ranks 35 out the 36 OECD countries in 2016. In perspective, Norway, who topped the list for tertiary education spending as a percentage of GDP, spent 1.669%. Therefore, as a percentage of GDP, the UK could increase spending on tertiary education through subsidies and potentially target individuals from the lowest socioeconomic status households who are going to benefit the most from the marginal increase in this spending. One example of this policy in action could be through the re-introduction of maintenance grants which were scrapped by George Osborne in 2015 (Association, 2016).

The Education and Skills Act 2008 provides an interesting area for further research. This legislation increased the minimum age at which individuals can leave either education or work-based learning such as apprenticeships. This meant that in 2013, children had to stay in school or work-based learning until 17 and this increased further in 2015 to 18. Future research may consider using this reform as a quasi-experiment to either confirm or refute results of this dissertation.

## 9. **Bibliography**

- About CSEs | Pearson qualifications [WWW Document], n.d. URL <https://qualifications.pearson.com/en/support/support-topics/understanding-our-qualifications/our-qualifications-explained/about-cses.html> (accessed 3.18.19).
- Acemoglu, D., Angrist, J., 1999. How Large are the Social Returns to Education? Evidence from Compulsory Schooling Laws (Working Paper No. 7444). National Bureau of Economic Research. <https://doi.org/10.3386/w7444>
- Ainsworth, D., 2017. Volunteering falls by 15 per cent in a decade, ONS finds [WWW Document]. URL <https://www.civilsociety.co.uk/news/volunteering-levels-fall-by-15-per-cent-in-a-decade-finds-office-for-national-statistics.html> (accessed 4.24.19).
- Angrist, J.D., Krueger, A.B., 1990. Does Compulsory School Attendance Affect Schooling and Earnings? (Working Paper No. 3572). National Bureau of Economic Research. <https://doi.org/10.3386/w3572>
- Ashenfelter, O., Krueger, A., 1994. Estimates of the Economic Return to Schooling from a New Sample of Twins. *Am. Econ. Rev.* 84, 1157–1173.
- Association, P., 2016. Maintenance grants scrapped for poorest students. *The Guardian*.
- BHPS Questionnaires and Survey Documents - Wave 18 - Institute for Social and Economic Research (ISER) [WWW Document], n.d. URL [https://www.iser.essex.ac.uk/bhps/documentation/pdf\\_versions/survey\\_docs/wave18/index.html](https://www.iser.essex.ac.uk/bhps/documentation/pdf_versions/survey_docs/wave18/index.html) (accessed 3.21.19).
- Card, D., 1993. Using Geographic Variation in College Proximity to Estimate the Return to Schooling (Working Paper No. 4483). National Bureau of Economic Research. <https://doi.org/10.3386/w4483>
- Dee, T.S., 2004. Are there civic returns to education? *J. Public Econ.* 88, 1697–1720. <https://doi.org/10.1016/j.jpubeco.2003.11.002>
- Dee, T.S., 2003. Are There Civic Returns to Education? (Working Paper No. 9588). National Bureau of Economic Research. <https://doi.org/10.3386/w9588>
- Doyle, W.R., Skinner, B.T., 2017. Does Postsecondary Education Result in Civic Benefits? *J. High. Educ.* 88, 863–893. <https://doi.org/10.1080/00221546.2017.1291258>
- Education resources - Public spending on education - OECD Data [WWW Document], n.d. . theOECD. URL <http://data.oecd.org/eduresource/public-spending-on-education.htm> (accessed 4.1.19).



- Friedman, M., 1955. *The role of government in education*. Rutgers University Press New Brunswick, NJ.
- Gerber, A.S., Green, D.P., Larimer, C.W., 2008. Social Pressure and Voter Turnout: Evidence from a Large-Scale Field Experiment. *Am. Polit. Sci. Rev.* 102, 33–48. <https://doi.org/10.1017/S000305540808009X>
- How long does a PGCE Take? | Teacher Training | University of Exeter | %Teacher Training% | %University of Exeter%, n.d. URL <http://blogs.exeter.ac.uk/teachertraining/the-road-to-teaching-how-long-does-a-pgce-take/> (accessed 3.18.19).
- July, 2, 2009, n.d. Training to be a nurse [WWW Document]. *Nurs. Times*. URL <https://www.nursingtimes.net/training-to-be-a-nurse/5003513.article> (accessed 3.18.19).
- Jung, S., 2015. Does education affect risk aversion? Evidence from the British education reform. *Appl. Econ.* 47, 2924–2938. <https://doi.org/10.1080/00036846.2015.1011313>
- Kirby, S., Riley, R., 2008. The external returns to education: UK evidence using repeated cross-sections. *Labour Econ.* 15, 619–630. <https://doi.org/10.1016/j.labeco.2008.04.004>
- Milligan, K., Moretti, E., Oreopoulos, P., 2004. Does education improve citizenship? Evidence from the United States and the United Kingdom. *J. Public Econ.* 88, 1667–1695. <https://doi.org/10.1016/j.jpubeco.2003.10.005>
- Niebuur, J., van Lente, L., Liefbroer, A.C., Steverink, N., Smidt, N., 2018. Determinants of participation in voluntary work: a systematic review and meta-analysis of longitudinal cohort studies. *BMC Public Health* 18, 1213. <https://doi.org/10.1186/s12889-018-6077-2>
- Selwyn sells all fossil fuel direct investments [WWW Document], n.d. . *Varsity Online*. URL <https://www.Varsity.co.uk/news/17060> (accessed 2.26.19).
- Smets, K., van Ham, C., 2013. The embarrassment of riches? A meta-analysis of individual-level research on voter turnout. *Elect. Stud.* 32, 344–359. <https://doi.org/10.1016/j.electstud.2012.12.006>
- Stoker, L., Jennings, M.K., 1995. Life-Cycle Transitions and Political Participation: The Case of Marriage. *Am. Polit. Sci. Rev.* 89, 421–433. <https://doi.org/10.2307/2082435>
- test for heteroskedasticity in logit/ probit models - Statalist [WWW Document], n.d. URL <https://www.statalist.org/forums/forum/general-stata-discussion/general/1292180-test-for-heteroskedasticity-in-logit-probit-models> (accessed 3.20.19).

UK Data Service › Series [WWW Document], n.d. URL

<https://beta.ukdataservice.ac.uk/datacatalogue/series/series?id=200005#!/faq>  
(accessed 3.18.19).

Verba, S., Nie, N.H., 1987. Participation in America: Political Democracy and Social Equality, Political science. University of Chicago Press.

Voter turnout at UK general elections 1945 – 2017 | UK Political Info [WWW Document], n.d. URL <http://www.ukpolitical.info/Turnout45.htm> (accessed 4.24.19).

Wolfinger, R.E., Rosenstone, S.J., 1980. Who Votes? Yale University Press.

Wooldridge, J., 2008. Introductory Econometrics, International ed of 4th revised ed edition. ed. South Western College, Mason, Ohio.

## 10. Appendix

**Table 3: The conversion of the ‘Highest Educational Qualification’ (rqfedhi) variable into ‘Years of Education’ (Educationyrs)**

<b>Highest Educational Qualification</b>	<b>Years of Education</b>	<b>Sources</b>
No Qualification (Born before September 1 <sup>st</sup> 1957)	10	-
No Qualification (Born after September 1 <sup>st</sup> 1957)	11	-
CSE	11	(“About CSEs   Pearson qualifications,” n.d.)
O Level	11	-
GCE A Level	13	-
Nursing Qualification	16	(July and 2009, n.d.)
Teaching Qualification	17	(“How long does a PGCE Take?,” n.d.)
First Degree	16	Assumption: 3-year bachelor’s degree
Higher Degree	17	Assumption: 1-year master’s degree
Commercial Qualification, Other Higher Qualification, Apprenticeship, Other Qualification, Still at School/No Qualification	Omitted from sample	-

**Table 4: Variable Definitions**

<b>Variable Name</b>	<b>Definition</b>
Voted	A dummy variable = 1 if the individual voted in the 2005 general election, = 0 otherwise.
Volunteered	A dummy variable = 1 if the individual has volunteered at least once in the last year, = 0 otherwise.
Educationyrs	Years of education of the individual.
Age	Age of the individual.
Ln(Income)	The natural log of income for the year. 'Ln(Income)' is preferred over 'Income' because of the level-log interpretation given by a log independent variable e.g. how does a 1% increase in income affect voter/voluntary participation?
Married	A dummy variable = 1 if the individual is married or in a civil partnership, = 0 otherwise.
Supportsaparty	A dummy variable = 1 if the individual currently supports a political party, = 0 otherwise.
SES1	A dummy variable = 1 if the individual's current job is in a professional or managerial & technical occupation, = 0 otherwise.
SES2	A dummy variable = 1 if the individual's current job is a skilled manual or skilled non-manual occupation, = 0 otherwise.
Policy	A dummy variable = 1 if the individual was born after September 1 <sup>st</sup> 1957 and hence affected by the policy, = 0 otherwise.
Policy (Placebo)	<p>Placebo 1 – A dummy variable = 1 if the individual was born after September 1<sup>st</sup> 1965, = 0 otherwise.</p> <p>Placebo 2 – A dummy variable = 1 if the individual was born after September 1<sup>st</sup> 1949, = 0 otherwise.</p>

**Table 5: Placebo Testing – IV-probit estimates of factors influencing voting and volunteering decisions**

Independent Variables	Placebo 1				Placebo 2			
	Second Stage	First Stage	Second Stage	First Stage	Second Stage	First Stage	Second Stage	First Stage
	Voted (1)	Educationyrs (2)	Volunteered (3)	Educationyrs (4)	Voted (5)	Educationyrs (6)	Volunteered (7)	Educationyrs (8)
Educationyrs	-0.132 (0.521)		-0.108 (0.558)		-0.333 (0.367)		-0.206 (0.720)	
Age	0.0235 (0.0194)	0.0230 (0.0290)	0.0165 (0.0164)	0.0239 (0.0290)	-0.00667 (0.0688)	-0.0644 (0.0433)	0.0206 (0.116)	-0.0643 (0.0433)
Sex	-0.141 (0.145)	-0.336*** (0.106)	-0.0356 (0.196)	-0.323*** (0.106)	-0.162 (0.152)	-0.424*** (0.154)	-0.221 (0.154)	-0.421*** (0.154)
Ln(Income)	0.129 (0.227)	0.488*** (0.0645)	0.0626 (0.275)	0.492*** (0.0646)	0.113 (0.130)	0.336*** (0.0822)	0.0589 (0.261)	0.337*** (0.0822)
Married	0.256*** (0.0777)	0.196* (0.111)	0.166* (0.0893)	0.203* (0.111)	-0.0114 (0.276)	-0.311* (0.171)	0.0706 (0.414)	-0.303* (0.171)
Supportsaparty	1.019** (0.414)	0.250** (0.110)			0.533 (0.754)	0.0883 (0.151)		
SES1	0.807 (1.175)	2.722*** (0.155)	0.649 (1.336)	2.741*** (0.155)	1.297** (0.582)	2.905*** (0.214)	1.119 (1.412)	2.916*** (0.214)
SES2	0.126 (0.106)	0.165 (0.155)	-0.0270 (0.167)	0.162 (0.155)	0.227* (0.123)	0.448** (0.203)	0.00969 (0.464)	0.450** (0.203)
Policy (Placebo)		0.232 (0.198)		0.229 (0.198)		0.188 (0.284)		0.178 (0.284)
Constant	-1.036 (4.987)	5.782*** (1.695)	-1.272 (5.301)	5.768*** (1.698)	3.567 (7.625)	13.07*** (3.202)	-0.402 (15.32)	13.08*** (3.202)
Observations	1,433	1,433	1,433	1,433	810	810	810	810

Notes: Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Variable Definitions: See Table 4, Placebo 1 – Individuals born 6 years either side of September 1<sup>st</sup> 1965, Placebo 2 – Individuals born 6 years either side of September 1<sup>st</sup> 1949