

RESEARCH NOTE

Does Education Instill Civic Duty? Evidence from Monozygotic Twins in the United States and Sweden

Aaron C. Weinschenk¹, Christopher T. Dawes²,
and Sven Oskarsson³

¹ Department of Political Science, University of Wisconsin–Green Bay, USA; ² Wilf Family Department of Politics, New York University, USA; ³ Department of Government, Uppsala University, Sweden

Why do some people feel a strong sense of civic duty to vote while others feel no obligation at all? One factor that has been identified as an important antecedent of the sense of civic duty is education. In *The American Voter*, Campbell, Converse, Miller, & Stokes (1960) note that the sense of civic duty appears to “depend substantially on education” (480). Sniderman (1975) argues that “. . .the further one progresses through the educational process, the deeper and firmer his grasp of the norms of the ideal culture” (p. 134–135). In their seminal work on voting, Wolfinger & Rosenstone (1980) note that “American schools provide a good deal of explicit instruction and exhortation on citizenship that emphasizes the obligation to vote and thus might be thought to nurture a sense of civic duty. The better educated are more likely to follow social norms” (p. 18). More recently, Lewis-Beck, Jacoby, Norpoth, & Weisberg (2008) point out that education “. . .instills civic responsibility, the idea of voting as a duty” (p. 351). It turns out that in many empirical models, education is one of the strongest predictors of civic duty (see, e.g., Blais & Labbé-St-Vincent, 2011; Carreras, 2018; Dinesen, Nørgaard, & Klemmensen, 2014; Jackson, 1995; Weinschenk, 2014). Jackson (1995), for example, finds that “Education is. . .the primary influence on civic duty. Highly educated individuals are more likely to believe that a person should vote in an election, regardless of concern over the outcome” (p. 288) and concludes that “education contributes to turnout by producing citizens who believe that they have an obligation (civic duty) to vote” (p. 295).

All correspondence concerning this article should be addressed to Aaron C. Weinschenk, PhD, Department of Political Science, University of Wisconsin–Green Bay, 2420 Nicolet Drive, Green Bay, WI 54311, USA. E-mail: weinscha@uwgb.edu

In this article, we are interested in taking a closer look at the relationship between education and the sense of civic duty to vote.¹ Recently, political scientists have been interested in the question of whether education exerts a causal effect on political behaviors or whether it is proxying for pre-adult attributes or experiences, such as family socialization or psychological predispositions (Dinesen et al., 2016; Gidengil, Tarkiainen, Wass, & Martikainen, 2017; Oskarsson, Dinesen, Dawes, Johannesson, & Magnusson, 2017; Persson, 2015). Most of this work has focused on the relationship between education and voter turnout, with researchers only just starting to explore whether the relationship between education and political attitudes is causal or confounded. Since many studies have documented a positive relationship between education and the sense of civic duty, we are interested in assessing whether education exerts a causal effect on civic duty, as some studies contend, or whether the relationship between education and civic duty is confounded by other variables.

Existing research indicates that there are a number of possible factors that might confound the relationship between education and the sense of civic duty. Psychological attributes are one possible source of confounding. Numerous studies have shown that personality traits are correlated with the sense of civic duty (Blais and Labbé-St-Vincent, 2011; Dinesen, Nørgaard, & Klemmensen, 2014; Weinschenk, 2014; Weinschenk and Dawes, 2018) and educational attainment (Branigan, McCallum, & Freese, 2013; van Eijck and de Graaf, 2004). Additionally, research in psychology has demonstrated that many personality traits, including the Big Five, are partially heritable (Deary, Spinath, & Bates, 2006; Haworth et al., 2009; Jang, Livesley, & Vernon, 1996; Loehlin, McCrae, Costa, & John, 1998), as is educational attainment (Branigan, McCallum, & Freese, 2013). Importantly, numerous recent studies in the area of political psychology have shown that the sense of civic duty is moderately heritable (Dawes et al., 2014; Klemmensen et al., 2012; Weinschenk and Dawes, 2018). It is possible, then, that measures of education are capturing personality traits and/or genetic predispositions that are correlated with both education and civic duty.² Political socialization is another obvious potential confounder. Family experiences or attributes like parental education have been shown to influence one's educational attainment (Hossler, Schmit, & Vesper, 1997; Schlechter and Milevsky, 2010) and the sense of civic duty (Galais, 2018). Thus, education could be a proxy for pre-adult experiences or traits. Fortunately, methods exist that allow us to get a sense of whether the relationship between education and civic duty is confounded and, if so, to estimate the extent of confounding. More specifically, we make use of the quasi-experiment of twinning. By looking at the relationship between education and civic duty *within* monozygotic (MZ) twin pairs reared together, we are able to avoid potential confounders rooted in genetic factors and common environmental influences because such twins share both.

¹According to Blais and Galais (2016), "The civic duty to vote is the belief that one has a moral obligation to vote in elections" (p. 61). Throughout the article, we will use the term "sense of civic duty." We are specifically interested in the sense of civic duty to vote. Thus, when we used the phrase "sense of civic duty," we are talking about the duty to vote. We note, however, that civic duty could be conceptualized more broadly than just voting. Indeed, some scholars have measured the sense of civic duty using items about voting and a variety of other civic acts.

²Interestingly, a number of existing studies have found evidence of substantial genetic overlap between some attitudes (e.g., political efficacy) and political outcomes (e.g., participation) and between some personality traits (e.g., extraversion) and political outcomes (Dawes et al., 2014; Dawes, Settle, Loewen, McGue, & Iacono, 2015; Klemmensen et al., 2012). Dawes et al. (2014) note that "if the same set of genes influences psychological traits and political participation separately, then the observed relationship between the two may be at least in part confounded by genetic factors" (p. 898).

The rest of this article proceeds in a straightforward manner. In the next section, we provide an overview of our approach. In brief, we use the co-twin control design, a technique that has been used heavily in the field of labor economics (see, e.g., Ashenfelter and Krueger, 1994; Ashenfelter and Zimmerman, 1997; Isacson, 1999) but has only recently started to get attention in political science as a way of assessing confounding. We then describe the datasets and measures we use to examine the relationship between education and the sense of civic duty. We are not aware of any previous studies that have used the co-twin control design to study the effect of education on the sense of civic duty. After a discussion of the results, we provide ideas for future research.

The Co-twin Control Design

In this article, we use the quasi-experiment of twinning to study the effect of education on the sense of civic duty to vote. There are many examples in the political science literature of using data on twins to study the genetic and environmental sources of variance in political traits (Alford, Funk, & Hibbing, 2005; Dawes et al., 2014; Fowler, Baker, & Dawes, 2008; Settle, Dawes, & Fowler, 2009), which is typically done by comparing the phenotypic correlation among MZ twins, who are genetically identical, to the correlation among dizygotic twins, who share half of their genes. In this study, we instead employ twin data for a different purpose—to estimate the impact of education on civic duty using the co-twin control design.³ The strength of the co-twin control design, which makes use of just MZ twin pairs, stems from the fact that MZ twins are genetically identical and, assuming they have been reared together, have been exposed to the same family environment. Thus, by relating within-pair differences in education to within-pair differences in civic duty, we are able to estimate the impact education net of confounding factors rooted in genetic predispositions and early rearing environment. In effect, we will use one twin in a pair as the co-twin's credible (although not perfect) counterfactual (McGue, Osler, & Christensen, 2010).

Following previous work (Ashenfelter and Zimmerman, 1997; Isacson, 1999; Oskarsson, Dinesen, Dawes, Johannesson, & Magnusson, 2017), we assume that the true relationships between education and civic duty are:

$$Y_{1j} = \beta X_{1j} + F_j + \epsilon_{1j}, \quad (1a)$$

$$Y_{2j} = \beta X_{2j} + F_j + \epsilon_{2j}, \quad (1b)$$

where Y denotes civic duty and X is the measure of educational attainment of twin i (1, 2) in pair j (1, 2, ..., N). The error term in each equation consists of an individual-specific component (ϵ_{ij}) and a family-specific component (F_j). The family-specific effects vary across but not within twin pairs and capture unobserved family background and unobserved genetic traits potentially influencing both education and civic duty.

Differencing (1a) and (1b) controls for family effects:

$$Y_{1j} - Y_{2j} = \beta_{FE}(X_{1j} - X_{2j}) + (\epsilon_{1j} - \epsilon_{2j}), \quad (2)$$

where β_{FE} represents the within-twin pair estimate of the effect of education on civic duty. Since MZ twins are genetically identical and assumed to have the same rearing

³The co-twin control design is also sometimes referred to as the discordant twin design.

environment, the estimate of β_{FE} is not biased by these unmeasured factors.⁴ In addition to the assumption about the same rearing environment, it is important to note that the co-twin design makes the assumption that differences in education are exogenous conditional on the fixed effects. An important question following this assumption is what may cause such differences in otherwise similar individuals. Indeed, even though differencing will remove the influence of unobserved factors common to twin pairs, if differences in education *within* twin pairs are not exogenously given, it is possible that there are still within-twin pair differences in unobserved factors that affect educational attainment. Fortunately, this question has been taken up in a number of recent analyses. For example, [Lundborg \(2013\)](#) provides numerous examples of exogenously given differences in educational attainment. Comfortingly, [Lundborg \(2013\)](#) finds that numerous factors that may vary within twin pairs (e.g., birth weight, early-life health, parent-child relations) do not predict within-twin pair differences in schooling. Interestingly, [Sandewall, Cesarini, & Johannesson \(2014\)](#) also examined within-pair factors that might be related to educational attainment. They found that within-pair variation in one measure—IQ test scores—predicts within-pair variation in schooling. Our assumption is that within-pair variation in education is explained by factors not related to civic duty, but we note that if civic duty is related to IQ, the estimates from our fixed-effects models could be biased.

We are only aware of a few studies in political science that have used this approach, none of which have focused on the sense of civic duty. In the first study to use the co-twin control design, [Dinesen et al. \(2016\)](#) examined the effect of education on political participation.⁵ Interestingly, they found that while the relationship between education and political participation was highly confounded by genes and/or familial environment, a positive impact remained in some contexts.⁶ [Oskarsson, Dinesen, Dawes, Johannesson, & Magnusson \(2017\)](#) also adopted this approach to examine the effect of education on social trust in Sweden. They found that after accounting for early-life socialization in the family and heritable psychological traits, the estimated effect of education on social trust was close to zero and not statistically significant.

Data and Measures

In this article, we examine the relationship between education and the sense of civic duty to vote in two developed, democratic countries—the United States and Sweden. Given that we need datasets with large samples of MZ twins, measures of education, and measures of civic duty, the choice of countries primarily reflects data availability. As we describe below, in both countries we were able to identify datasets that contained relevant samples and measures. Nevertheless, we note that the comparative element of our study does raise the question of whether the relationship between education and

⁴A useful way to think about this approach is that it corresponds to a situation where we would estimate a dummy variable for each of the families in the dataset.

⁵There is an ongoing debate about the extent to which education causes political participation and this study attempts to contribute to the question of whether education exerts a causal effect. For examples of different approaches (none of which use the co-twin control design), see the following studies: [Berinsky and Lenz \(2011\)](#); [Hillygus \(2005\)](#); [Henderson and Chatfield \(2011\)](#); [Kam and Palmer \(2008, 2011\)](#); [Mayer \(2011\)](#); [Persson \(2012, 2014\)](#). In addition, see [Persson \(2015\)](#) for a detailed review of the literature.

⁶[Gidengil et al. \(2017\)](#) use a discordant design, but they focus on siblings rather than just twin siblings. Thus, the approach is slightly different.

civic duty plays out similarly in the two countries we study. Below, we provide an overview of the datasets and measures we use for our analyses.

MIDUS Study

The first dataset we use in this study is the National Survey of Midlife Development in the United States (MIDUS), which was conducted by the MacArthur Foundation Research Network on Successful Midlife Development. The study was designed to investigate patterns, predictors, and consequences of midlife development in the areas of physical health, psychological well-being, and social responsibility. The MIDUS survey was conducted in 1995–96. The baseline MIDUS study is based on data from four subsamples, which include a national random digit dialing (RDD) sample, oversamples from five metropolitan areas, a sample of siblings of individuals from the RDD sample, and a national RDD sample of twin pairs.⁷ In this article, we rely on the data from the sample of twin pairs. Twin pairs were recruited in a two-part sampling design. The first part of the design involved screening a representative national sample of approximately 50,000 households for the presence of a twin. Those who reported the presence of a twin in the family were then asked whether it would be acceptable for the research team to contact the twins to solicit their participation in the MIDUS study (60% gave permission to contact). All respondents were invited to participate in a phone interview and to complete two self-administered surveys. The twin subsample was administered a short screening survey to assess zygosity and additional twin-specific information.⁸ Since we are using the co-twin control design, we make use of just the MZ twins in the MIDUS dataset. In total, the MIDUS sample has 304 MZ twin pairs (608 twins) reared together.

To measure the sense of civic duty, we use the following question: Here is a list of hypothetical situations. Please rate how much obligation you would feel if they happened to you, using a 0–10 scale where 0 means “no obligation at all” and 10 means “a very great obligation.” If the situation does not apply to you, please think about how much obligation you would feel if you were in this situation: *To vote in local and national elections*. The response to this question is coded on an 11-point scale ranging from 0 (no obligation at all) to 10 (a very great obligation). Education is conceptualized in two ways. First, we make use of a 12 category measure where the categories range from no schooling/some grade school to advanced degree.⁹ To make sure our results are comparable across different datasets, we converted these categories into years.¹⁰ We use this measure of the years of schooling completed in our regression analyses. Second, we

⁷In all of the subsamples, all eligible participants were non-institutionalized, English-speaking adults in the coterminous United States, aged 25 to 74.

⁸For the twin subsample, the response rate for the phone survey was 60% and 92% for the self-administered surveys. Additional details about the MIDUS Study are available at the following website: <https://www.midus.wisc.edu/midus1/index.php>

⁹Categories are: No school/some grade school, Eighth grade/junior high school, Some high school, GED, Graduated from high school, 1 to 2 years of college, no degree yet, 3 or more years of college (no degree yet), Graduated from a 2-year college or vocational school, or associate’s degree, Graduated from a 4- or 5-year college, or bachelor’s degree, Some graduate school, Master’s degree, and Ph.D, ED.D, MD, DDS, LLB, LLD, JD, or other professional degree.

¹⁰To do this, we follow the lead of [Dinesen et al. \(2016\)](#). To convert education categories into years, they developed a coding scheme where non-high-school graduates = 10 years, High school graduate or GED = 12; Trade or technical training after high school = 13 years; Some college or AA degree = 14 years; College degree = 16 years; Professional, or graduate training or degree after college = 19 years.

developed a dummy variable indicating whether a respondent has a college degree or higher (yes coded as 1, rest coded as 0).

Swedish Twin Registry

Our second dataset comes from the Swedish Twin Registry (STR). The STR registry began in the 1950s and contains nearly all twins born in Sweden between 1886 and 2005, totaling more than 170,000 twins (Lichtenstein et al., 2006). The STR routinely administers surveys to its members, and in this article, we use data from a survey called Screening Across the Life-span Twin study, Younger cohort (SALTY).¹¹ The SALTY study was initiated in 2007 by a group of researchers in epidemiology, medicine, economics, and political science. Beginning in early 2009, the survey was sent out to 24,914 Swedish twins born between 1943 and 1958, and the final reminders were sent out in the spring of 2010. The survey generated a total of 11,578 responses. Of these, 11,261 (97.2%) respondents gave informed consent to have their responses stored and analyzed. Subject zygosity was classified either by questionnaire items with high reliability or, when available, by analysis of biosamples (Lichtenstein et al., 2006). In total, our sample is comprised of 990 complete MZ twin pairs (1,980 twins).

The SALTY study asked subjects one question about whether they view the act of voting as a civic duty. More specifically, they were asked: To what extent do you believe that people who are entitled to vote have a civic duty to cast their ballots in elections? Please indicate your response on the scale below: No duty (1) . . . Very strong duty (10).¹² Following the coding scheme above, we measure education as the number of years of schooling completed. We also developed a dummy variable indicating whether a subject has a college degree or higher.

Results and Analysis

Before proceeding to the results, it is important to confirm that there are within-twin pair differences for our key measures. Table 1 below provides a look at the mean differences for our measures and the percentage of pairs that differ on civic duty, the education measure (years of schooling), and the college degree (or higher) dummy variable. Overall, we see that there are indeed differences within twin pairs in both of the samples. This is important since the co-twin control design relates within-pair differences in education to within-pair differences in civic duty.

We begin our analysis by focusing on the MIDUS results, which are shown in the first four columns in Table 2.¹³ Here, we report estimates of the effects of our two measures of education on the sense of civic duty to vote. For each conceptualization of education, we report two sets of estimates. First, we present naïve OLS estimates (controlling for birth year and sex) in which twins are treated as individuals without regard to their membership in a twin pair and unobserved family factors are not taken

¹¹Twins in the Swedish Twin Registry with a date of birth between January 1, 1943, and December 31, 1958, were sent the SALTY survey, provided at least one member of each twin pair had previously participated in a major phone survey administered by the registry.

¹²We convert this to a 0–10 scale (from a 1–10 scale).

¹³We report the R^2 values for all models but note that the variation to be explained is very different between the OLS and FE models—in short, it is not all that meaningful to compare the R^2 values across the models.

Table 1.
Within-Twin Pair Differences, MIDUS, and STR Samples

	United States (MIDUS)		Sweden (STR)	
	Mean	St. Dev.	Mean	St. Dev.
Absolute difference in civic duty	1.87	2.37	2.33	2.29
Absolute difference in education (years)	1.13	1.58	1.26	1.58
Percentage differing on civic duty	65.46%		76.36%	
Percentage differing in college completion	12.83%		15.25%	
Percentage different in education (years)	40.46%		54.55%	

Table 2.
Impact of Education on Civic Duty to Vote

	United States (MIDUS)				Sweden (STR)			
	(1) OLS b/se	(2) FE b/se	(3) OLS b/se	(4) FE b/se	(5) OLS b/se	(6) FE b/se	(7) OLS b/se	(8) FE b/se
Education	0.219* (0.047)	0.037 (0.089)			0.130* (0.027)	0.067 (0.051)		
College			1.086* (0.228)	0.718 (0.482)			0.696* (0.148)	0.611* (0.266)
Birth year	-0.054* (0.010)		-0.054* (0.011)		-0.038* (0.015)		-0.033* (0.015)	
Male	-0.332 (0.251)		-0.329 (0.255)		-0.087 (0.146)		-0.087 (0.146)	
Constant	111.011* (20.433)	7.418* (1.268)	113.996* (21.002)	7.723* (0.174)	80.082* (29.579)	6.368* (0.626)	71.695* (29.550)	7.049* (0.078)
<i>N</i>	608	608	608	608	1,980	1,980	1,980	1,980
<i>R</i> ²	0.08	0.03	0.08	0.02	0.02	0.01	0.01	0.01

*FE = Fixed-effects; OLS = Ordinary Least Squares. $p < .05$, two-tailed.

into account. This is the typical way of assessing the effect of education on civic duty (i.e., this is how one would examine the effect in a cross-sectional analysis).¹⁴ Second, we present twin-pair fixed-effects estimates, which gauge the within-pair impact of education on civic duty. These are the estimates of primary interest, but it is important to present the OLS estimates since they function as benchmarks against which the fixed-effects models that account for confounding due to genetic factors and familial socialization can be compared. A number of important findings emerge from the MIDUS results in Table 2. A look at the naïve OLS estimates indicates that there is a strong,

¹⁴In co-twin control models, sex and age are controlled for by design (within-family estimates using same-sex twins). We include age and sex as covariates in the OLS models (as do most other papers that use the co-twin control design) so that the estimates are comparable to the FE estimates.

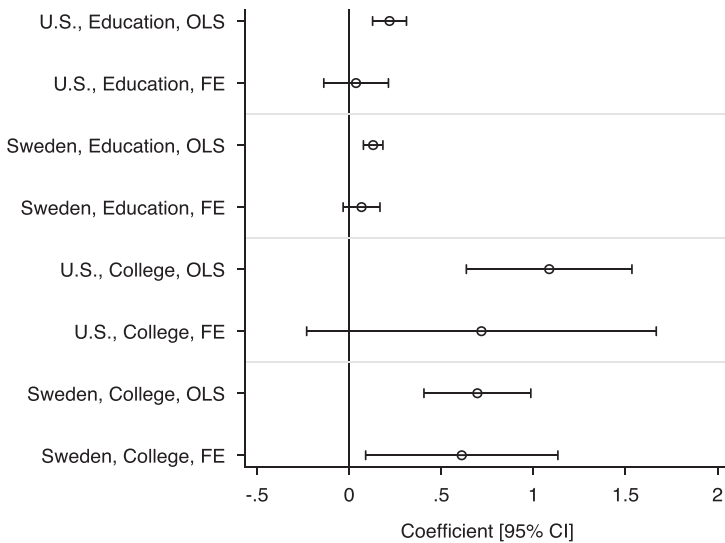
positive relationship between education and the sense of civic duty to vote. This is consistent with what many previous studies have reported (Blais and Labbé-St-Vincent, 2011; Weinschenk, 2014; Dinesen, Nørgaard, & Klemmensen, 2014; Jackson, 1995). A comparison between the OLS estimates and the twin-pair fixed-effects estimates, however, indicates that the OLS estimates are upward biased, and once confounding stemming from genetic factors and familial socialization is taken into account in the twin-pair fixed-effects models, the estimated effect of education on civic duty drops dramatically in the models shown in Table 2. In the models that use the continuous measure of education (years of schooling), the education coefficient drops from 0.219 ($p < .05$) in the OLS specification to 0.037 in the twin-pair fixed-effects specification, which amounts to an 83% reduction in the magnitude of the effect. In the twin-pair fixed-effects model, the coefficient is not statistically significant ($p = .675$). In the models that use a dummy variable to measure whether one has a college degree or higher, there is also a reduction in the effect of education across the models. In the OLS model, the coefficient on the college education variable is 1.086 ($p < .05$), but in the twin-pair fixed-effects model, the coefficient drops to 0.718, which is a 34% decrease in the magnitude of the coefficient. In addition, the coefficient is not statistically significant at the $p < .05$ level, though we note that it is fairly close at $p = .069$ (one-tailed).

The results from the Swedish sample are shown in the last four columns (5–8) in Table 2. As was the case above, the naïve OLS estimates indicate that there is a strong, positive relationship ($p < .05$) between education and the sense of civic duty to vote. However, when we compare the OLS estimates to the fixed-effects estimates, we see that they are upward biased. In the models that use the years of schooling measure, the education coefficient drops from 0.130 in the OLS specification to 0.067 in the twin-pair fixed-effects specification, which amounts to a 48% reduction in the magnitude of the effect. In the fixed-effects specification, the coefficient is not statistically significant at the $p < .05$ level. In the models that use a dummy variable to measure whether one has a college degree or higher, we also see a reduction in the effect of education across the models. In the OLS model, the coefficient is 0.696 and drops to 0.611 when we move to the fixed-effects specification. Both of the coefficients are statistically significant at $p < .05$, but the size of the coefficient drops by about 12% when moving from the OLS model to the fixed-effects model. A look at Figure 1, which plots the coefficients (and 95% CIs) from the models shown in Table 2, helps to visualize the reduction in the magnitude of the education effects when comparing the OLS results to the fixed-effects results.

Overall, our results show that the concern over confounding of the relationship between education and civic duty by genetic factors and/or familial environment is well-directed. Indeed, the relationship between education and civic duty is to a certain degree confounded, irrespective of the measure of education we use. However, it is interesting to note that even though the magnitude of the college education dummy variable decreases when moving from the OLS to fixed-effects models, the effect remains statistically significant at $p < .05$ in the Swedish sample and is close to being statistically significant ($p = .069$, one-tailed) in the U.S. sample. This suggests that, even after accounting for confounding, education may be more influential at certain margins. When it comes to civic duty, it appears that having a college education is more important than the average effect of education (i.e., the effect of the years of education measure in our models). Our finding that college is an especially important threshold fits well with research on the influence of schooling on political participation (see, e.g.,

Figure 1.

Comparison of OLS and fixed-effects estimates of the effect of education on civic duty to vote



Henderson and Chatfield, 2011). Interestingly, in a recent analysis on the impact of education on political engagement, Dinesen et al. (2016) found that even though the relationship between education and political participation is confounded by genes and/or family environment, education still had a positive impact in some of their samples.

Conclusion and Future Research

Many studies have shown that education has a positive effect on the sense of civic duty (Blais and Labbé-St-Vincent, 2011; Carreras, 2018; Dinesen, Nørgaard, & Klemmensen, 2014; Jackson, 1995; Weinschenk, 2014). However, few studies have scrutinized the relationship between these two variables. Indeed, there are numerous confounders that may influence the relationship between education and the sense of duty. Our approach here was to employ the co-twin control design, which focuses on the relationship between education and civic duty *within* MZ twin pairs reared together. This enabled us to avoid potential confounders rooted in genetic factors and common environmental influences because such twins share both. Using data from two samples of MZ twins, one from the United States and one from Sweden, we found that the relationship between education and civic duty is confounded by genetic factors and/or familial environment. Our results were fairly similar across the two countries studied in this article. Interestingly, although we find that the relationship between having a college degree or higher and civic duty is confounded to some extent, this measure of educational attainment has a positive effect on the sense of civic duty (at $p < .05$ in Sweden and $p < .10$ in the United States) even after accounting for confounders. While it will likely be difficult to disentangle the genetic and environmental confounders, we are able to provide some preliminary ideas. In the MIDUS study, twins were asked about the extent to which they dressed differently

growing up, which we can use as a weak proxy for differences in familial environment.¹⁵ The results of models that include this item as a control are presented in the [Supplementary Appendix](#). Overall, we find that the results reported in [Table 2](#) do not change much after including the dress similarity item.¹⁶ Indeed, the coefficients and significance levels are nearly identical when we compare the models. We take this as tentative evidence that the source of the confounding is likely genetic. However, further research is needed in order to get a better handle on the sources of confounding.

Based on our results, we see a number of directions for future research. First, we encourage replications of this study. It is important to make sure that findings are consistent across different datasets and measures. Second, researchers should consider applying the approach used here to study other relationships that might be confounded. For example, scholars could examine the effect of education on political orientations, such as political interest and political efficacy, using the co-twin design. Finally, in addition to studying other orientations, we encourage future studies in a wide range of contexts. It will be important to examine whether similar findings emerge across different places. In the end, we believe that the co-twin control design can help researchers develop a better understanding of relationships that may theoretically be confounded by heritable psychological factors and/or the early-life family environment.

Funding

The Swedish Twin Registry is supported by grants from the Swedish Research Council and the Ministry for Higher Education.

Supplementary Data

[Supplementary Data](#) are available at *IJPOR* online.

References

- Alford, J., Funk, C., & Hibbing, J. (2005). Are political orientations genetically transmitted? *American Political Science Review*, *99*(2), 153–167.
- Ashenfelter, O., & Krueger, A. (1994). Estimates of the economic return to schooling from a new sample of twins. *The American Economic Review*, *84*(5), 1157–1173.
- Ashenfelter, O., & Zimmerman, D. J. (1997). Estimates of the returns to schooling from sibling data: Fathers, sons, and brothers. *The Review of Economics and Statistics*, *79*(1), 1–9.
- Berinsky, A. J., & Lenz, G. S. (2011). Education and political participation: Exploring the causal link. *Political Behavior*, *33*(3), 357–373.
- Blais, A., & Galais, C. (2016). Measuring the civic duty to vote: A proposal. *Electoral Studies*, *41*, 60–69.

¹⁵Question wording is “How often did you dress alike – always, most of the time, sometimes, or never?” We thank an anonymous reviewer for the suggestion to use this item as a rough proxy for family environment.

¹⁶This variable is significantly correlated with the dependent variable in the two OLS models in the [Supplementary Appendix](#).

- Blais, A., & Labbé-St-Vincent, S. (2011). Personality traits, political attitudes and the propensity to vote. *European Journal of Political Research*, 50(3):395–417.
- Branigan, A., McCallum, K., & Freese, J. (2013). Variation in the heritability of educational attainment: An international meta-analysis. *Social Forces*, 92, 109–140.
- Branigan, A., McCallum, K., & Freese, J. (2013). Variation in the heritability of educational attainment: An international meta-analysis. Northwestern University Institute for Policy Research Working Paper.
- Campbell, A., Converse, P., Miller, W., & Stokes, D. (1960). *The American voter*. Chicago, IL: University of Chicago Press.
- Carreras, M. (2018). Why no gender gap in electoral participation? A civic duty explanation. *Electoral Studies*, 52, 36–45.
- Dawes, C., Cesarini, D., Fowler, J. H., Johannesson, M., Magnusson, P. K., & Oskarsson, S. (2014). The relationship between genes, psychological traits, and political participation. *American Journal of Political Science*, 58(4), 888–903.
- Dawes, C. T., Settle, J. E., Loewen, P. J., McGue, M., & Iacono, W. G. (2015). Genes, psychological traits and civic engagement. *Philosophical Transactions of the Royal Society of London, Series B Biological Sciences*, 370(1683), 20150015.
- Deary, I., Spinath, F. M., & Bates, T. C. (2006). Genetics of intelligence. *European Journal of Human Genetics*, 14, 690–700.
- Dinesen, P., Dawes, C., Johannesson, M., Klemmensen, R., Magnusson, P., Norgaard, S., . . . Pedersen, I. (2016). Estimating the causal impact of education and political engagement: Evidence from monozygotic twins in Denmark, Sweden, and the United States. *Political Behavior*, 38(3), 579–601.
- Dinesen, P. T., Norgaard, A. S., & Klemmensen, R. (2014). The civic personality: Personality and democratic citizenship. *Political Studies*, 62(S1), 134–152.
- Fowler, J. H., Baker, L. A., & Dawes, C. T. (2008). Genetic variation in political behavior. *American Political Science Review*, 102(2):233–248.
- Galais, C. (2018). How to make dutiful citizens and influence turnout: The effects of family and school dynamics on the duty to vote. *Canadian Journal of Political Science*, 51(3), 599–617.
- Gidengil, E., Tarkiainen, L., Wass, H., & Martikainen, P. (2017). Turnout and education: Is education proxying for pre-adult experiences within the family? *Political Science Research and Methods*, 7(2), 1–17.
- Haworth, C., Wright, M., Martin, N., Martin, N., Boomsma, D., Bartels, M., . . . Plomin, R. (2009). A twin study of the genetics of high cognitive ability selected from 11,000 twin pairs in six studies from four countries. *Behavior Genetics*, 39, 359–370. 10.1007/s10519-009-9262-3.
- Henderson J., & Chatfield, S. (2011). Who matches? Propensity scores and bias in the causal effects of education on participation. *Journal of Politics*, 73(3), 646–658.
- Hillygus, D. S. (2005). The missing link: Exploring the relationship between higher education and political engagement. *Political Behavior*, 27(1), 25–47.
- Hossler, D., Schmit, J., & Vesper, N. (1997). *Going to college: How social, economic, and educational factors influence the decisions students make*. Baltimore, MD: Johns Hopkins University Press.
- Isacson, G. (1999). Estimates of the return to schooling in Sweden from a large sample of twins. *Labour Economics*, 6, 471–489.

- Jackson, R. (1995). Clarifying the relationship between education and voter turnout. *American Politics Quarterly*, 23(3), 279–299.
- Jang, K., Livesley, W., & Vernon, P. (1996). Heritability of the big five personality dimensions and their facets: A twin study. *Journal of Personality*, 64, 577–591.
- Kam, C. D., & Palmer, C. (2011). Rejoinder: Reinvestigating the causal relationship between higher education and political participation. *Journal of Politics*, 73(7), 659–663.
- Kam, C. D., & Palmer, C. L. (2008). Reconsidering the effects of education on political participation. *The Journal of Politics*, 70(03), 612–631.
- Klemmensen, R., Hatemi, P. K., Hobolt, S. B., Petersen, I., Skytthe, A., & Nørgaard, A. S. (2012). The genetics of political participation, civic duty, and political efficacy across cultures: Denmark and the United States. *Journal of Theoretical Politics*, 24(3), 409–427.
- Lewis-Beck, M., Jacoby, W., Norpoth, H., & Weisberg, H. (2008). *The American voter revisited*. Ann Arbor, MI: University of Michigan Press.
- Lichtenstein, P., Sullivan, P., Cnattingius, S., Gatz, M., Johansson, S., Carlstrom, E., . . . Pedersen, N. (2006). The Swedish Twin Registry in the third millennium: An update. *Twin Research and Human Genetics*, 9(6), 875–882.
- Loehlin, J., McCrae, R., Costa, P., & John, O. (1998). Heritabilities of common and measure-specific components of the big five personality factors. *Journal of Research in Personality*, 32, 431–453.
- Lundborg, P. (2013). The health returns to schooling—What can we learn from twins? *Journal of Population Economics*, 26, 673–701.
- Mayer, A. K. (2011). Does education increase political participation? *The Journal of Politics*, 73(03), 633–645.
- McGue, M., Osler, M., & Christensen, K. (2010). Causal inference and observational research: The utility of twins. *Perspectives on Psychological Science*, 5(5), 546–556.
- Oskarsson, S., Dinesen, P. T., Dawes, C. T., Johannesson, M., & Magnusson, P. (2017). Education and social trust: Testing a causal hypothesis using the discordant twin design. *Political Psychology*, 38(3), 515–531.
- Persson, M. (2012). Does type of education affect political participation? Results from a panel survey of Swedish adolescents. *Scandinavian Political Studies*, 35(3), 198–221.
- Persson, M. (2014). Testing the relationship between education and political participation using the 1970 British cohort study. *Political Behavior*, 36(4), 877–897.
- Persson, M. (2015). Review article: Education and political participation. *British Journal of Political Science*, 45(3), 689–703.
- Sandewall, Ö., Cesarini, D., & Johannesson, M. (2014). The co-twin methodology and returns to schooling—Testing a critical assumption. *Labour Economics*, 26, 1–10.
- Schlechter, M., & Milevsky, A. (2010). Parental level of education: associations With psychological wellbeing, academic achievement and reasons for pursuing higher education in adolescence. *Educational Psychology*, 30(1), 1–10.
- Settle, J. E., Dawes, C. T., & Fowler, J. H. (2009). The heritability of partisan attachment. *Political Research Quarterly*, 62(3), 601–613.
- Sniderman, P. (1975). *Personality and Democratic Politics*. Berkely, CA: University of California Press.

- van Eijck, K., & de Graaf, P. M. (2004). The big five at school: The impact of personality on educational attainment. *The Netherlands' Journal of Social Sciences*, 40(1), 24–40.
- Weinschenk, A. (2014). Personality traits and the sense of civic duty. *American Politics Research*, 42(1), 90–113.
- Weinschenk, A., & Dawes, C. T. (2018). Genes, personality traits, and the sense of civic duty. *American Politics Research*, 46(1), 47–76.
- Wolfinger, R., & Rosenstone, S. (1980). *Who votes*. New Haven: Yale University Press.

Biographical Notes

Aaron C. Weinschenk is an associate professor of Political Science at the University of Wisconsin–Green Bay. His research focuses on political participation, elections, and voting behavior. He has published in journals such as *Political Behavior*, *Political Research Quarterly*, *Electoral Studies*, and the *Journal of Elections, Public Opinion & Parties*.

Christopher T. Dawes is an associate professor in the Wilf Family Department of Politics at New York University. His research focuses on political behavior, voter turnout, genopolitics, and experimental methods. His work has appeared in journals such as the *American Political Science Review*, the *American Journal of Political Science*, and the *Journal of Politics*.

Sven Oskarsson is Professor in the Department of Government at Uppsala University. His research interests include political representation and participation and social science genomics. His previous work has appeared in journals such as *American Political Science Review*, *American Journal of Political Science*, *Political Behavior*, *Nature*, and *Behavior Genetics*.