



Genes, Personality Traits, and the Sense of Civic Duty

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Abstract

Political scientists have long known that the sense of civic duty is one of the strongest predictors of individual voter turnout, yet scholars are only just starting to study and understand the origins of this orientation. Recent genopolitics research has indicated that the sense of civic duty is heritable, and recent research in political psychology has illustrated that individual personality traits, many of which have a heritable component, shape feelings of civic obligation. In this article, we link these two lines of inquiry to better understand how individual differences shape the sense of civic duty. More specifically, we explore the relationship between personality traits, measured using the Big Five model; genes; and the sense of civic duty. We show that genetic factors account for between 70% and 87% of the correlation between civic duty and four of the Big Five personality traits. Overall, the results presented here expand our understanding of the process through which prosocial orientations, such as civic duty, are formed.

Keywords

civic duty, voter turnout, personality traits, Big Five, genes, genopolitics, prosocial

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Introduction

Why do some people vote while others do not? This is one of *the* classic questions in political science. For decades now, political scientists have grappled with this question, which seems fairly straightforward but is actually remarkably complicated. Indeed, after decades of study, scholars are still trying to explain variation in voter turnout. The study of voter turnout is so important and intriguing that scholars in other disciplines, including economics and psychology, have also attempted to answer the question of why some vote and some do not. One of the most prominent ideas about political participation—and one that has influenced much research in political science, economics, and psychology—begins with the assumption that individuals will vote if the expected utility from voting exceeds the expected utility from not voting. According to Downs (1957), the decision to vote can be represented by the equation $R = (B \times P) - C$, where R is the reward that one receives from voting, B is the utility gain from getting the preferred outcome, P is the probability that the individual's vote will yield the preferred outcome (the probability that the individual is the pivotal voter), and C is the cost of voting. According to the calculus of voting equation, if $R > 0$, then it is rational to vote and if $R \leq 0$, then it is not rational to vote. Given the infinitesimal chance of being the pivotal voter and the notion that $C > 0$, B would have to be a large number for R to be positive. Thus, R will typically be negative (even when a person votes), which means that voting is irrational.

Recognizing that many people vote, despite the irrationality of voting according to the calculus of voting equation, Riker and Ordeshook (1968) attempted to modify the equation to account for other factors that might shape the vote decision. Their famous modification suggests that the calculus of voting is represented by the equation $R = (B \times P) - C + D$. Here, the D term represents the positive benefits associated with the act of voting. Many people think of the D term as the sense of civic duty to vote. According 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). It is important to note that the sense of civic duty is about an *individual's* sense of obligation, but it is also about making a *contribution to others and ultimately to society as a whole*. Indeed, as Loewen and Dawes (2012) note, “A sense of a duty to vote is a *prosocial orientation* applied to politics” (p. 364, emphasis added). Although voting is often costly to the individual who does it, some people feel obligated to contribute to their local, state, or national government (or all of the above), despite the costs of participating, by taking part in elections. The ability of people to behave prosocially is important for the functioning of democracy.

A great deal of work in political science (Blais, 2000; Blais & Achen, 2010; Blais & Labbé-St-Vincent, 2011; A. Campbell, Converse, Miller, & Stokes, 1960; Galais & Blais, 2014; Lewis-Beck, Jacoby, Norpoth, & Weisberg, 2008) has illustrated that the sense of civic duty is a powerful predictor in models of individual voter turnout. In fact, Blais (2000) has noted that the sense of civic duty is the *single* most important predictor of the decision to vote. Some people feel a strong obligation to vote while others feel no obligation at all; those with a strong sense of civic duty are much more likely to vote than those who do not (Blais, 2000). Interestingly, despite the importance of the sense of civic duty, relatively little research has been done on its antecedents. Where does the sense of duty come from? Much work has been done on the origins of party identification (A. Campbell et al., 1960; Niemi & Jennings, 1991), political efficacy (Finkel, 1985), political knowledge (Delli Carpini & Keeter, 1996), trust in government (Hetherington, 1998), and ideology (Converse, 2006), but we know very little about why some people feel a strong sense of civic duty and why others do not. Given the importance of civic duty as an antecedent of voter turnout, it is critical to understand the origins of this political orientation. If civic duty is shaped primarily by environmental factors (e.g., schools, parental socialization, religious institutions, etc.), it may be possible to design interventions to cultivate the sense of civic obligation. If the sense of civic duty is more deeply rooted within individuals, those who are interested in increasing feelings of civic duty may have to be more creative when thinking about how to shape this orientation. Of course, just because deeply rooted individual differences (e.g., personality traits, genes, psychological dispositions, etc.) influence an attitude or behavior does not mean that people are guaranteed to behave or feel a certain way. Deeply rooted factors may *predispose* people to hold a certain attitude or respond in a particular way to a stimulus but they are *not deterministic*. Knowing which innate differences shape the sense of civic duty might be helpful in designing interventions that appeal to people whose attributes initially lead them to feel a weak sense of civic duty. Certain messages or programs might be very effective in cultivating the sense of civic duty for people with a particular trait or set of traits but ineffective for people with a different trait or set of traits. A number of experimental studies have started to consider the extent to which receptivity to political messages and voter mobilization appeals is influenced by personality traits and biological attributes (Gerber, Huber, Doherty, Dowling, & Panagopoulos, 2011; Settle, Dawes, Loewen, & Panagopoulos, Forthcoming; Weinschenk & Panagopoulos, 2014).

In this article, we examine two questions about the sense of obligation to vote in elections.¹ First, we are interested in understanding the origins of the sense of duty to vote. To examine the origins of the sense of duty to vote, we

use a technique that allows us to estimate the extent to which this orientation is heritable and the extent to which it is driven by environmental factors. Second, to the extent that the sense of duty is heritable, we are interested in learning whether there is genetic overlap between individual personality traits, many of which psychologists have found to be heritable, and the sense of civic duty to vote. A number of previous studies have found that individual differences in personality traits shape the sense of duty to vote (Blais & Labbé-St-Vincent, 2011; Dinesen, Nørgaard, & Klemmensen, 2014; Weinschenk, 2014). Thus, we are interested in building upon and extending previous research in this area. The rest of this article proceeds in a straightforward manner. In the next section, we provide an overview of the literature on the etiology of civic duty. We then proceed to a discussion about the possible connection between genes, personality traits, and civic duty. After describing our data and measures, we analyze the link between genes, the Big Five traits, which capture important elements of personality, and civic duty, yielding one of the first empirical studies to connect these three factors. We conclude with a discussion of the implications of our results and ideas for future research.

The Origins of Civic Duty

As we noted above, little political science research has been done on the antecedents of civic duty compared with other political attitudes. When it comes to civic duty, the focus has primarily been on the effects of this orientation on political behavior. As Galais and Blais (2014) observe,

A large body of literature has shown that benefits and costs cannot fully account for the decision to vote or abstain, and that some form of expressive benefits or moral obligations should be added to the equation. Thus, most models include a “Duty” term that improves their explanatory power. Yet there is still a lot to learn about this “D” term. (p. 11)

Delli Carpini (2009) notes that “There is little empirical research, however, that attempts to uncover how normative theories of obligation translate into individual values, opinions, or behaviors, or that tries to explain why people differ in their sense of duty” (p. 37). D. Campbell (2006) points out that “a sense of civic duty has largely been ignored as a subject of serious research” and goes on to argue that “the early consensus regarding the importance of civic duty seems to have closed it off. Having recognized that people vote out of a sense of duty, political scientists moved on to other explanations for why people vote” (p. 191). Importantly, though, the finding that civic duty greatly affects voter turnout “only prompts second-order questions like where a

sense of duty comes from and why some people have more of it than others” (D. Campbell, 2006, p. 191).

There have been a number of studies on the antecedents of the sense of duty, and existing research provides a useful starting point for thinking about the factors that shape feelings of civic obligation. Blais (2000) examines the impact of a number of political and demographic variables on the sense of duty. His analysis reveals that women, those who are politically interested, older people, those with higher incomes, and more religious individuals have a stronger sense of duty than their counterparts. D. Campbell (2006) also explores where feelings of civic obligation come from (and what effects they have). He focuses on adolescent experiences and finds that being socialized in a community that has strong civic norms increases feelings of civic obligation and the chance that an adolescent will participate in civic life when he or she reaches adulthood. Campbell also notes that the presence of an encouraging civic climate in one’s high school can have an important effect on civic obligation later on in life. Thus, the early experiences that one has can have a profound impact on his or her sense of civic duty.

Although Campbell focuses on how the attributes of the schools and communities that people are socialized in early on in life can affect them later on, it is interesting to consider whether attributes that people have *early on in life* affect their attitudes and behaviors. A number of recent studies provide insight into the impact of personality traits, which develop at a fairly young age (McCrae & Costa, 2003, 1992) and are remarkably stable over time (Pullman, Raudsepp, & Allik, 2006), on the sense of civic duty. Blais and Labbé-St-Vincent (2011) examine the impact of four lower-level personality traits on the sense of duty to vote. They focus on shyness, conflict avoidance, efficacy, and altruism. They find that three of these personality traits have statistically significant effects on the sense of civic duty, after controlling for demographic variables. Those individuals who are more altruistic and who have higher levels of self-efficacy feel a stronger sense of duty to vote than their counterparts. Those who are shy feel a weaker sense of civic duty than those who are not. More recently, Dinesen et al. (2014) and Weinschenk (2014) investigate the impact of the Big Five personality traits, which are Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability (or the inverse Neuroticism), on the sense of civic duty to vote. Both of those studies find that Extraversion, Agreeableness, and Conscientiousness are statistically significant predictors of the sense of duty to vote. Weinschenk’s study also identified a positive and statistically significant effect for Openness (Openness had a positive effect in the Dinesen et al., 2014, study but was not statistically significant). In short, it appears that the sense of civic duty is at least partially shaped by one’s personality traits.

A number of studies have investigated the extent to which biological factors explain the sense of duty to vote. Loewen and Dawes (2012) for example, use a twin study design to estimate the extent to which the sense of duty is heritable. Their analysis indicates that 34% to 46% of civic duty is heritable.² More recently, Dawes et al. (2014), using a sample of Swedish twins, estimate that about 29% of the sense of civic duty is heritable.³ Dawes et al. (2014) also examine the extent to which the relationship between genes and political orientations is mediated by three psychological traits—cognitive ability, personal control, and extraversion (one of the Big Five traits). Although they examine a number of political behaviors and orientations, their analysis of civic duty illustrates that the genetic correlations between civic duty and the three psychological traits are statistically significant. It appears that a common genetic factor can explain most of the relationship between political behaviors, as well as orientations, and psychological traits, although, as Dawes et al. (2014) note, much more research is needed to sort out the pathways between genes, psychological traits, political orientations, and behaviors. In this article, we build on previous research by investigating the link between genes, the Big Five personality traits, and the sense of civic duty to vote in elections.

Linking Genes, the Big Five Traits, and Civic Duty

Given the research outlined above, we believe it is important and worthwhile to expand the study of individual differences and political orientations. In this article, we are interested in the connection between genes, the Big Five personality traits, and the sense of civic duty. As we noted above, previous studies (Dawes et al., 2014; Loewen & Dawes, 2012) have illustrated that the sense of civic duty is heritable. However, existing studies are only just starting to provide insight into the mechanisms that link genes and political orientations like the sense of civic duty. As previous research (Dawes et al., 2014; Ksiazkiewicz, Ludeke, & Krueger, 2016; Mondak, Hibbing, Canache, Seligson, & Anderson, 2010; Oskarsson et al., 2015) has suggested, personality traits could be a plausible link between genes and political orientations and behaviors. Fortunately, a voluminous body of literature in psychology exists on the measurement, effects, and causes of individual personality traits, which we use to guide our study. A great deal of work has focused on the Big Five personality traits, which is where we focus our attention in this article. In brief, “The Big-Five framework suggests that most individual differences in human personality can be classified into five broad, empirically derived domains” (Gosling, Rentfrow, & Swann, 2003, p. 506). Table 1 provides a brief overview of some of the attributes associated with the Big Five traits.

Table 1. Descriptions of Big Five Personality Traits.

Trait	High scores	Low scores
Extraversion	sociable, active, assertive	reserved, quiet, shy
Agreeableness	altruistic, cooperative, trusting	hard-headed, skeptical
Conscientiousness	follows norms, organized	easygoing, careless
Openness	broad interests, imaginative	practical, traditional
Emotional stability	even-tempered, calm	anxious, nervous

For each trait, we have listed a number of adjectives that characterize people with high and low scores on each trait.⁴

The Big Five are among the most widely researched personality traits within the field of psychology and, as John and Srivastava (1999) note, “After decades of research, the field is approaching consensus on a general taxonomy of personality traits, the ‘Big Five’ personality dimensions.” A range of studies have confirmed that the Big Five traits are heritable (Bouchard, 1994, 2004; Jang, Livesley, & Vernon, 1996; Loehlin, McCrae, & Costa, 1998; McCrae & Costa, 2003; Stelmack, 1991). Importantly, across different studies, heritability estimates for the Big Five traits are generally very similar.⁵

Political science research has demonstrated that the sense of civic duty is heritable and psychology research has illustrated that personality traits are heritable. It is important to note that a number of studies have illustrated that the Big Five traits (and also a number of lower-level personality items—shyness, efficacy, and altruism—that fit into the Big Five model) exert statistically significant effects on the sense of civic duty (Blais & Labbé-St-Vincent, 2011; Dinesen et al., 2014; Weinschenk, 2014).

Agreeableness has also been shown to be positively related to civic duty (Dinesen et al., 2014; Weinschenk, 2014). People with high scores on this trait tend to have a prosocial or communal orientation and are altruistic, trusting, and willing to cooperate. Interestingly, Blais and Labbé-St-Vincent (2011) find that one element of Agreeableness, altruism, is positively related to civic duty, which makes theoretical sense.

When it comes to Extraversion (and traits that fall within this personality factor), previous studies have identified a positive relationship (Blais & Labbé-St-Vincent, 2011; Dinesen et al., 2014; Weinschenk, 2014). Blais and Labbé-St-Vincent (2011) find that shyness, one trait that is part of the Extraversion factor, is significantly related to feelings of civic duty. According to their analysis, shy people feel a weaker sense of duty to vote than people who are not shy. Because extraverts are likely to feel more fully

integrated into society, they may, therefore, feel more obligated to abide by societal norms than their counterparts.

When it comes to Openness, previous studies have hypothesized a positive relationship (Dinesen et al., 2014; Weinschenk, 2014). Those with high scores on Openness tend to be intellectual and enjoy cognitive stimulation (McCrae & Costa, 2003) and may appreciate the intellectual elements associated with making a vote choice. Indeed, Gerber, Huber, Doherty, and Dowling (2011) find that Openness is positively related to political interest, knowledge, and media consumption. People with high scores on Openness may feel obligated to participate in the political process, in part, to make use of the information and knowledge they have about politics. Dinesen et al. (2014) also note that “given the importance attached to open-mindedness and alternative thinking among people high on Openness to experience, this trait should be positively associated with adherence to norms that promote these qualities” (p. 138). Weinschenk (2014) finds that Openness has a positive and statistically significant effect on the sense of duty and Dinesen et al. (2014) find a positive effect (though not statistically significant at conventional levels).

Emotional Stability has been positively related to the sense of civic duty to vote, though it was not statistically significant in previous analyses (Weinschenk, 2014). In general, people with high scores on Emotional Stability are calm, confident, relaxed, and experience negative emotions at a lower rate than those with low scores on this trait. Interestingly, Blais and Labbé-St-Vincent (2011) find that self-efficacy, which is highly correlated with Emotional Stability (Judge, Erez, Bono, & Thoresen, 2002), has a positive and statistically significant effect on civic duty. It is also worth noting that Littvay, Weith, and Dawes (2011) find that general measures of self-efficacy are heritable and that the covariance between efficacy and civic duty is driven by underlying additive genetic sources.

Previous research has found that Conscientiousness is positively related to the sense of civic duty (Dinesen et al., 2014; Gallego & Oberski, 2012; Schoen & Steinbrecher, 2013; Weinschenk, 2014).⁶ In their article on the link between the Big Five personality traits, attitudes, and political participation, Gallego and Oberski (2012), for example, note that they expect that “conscientiousness positively affects voter turnout indirectly, by making it more likely to adhere to the idea that voting is a duty.”⁷ They go on to argue that

in the US the trait of conscientiousness has been found to have no effect (Mondak et al. 2010) or a negative effect (Gerber et al. 2011) on turnout. Theoretically, the most plausible mechanism linking conscientiousness to turnout is the norm of civic duty (Mondak et al. 2010). Social norms are socially

enforced rules of conduct that operate in three steps. People need to be aware that they exist. Second, norms may or may not be internalized and accepted. Finally, norms are enforced (see Gerber et al., 2008). Conscientiousness should play a role in the second step. Conscientious people should be more ready to internalize the norm that voting is a duty and to act accordingly. (p. 428)

Given that people with high scores on the Conscientiousness trait tend to follow rules and norms, the hypothesis that there is a positive link between Conscientiousness and the sense of duty to vote seems intuitive. It is important to note, however, that one of the six facets of Conscientiousness is dutifulness (McCrae & Costa, 2003, 1992), which studies in psychology have estimated to be about 30% to 40% heritable (Jang et al., 1996; Jang, McCrae, Angleitner, Riemann, & Livesley, 1998; Luciano, Wainwright, Wright, & Martin, 2006). This facet is typically measured by asking questions such as “I pay my debts promptly and in full” or “I try to follow the rules.” Importantly, in one of the most well-known personality inventories, McCrae and Costa’s Neuroticism-Extraversion-Openness Personality-Inventory-Revised (NEO-PI-R) (which contains 240 items), one of the items that is included asks respondents to rate themselves on the statement “I don’t take civic duties like voting very seriously.” Although none of the studies mentioned above that connect Conscientiousness to the sense of civic duty have used the NEO-PI-R or have included this item in their measure of Conscientiousness, it is important to note that occasionally the psychologists who have developed personality measurement batteries have included questions that mention political content. Interestingly, Hatemi and Verhulst (2015) have noted that “As personality theory and measurement progressed, political values were incorporated into various personality theories in several ways, including several of the dimensions and subfacets of the five-factor model (FFM) as well as Eysenck’s Big 3” (p. 2). In addition, Verhulst, Eaves, and Hatemi (2012) have pointed out that “Costa and McCrae’s (1995) FFM was originally designed to include a political values dimension and includes politically charged questions” (p. 39). One thing to note is that the Big Five emerged from two independent research programs, and adjective-based measures of personality (which we use in this article) are from the older one, the lexical approach (John & Srivastava, 1999). Indeed, Costa and McCrae did not even add a Conscientiousness scale to the NEO-PI until after they came across it in the lexical research (John & Srivastava, 1999).⁸ The voting item that has been included in the NEO-PI-R did not exist when the Big Five traits were initially discovered.⁹ Thus, the idea that the voting item from the NEO-PI-R is being captured by adjective-based measures of personality should not be overly concerning.¹⁰

It is also important to note that conceptually many personality psychologists make a distinction between a latent personality factor versus the thoughts, feelings, or behaviors that are caused by it (manifestations of it). Indeed, McCrae and Costa's five-factor theory makes this distinction (McCrae & Costa, 2008). McCrae and Costa (2008) argue that as the Big Five traits are latent constructs, you cannot observe them directly. Rather, you can only observe the measurable things that they cause, which is reflected in how they wrote NEO items (you infer the trait by observing the things that it causes). Accordingly, McCrae and Costa (2008) would consider attitudes to be characteristic adaptations, which are caused by the Big Five but not causes of them.¹¹

Given that some measures of personality include items related to politics, we should make it very clear that we do not advocate using personality items that mention politics to predict political attitudes or behaviors. Indeed, none of the personality measures that we use in this article contain any reference to politics. We note, however, that the inclusion of political items in personality batteries reflects a larger debate about personality and political predispositions. Indeed, while many personality psychologists believe that "political attitudes are part of a person's personality," there is disagreement about this point (Verhulst et al., 2012, p. 47). For example, Funk et al. (2013) find that

broad personality traits are clearly empirically distinct from measures of values and political ideology. While there is some overlap between personality traits, as measured by the Big Five, and other measures of political predispositions, these more general personality traits are clearly distinct from the other indicators. (p. 816)

We cannot resolve this debate within this article, but believe it is important for readers to be aware of the different arguments and findings. Given these different perspectives, we are faced with the question of whether we should examine the connection between Conscientiousness and the sense of civic duty. As the measure of Conscientiousness that we use in this article (described in more detail below) *does not contain any items that mention politics* and the fact that we are not using the NEO-PI-R (which contained the item asking about voting) or shortened versions of the inventory like the NEO-FFI, we opt to include Conscientiousness in our models rather than omitting it from our analysis.¹² Our findings regarding the connection between Conscientiousness and the sense of civic duty should be interpreted in light of the debate discussed above. In addition, we strongly encourage replications of our analysis using more sophisticated datasets (e.g., longitudinal data), different measures of key concepts, and other research designs.

It is worth pointing out that previous studies on the effects of the Big Five on prosocial behaviors and orientations that are nonpolitical in nature generally support the findings outlined above. Bekkers (2005), for instance, finds a positive relationship between Conscientiousness and participation in voluntary associations. He also finds a positive relationship between Extraversion and participation in voluntary associations. In a study on personality and charitable behavior, Brown and Taylor (2015) find that Agreeableness, Extraversion, and Openness are positively and significantly related to monetary donations to charitable causes. A number of studies (Miller, Griffin, & Hart, 1999; Neuman & Kickul, 1998) have indicated that Conscientiousness is positively correlated with citizenship in the workplace (e.g., volunteering for extra work or responsibilities, helping others, etc.). Previous research on Agreeableness has illustrated that this trait is positively related to volunteering and holding prosocial value motivations (Carlo, Okun, Knight, & de Guzman, 2005). Studies have also found that individuals with high scores on the Agreeableness trait are more likely than those with low scores to engage in citizenship behaviors in the workplace (McManus & Kelly, 1999).

The studies on the heritability of duty, the heritability of personality, and the association between personality and civic duty discussed above provide important insights into different factors that may shape the sense of civic duty. However, to our knowledge, no study has analyzed genetic factors, the Big Five, and the sense of civic duty simultaneously. How do genes and personality traits combine to shape feelings of civic duty? Given the importance of the sense of civic duty to voting behavior, we argue that it is useful to combine the insights from previous studies in political science and psychology into one study to get a better and more nuanced understanding of how genes and personality traits influence political orientations. Although we do not focus on measuring political participation in this study, we encourage future research on the connection between genes, personality traits, attitudes, and participation, as previous studies have illustrated that participation is heritable (Fowler, Baker, & Dawes, 2008), that civic duty has an important effect on voter turnout (Blais, 2000; Blais & Labbé-St-Vincent, 2011), and that personality traits influence political participation (Gerber, Huber, Doherty, Dowling, Raso, et al., 2011; Mondak et al., 2010). Importantly, Gallego and Oberski (2012) have found evidence in support of the “mediation hypothesis,” which suggests that the effect of personality traits on political participation is mediated by political orientations such as political interest, efficacy, and the sense of duty to vote. Integrating biological factors into the model developed by Gallego and Oberski (2012) would provide an even more nuanced understanding of political participation.

Data

The data for this study come from 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. Importantly, the study asked a number of questions about politics and personality traits, which we will describe in detail below. The MIDUS survey was conducted in 1995-1996. The baseline MIDUS study is based on data from four subsamples, which include a national RDD (random digit dialing) sample, oversamples from five metropolitan areas, a sample of siblings of individuals from the RDD sample, and a national RDD sample of twin pairs.¹³ 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.¹⁴

Measures

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 to 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*). The MIDUS study included very little political content, so this is the only measure of the sense of civic duty to vote available in the dataset.¹⁵ It is worth noting that this measure has been used in a number of previous studies (Littvay et al., 2011; Loewen & Dawes, 2012; Weinschenk, 2014) and also corresponds to a measure used by Blais (2000) and Blais and Labbé-St-Vincent (2011) asking whether it is every citizen's duty to vote in an election.

To measure the Big Five personality traits, we make use of a series of adjective-based ratings. The use of adjectives is widely viewed as a valid and reliable way of measuring individual personality traits (Gosling et al., 2003; John & Srivastava, 1999). Respondents in the MIDUS study were asked to rate themselves on 30 different adjectives.¹⁶ Each of the questions asked respondents to “Please indicate how well each of the following describes you,” with the response categories being a lot, some, little, and not at all. The adjectives were as follows: for Extraversion (outgoing, friendly, lively, active, talkative, dominant, self-confident, assertive, forceful, and outspoken), for Emotional Stability (moody, worrying, nervous, and calm), for Openness (creative, imaginative, intelligent, curious, broad-minded, sophisticated, and adventurous), for Conscientiousness (organized, responsible, hardworking, and careless), and for Agreeableness (helpful, warm, caring, softhearted, and sympathetic). All of the adjectives were scaled so that higher values corresponded to higher levels of the Big Five trait they were designed to capture. For each Big Five trait, the corresponding measures were summed and then each of the five overall personality measures was divided by its maximum possible value so that the variables range from 0 to 1. The adjective measures used in this article are fairly reliable, with Cronbach’s alpha scores as follows: .85 (Extraversion), .81 (Agreeableness), .58 (Conscientiousness), .75 (Emotional Stability), and .78 (Openness).¹⁷ These are nearly identical to the alpha scores reported in a recent analysis that made use of the nationally representative RDD MIDUS sample to measure the Big Five personality traits.¹⁸

Biometric Modeling

Our analysis is comprised of two steps. First, we estimate univariate twin models to determine how much of the variation in civic duty and the Big Five personality traits can be attributed to genetic and environmental factors. A twin study leverages the fact that monozygotic (MZ) twins share 100% of their genes while dizygotic (DZ) twins share on average 50% of their genes. By comparing the trait similarity among MZ twin pairs with that of DZ twin pairs, we can obtain an estimate of the degree to which genes influence that trait. More formally, the univariate twin model assumes that the *variance* in an observed trait can be partitioned into additive genetic factors (A), environmental factors which are shared or common to co-twins (C), and unique environmental factors (E). This is the so-called Additive Genetic, Common Environment, Unshared Environment (ACE) model.¹⁹ Common environment includes the family environment in which both twins were raised and any other factor to which both twins were equally exposed. In contrast, the unique environment includes influences that are experienced individually. The role

Table 2. Summary Statistics Broken Out by Zygosity and Gender.

	MZ twins				DZ twins			
	Male		Female		Male		Female	
	M	SD	M	SD	M	SD	M	SD
Duty	7.93	2.74	7.97	2.79	7.95	2.79	8.06	2.68
Extraversion	0.72	0.14	0.73	0.14	0.75	0.13	0.72	0.13
Agreeableness	0.84	0.12	0.90	0.10	0.85	0.12	0.90	0.10
Conscientiousness	0.84	0.11	0.89	0.10	0.85	0.10	0.87	0.11
Emotional stability	0.71	0.18	0.69	0.17	0.70	0.15	0.68	0.16
Openness	0.74	0.13	0.75	0.13	0.75	0.12	0.73	0.13
<i>n</i>	177		261		272		308	

Note. MZ = monozygotic; DZ = dizygotic.

of genes and environment are not measured directly but their influence is inferred via their effects on the covariances of twin siblings (Neale & Cardon, 1992).²⁰

Second, to estimate how much of the *covariation* between duty and each of the personality traits we study can be attributed to the same genetic source, we utilize a Cholesky decomposition model (Martin & Eaves, 1977). The Cholesky model assumes that the latent factors underlying personality also influence civic duty but that the latent factors underlying civic duty do not affect personality.²¹ The parameter estimates generated by this bivariate model can be used to construct quantities of interest. The genetic correlation quantifies the degree to which the genetic endowment of two traits covaries. A correlation of 0 means that the two traits are influenced by completely different genes and a correlation of 1 (or -1) means the same genes influence both traits. Another meaningful quantity is the percentage of the phenotypic correlation between two traits that can be explained by additive genetic factors.²²

All of our analyses are based on complete same-sex twin pairs reared together with nonmissing responses for civic duty and the Big Five personality traits. All measures are residualized of age and gender.²³ Summary statistics for the two samples, broken out by zygosity and gender, are provided in Table 2.

Results

The univariate estimates of heritability and unique environment are shown in Table 3. The heritability estimate for the measure of civic duty is 0.39 and is significantly different from zero at the 5% level. Heritability estimates for four

Table 3. Heritability Estimates for Duty and Each of the Big Five Personality Traits.

	Heritability	Common environment	Unique environment
Duty	0.39 [0.10, 0.47]	0.00 [0.00, 0.24]	0.61 [0.53, 0.71]
Extraversion	0.48 [0.25, 0.56]	0.00 [0.00, 0.20]	0.52 [0.44, 0.60]
Agreeableness	0.28 [0.00, 0.37]	0.00 [0.00, 0.23]	0.72 [0.63, 0.83]
Conscientiousness	0.45 [0.19, 0.53]	0.00 [0.00, 0.21]	0.55 [0.47, 0.65]
Openness	0.43 [0.13, 0.52]	0.00 [0.00, 0.25]	0.57 [0.48, 0.66]
Emotional stability	0.49 [0.26, 0.56]	0.00 [0.00, 0.20]	0.51 [0.44, 0.59]

Note. Parameter estimates and 95% confidence intervals in brackets are shown for a univariate Additive Genetic, Common Environment, Unshared Environment (ACE) model.

of the Big Five personality traits are significantly different from zero and range between 0.43 and 0.49. The estimate for Agreeableness (0.28) is not significant from zero at the 5% level. The point estimates for common environment are at or near zero for civic duty as well as all of the Big Five traits, and none of the estimates are significantly different from zero at the 5% level. The common environment estimate for duty and the five personality traits is zero.

Based on the results from the univariate ACE model, we exclude Agreeableness from bivariate analysis as its heritability estimate is statistically indistinguishable from zero. As the common environment point estimates for duty and the four personality traits are zero and insignificant in the univariate model, we estimate a model assuming that the common environment correlation is zero.²⁴

The genetic and environmental correlations and the percentage of the total correlation due to genetic and environmental factors are presented in Table 4 and graphically illustrated in Figure 1. All four genetic correlations are significant and make up between 70% and 87% of the total correlation. Our results for Extraversion are nearly identical to what Dawes et al. (2014) found based on a sample of Swedish twins (using a slightly different measure of civic duty and Extraversion). The results are also consistent with the relationship between Extraversion and a self-reported measure of civic engagement recently reported by Dawes, Settle, Loewen, McGue, and Iacono (2015).

Table 4. Top Panel: Genetic (r_g) and Unique Environmental (r_e) Correlation and 95% CIs From Bivariate Cholesky Additive Genetic, Unshared Environment (AE) Models of Civic Duty With Each of the Big Five Personality Traits and the Phenotypic Correlations (r) Between Each Personality Trait and Civic Duty. Bottom Panel: Percentage of Total Correlation Due to Genetic and Unique Environmental Correlation and 95% CIs From Bivariate Cholesky AE Models of Duty With Each of the Big 5 Personality Traits.

	Duty		
	r_g	r_e	r
Extraversion	0.33 [0.16, 0.71]	0.05 [-0.05, 0.16]	0.17 [0.11, 0.23]
Conscientiousness	0.27 [0.09, 0.52]	0.08 [-0.02, 0.19]	0.16 [0.10, 0.22]
Openness	0.45 [0.25, 1.00]	0.10 [-0.01, 0.20]	0.23 [0.17, 0.29]
Emotional stability	0.21 [0.04, 0.46]	0.02 [-0.08, 0.13]	0.11 [0.05, 0.17]
	$\%r_g$	$\%r_e$	
Extraversion	0.83 [0.48, 1.20]	0.17 [-0.20, 0.52]	
Conscientiousness	0.70 [0.29, 1.10]	0.30 [-0.10, 0.71]	
Openness	0.75 [0.47, 1.02]	0.25 [-0.02, 0.53]	
Emotional stability	0.87 [0.24, 1.69]	0.13 [-0.69, 0.76]	

Note. CI = confidence interval.

These results suggest that common genes account for most of the correlation between duty and personality. However, it is important to point out that the phenotypic correlations, listed in the last column of the top panel of Table 4, are small to modest.²⁵ For example, nearly all of the covariance between duty and Emotional Stability can be attributed to genetic factors. However, the phenotypic correlation between the two is only 0.11 meaning that Emotional Stability can only account for 1% of the variation in civic duty.

To test whether there are sex differences in variance components, we ran univariate and bivariate sex limitation models which assume sex-specific variance components. The fit statistics are reported in Table 6 and Table 8 in the online appendix. For each of the personality traits, we could not statistically

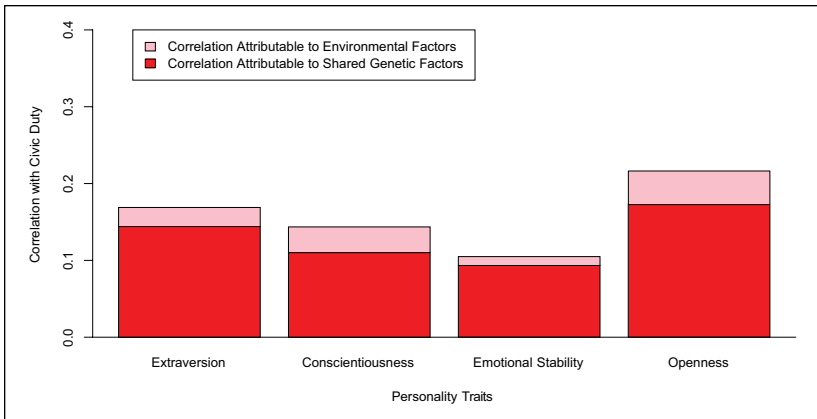


Figure 1. Correlations between psychological and political traits.

Note. The overall height of the bar is the total correlation, the dark portion is the genetic component, and the light portion is environmental component.

reject a pooled univariate model in favor of a sex limitation model. However, the sex limitations model fit the data better for civic duty. Table 7 in the online appendix reports the civic duty estimates for males and females. For the bivariate models, we could not statistically reject a pooled model in favor of a sex limitation model for Extraversion, Openness, and Emotional Stability but the sex limitations model fits the data better for Conscientiousness. Tables 9 and 10 in the online appendix report the genetic and environmental correlations between all four of the personality traits and civic duty for males and females.²⁶

Robustness Checks

We conducted a number of robustness checks to ensure that the results reported above are not sensitive to measurement. First, we examined whether our results held up when using an alternative measure of the dependent variable. Although the MIDUS dataset only included one item measuring the sense of duty to vote, it did include a number of other obligation questions. We examined the obligation items in the MIDUS study and identified a number of questions that had some connection to civic life. There were five items that related to civic obligations—the vote obligation question we use throughout the article, obligation to serve on a jury if called, obligation to volunteer time or money for social causes, obligation to vote for a law that would help those who are worse off than you but that would increase your taxes, and obligation to keep informed about public affairs. Cronbach's

alpha was .75 for these items. We combined the five items into an overall obligation index and then replicated the analyses that we conducted in the article for the vote measure. The results are included in the online appendix in Tables 11, 15, 16, and 17. Comfortingly, the heritability estimate for the index (.38) is nearly identical to the estimate for the vote item (.39). In addition, the bivariate results for the index (shown in Table 17 in the online appendix) are very similar to those obtained when using the vote measure as the dependent variable (shown in Table 4). Indeed, the genetic correlation between the sense of civic duty to vote and Extraversion is .33 (.40 for the obligation index), .27 for Conscientiousness (.24 for the obligation index), .45 for Openness (.61 for the obligation index), and .21 for Emotional Stability (.27 for the obligation index).

We also examined how the results held up when Conscientiousness and Emotional Stability were measured in different ways. For Extraversion, Agreeableness, and Openness, all of the adjectives included in the MIDUS study were positive in nature (e.g., outgoing). For Conscientiousness and Emotional Stability, there were a mix of positive and negative adjectives. Indeed, the four items for Conscientiousness were organized, hardworking, responsible, and careless (the only negative item). The four items for Emotional Stability were moody, worrying, nervous, and calm (the only positive term). As a robustness check for Conscientiousness, we created balance in item valence by limiting the measurement of this trait dimension to the negative item and one of the positive items. We did the same for Emotional Stability by using the positive item and one of the negative items. This was repeated for each combination of two-item indicators. Thus, we developed three alternative measures of Conscientiousness (one that combined the Careless and Responsible items, one that combined the Careless and Organized items, and one that combined Careless and Hardworking) and three alternative measures of Emotional Stability (one that combined Calm and Moody, one that combined Calm and Worrying, and one that combined Calm and Nervous). Basically we were interested in determining whether the results for Conscientiousness and Emotional Stability were the same for the two-item indicators as they are for the full four-item scales. Of course, the reliabilities for the two-item indicators were lower than for the four-item scales. Overall, the results of the robustness checks indicate that the bivariate relationships shown in Table 4 for Emotional Stability and Conscientiousness (where the four-item measures are used for each trait) remain fairly similar when using the six alternative measures of these personality traits. Indeed, the genetic correlation between Emotional Stability and civic duty in Table 4 is .21 and the genetic correlations between civic duty and the alternative measures of Emotional Stability are .13 (Calm and Moody), .19 (Calm and Worrying), and .17 (Calm and Nervous). In addition, the genetic

correlation between Conscientiousness and civic duty in Table 4 is .27 and the genetic correlations between civic duty and the alternative measures of Conscientiousness are .22 (Organized and Careless), .23 (Responsible and Careless), and .23 (Hardworking and Careless). We note that the confidence intervals are generally wider when using the two-item measures as opposed to the four-item measures, but this is to be expected given the decreased reliability that occurs when using shorter measures of personality.

Discussion and Conclusion

In this article, we show that genetic factors account for between 70% and 87% of the correlation between civic duty and four of the Big Five personality traits. These results suggest that most of the relationship between personality traits and civic duty can be explained by the same set of genes. Our study, combined with other recent research (Arceneaux, Johnson, & Maes, 2012; Fizekas & Littvay, 2012; Hatemi, Hibbing, Alford, Martin, & Eaves, 2009; Littvay et al., 2011; Klemmensen, Hatemi, Hobolt, Petersen, et al., 2012; Oskarsson, Dawes, Johannesson, & Magnusson, 2012; Weber, Johnson, & Arceneaux, 2011), contributes to better understanding the possible pathways linking genes and political traits. We note, however, that there are several limitations to our study. A significant genetic correlation could be interpreted as evidence of personality traits *mediating* the relationship between genes and civic duty (Mondak, 2010). This would imply a causal ordering. However, alternatively, personality traits and civic duty may share the same underlying genetic mechanism but not share a causal relationship (Posthuma et al., 2003). The latter scenario, known as *pleiotropy*, implies that genetic factors are a confounder. The Cholesky model does not allow us to adjudicate between different types of possible relationships. Ultimately, cross-sectional datasets, like the MIDUS Study we use here, limit the types of claims we can make. In the future, we encourage the collection of longitudinal datasets that contain samples of twins, measures of personality, and measures of political behaviors and attitudes. Such datasets will allow for an even more comprehensive assessment of the causal ordering among biological factors, personality, and political traits.

We should also note that although we have applied standard methodology, it is well known that the assumptions needed for the twin models we use to be identified are quite strong, especially the equal environments assumption. A violation of the equal environments assumption leads to an upward bias in heritability and a downward bias in common environment estimates. We suggest that future work use samples incorporating other sibling types and pedigrees to evaluate some of the moment restrictions assumptions in the twin

model. New analytical tools have also recently been developed that rely on direct measures of genetic relatedness, and thus do not rely on the equal environments assumption, to estimate heritability (Visscher, Yang, & Goddard, 2010; Yang et al., 2010; Yang, Lee, Goddard, & Visscher, 2011).

Overall, our results indicate that people do not come into the political arena as “blank slates.” Instead, people have different predispositions (some, like the personality traits examined in this article, are biologically based) that may shape how they react to politics. We strongly encourage future research on the extent to which individual differences in personality and biology influence receptivity to interventions and messages that are aimed at increasing feelings of civic duty or other political orientations, such as efficacy or interest in politics. As we mentioned at the beginning of the article, knowing which deeply rooted differences shape the sense of civic duty could be helpful in designing interventions that appeal to people whose attributes initially predispose them to feel a weak sense of duty to vote in elections or participate in other important political activities. While certain messages or programs might be very effective at increasing the sense of civic duty for people with a particular trait or set of traits, they might be ineffective (or have a negative effect) for people with a different trait or set of traits. A number of recent studies in political science have started to examine the extent to which psychological and biological predispositions shape receptivity to political interventions (e.g., efforts to increase voter turnout; Gerber et al., 2013; Settle et al., Forthcoming; Weinschenk & Panagopoulos, 2014),

The results reported here suggest a number of potential avenues for future research. First, it would be useful to consider the role of psychological traits that are not included in the Big Five model in shaping political orientations and behaviors. The Big Five traits are an important starting point and should certainly be investigated in future studies, but it is important to note that psychologists have identified a range of personality traits beyond the Big Five, some of which may be relevant to politics. Recent studies have started to consider the role of cognitive style (e.g., need for cognition and need for closure) in linking genes to political attitudes, which has led to important insights (Ksiazkiewicz et al., 2016). There may be additional personality attributes worth examining, including need to evaluate, need for affiliation, conflict avoidance, and need for power. Ideally, studies would include a variety of personality batteries, so that personality traits that are not included in the Big Five framework can be included alongside the Big Five in models of political attitudes and behavior.

Second, future studies should investigate the link between genes, personality traits, and other political attitudes. In this article, we focused on the sense of civic duty, but there are other important attitudes that deserve study,

including political efficacy, political interest, and social trust. Political efficacy, interest in politics, and social trust have heritable elements (Arceneaux et al., 2012; Dawes et al., 2014; Klemmensen, Hatemi, Hobolt, Petersen, et al., 2012; Klemmensen, Hatemi, Hobolt, Skyttthe, & Nørgaard, 2012; Oskarsson et al., 2012), and a number of studies have illustrated that some personality and psychological traits influence these orientations and attitudes (Dawes et al., 2014; Oskarsson et al., 2012). Learning about the biological and psychological bases of orientations and attitudes like these will help to provide a more comprehensive understanding of their origins.

Third, we believe that one important step for future researchers will be to consider more complicated models where biological and psychological predispositions interact with environmental factors to shape political orientations. Indeed, in the theoretical model developed by Mondak et al. (2010), they note that the effects of predispositions on political behaviors and orientations may be shaped by contextual variables. In this study, we have focused on biological and psychological factors, but future scholars could build on this study by examining whether and how contextual factors play into the development of civic duty.

Finally, given the results presented in this study, we believe that future researchers should work to collect new datasets that include biological information, psychological measures, and political variables. Although there are a variety of studies that have enabled researchers to learn about the connections among genes, psychological traits, and politics, it would be useful to collect new datasets. Such datasets could be used to replicate previous studies, which is an important endeavor, but could also be used to test new hypotheses. In addition, the collection of new datasets would allow researchers to collect multiitem measures of civic duty and other political traits, which would likely be more reliable than single-item measures.

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Supplementary Material

Supplementary material is available for this article online.

Notes

1. 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 use 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.
2. Littvay, Weith, and Dawes (2011) use an obligation to vote measure and estimate that 39% of the obligation to vote is heritable, which is similar to Loewen and Dawes's estimate.
3. We should note that we focus on civic duty in the United States in this article. Interestingly, there is some evidence that the heritability of duty (and other political attitudes) varies by context (Fazekas & Littvay, 2015). Klemmensen, Hatemi, Hobolt, Petersen, et al. (2012) find that civic duty is not heritable in their sample of Danish twins. As Fazekas and Littvay (2015) note, it is important to keep in mind that the "heritability of political characteristics, like all others, is population specific and highly context dependent stressing its nondeterministic nature" (p. 369). It is also important to note that differences in heritability (moderate heritability in the United States and Sweden and little to no heritability in Denmark) could be due to the adoption of different measures of civic duty across studies. We thank an anonymous reviewer for the suggestion about measurement differences.
4. Adjectives from John and Srivastava (1999) and McCrae and Costa (2003).
5. Loehlin, McCrae, and Costa (1998) report heritability estimates of 57% (Extraversion), 51% (Agreeableness), 52% (Conscientiousness), 58% (Neuroticism), and 56% (Openness). Jang, Livesley, and Vernon (1996) report heritability estimates of 53% (Extraversion), 41% (Agreeableness), 44% (Conscientiousness), 41% (Neuroticism), and 61% (Openness). Bouchard (2004) reports heritability estimates of 54% (Extraversion), 42% (Agreeableness), 49% (Conscientiousness), 48% (Neuroticism), and 57% (Openness).
6. Some studies have looked at the impact of Conscientiousness on the act of voting. In such studies, scholars typically argue that Conscientiousness will have a positive impact on voter turnout via civic duty. For example, Gerber, Huber, Doherty, Dowling, Raso, et al. (2011) note that

to the extent that political participation is viewed as a civic duty, Conscientious people may be likely to participate as a way of adhering to social norms. Individuals high on this trait may therefore be more likely to fulfill a perceived obligation to vote than to engage in other forms of participation, such as attending a rally, that are unlikely to be viewed as civic duties. (p. 696)

In addition, Mondak, Hibbing, Canache, Seligson, and Anderson (2010) suggest that "any relationship between conscientiousness and participation will be contingent on the individual's views regarding whether political engagement constitutes an obligation of citizenship; that is, if the person perceives a sense of duty, then conscientiousness will compel engagement" (p. 92).

7. Schoen and Steinbrecher (2013) point out that “high levels of conscientiousness will increase the probability of participation in German federal elections since it makes citizens more eager to obey to social norms including the norm of participating in elections” (p. 536) and go on to note that “We thus expect that conscientiousness will make voters more likely to subscribe to the notion of citizen duty” (p. 537). In addition, Dinesen, Nørgaard, and Klemmensen (2014) argue that

given that the citizenship norms may involve a sense of civic duty with regard to various aspects of being a democratic citizen, we expect people high on Conscientiousness—the personality trait associated with dutifulness—to display stronger norms of citizenship in general. (p. 137)

8. The NEO PI-R was developed by Costa and McCrae in 1992 (the original NEO-PI was developed in 1978, with some important publications on the inventory coming out several years later in 1985), at which point facet scales for Agreeableness and Conscientiousness were added (including items like “I don’t take civic duties like voting very seriously”). The reason why McCrae and Costa called their original personality inventory the NEO-PI was because originally they found just three personality factors, N, E, and O.
9. Thanks to Sanjay Srivastava for pointing this out to us. A nice overview of the development and history of lexical and questionnaire approaches to personality measurement can be found at http://ipip.ori.org/Finding_Scales_to_Measure_Particular_Constructs.htm
10. We provide empirical evidence on this point later in the article.
11. They note that

FFT, however, insists on a distinction that other theories make only in passing, and it assigns traits exclusively to the category of basic tendencies. In FFT [Five-Factor Theory], traits are not patterns of behavior (Buss and Craik, 1983), nor are they plans, skills, and desires that lead to patterns of behavior (Johnson, 1997). They are directly accessible neither to public observation nor to private introspection. Instead, they are deeper psychological entities that can only be *inferred* from behavior and experience. Self-reports of personality traits are based on such inferences, just as observer ratings are. (p. 163)

They go on to note,

Although it seems to smack of obfuscation, there are good reasons to uncouple personality traits from other more observable components of personality. Characteristic adaptations—habits, attitudes, skills, roles, relationships—are influenced both by basic tendencies and by external influences. They are *characteristic* because they reflect the enduring psychological core of the individual and they are *adaptations* because they help the individual fit into the ever-changing social environment. Characteristic adaptations and their configurations inevitably vary tremendously across cultures, families, and portions of the lifespan. *But*

personality traits do not: The same five factors are found in all cultures studied so far. (pp. 163-164)

12. We are not the first to encounter this issue. Verhulst, Hatemi, and Martin (2010) note that one

common problem that plagues the study of personality and politics is the clear distinction between attitudinal items and personality items. The tautology problem is more common in other personality measures, like the NEO-PI-R Openness to Experience scale where several items explicitly tap political concepts (see Costa & McCrae, 1992). (p. 307)

Their approach is as follows:

Remaining cognizant of this problem, we identified three items in the Psychoticism scale that had also the possibility of overlapping with attitudinal items. Specifically, the items “Would being in debt worry you?” and “Do you think people spend too much time safeguarding their future with savings and insurances?” potentially overlap with economic political attitudes, while “Do you think marriage is old-fashioned and should be done away with?” potentially overlaps with both social and religious political attitudes. Importantly, the factor loadings of these items are not overwhelming and measures of fit do not decline with the removal of these items. Removing potentially tautological items is not meant to fundamentally alter the concept, but rather ensure that the items that comprise the construct are not inherently political. In other words, this should ensure that the observed relationship is between the traits and not a function of similar items. (pp. 307-308)

In a section that follows, we adopt this approach and conduct a similar analysis to confirm that civic duty is not simply captured by Conscientiousness.

13. In all of the subsamples, all eligible participants were noninstitutionalized, English-speaking adults in the coterminous United States, aged 25 to 74.
14. For the twin subsample, the response rate for the phone survey was 60% and 92% for the self-administered surveys. Additional details about the Midlife Development in the United States (MIDUS) Study are available at the following website: <http://www.midus.wisc.edu/midus1/index.php>
15. A multiitem index measuring the sense of duty to vote would likely be more reliable and therefore preferable. One thing worth noting is that the relationship between personality and civic duty may be underestimated because of the single-item measure of civic duty. In other words, this article may offer a conservative test of the links between traits and civic duty. For a discussion of how short measures can lead to conservative estimates, see Credé, Harms, Niehorster, and Gaye-Valentine (2012). We thank an anonymous reviewer for pointing this out to us.
16. Although it is common to use personality measurement batteries like Ten Item Personality Inventory (TIPI), NEO-PI-R, or Big Five Inventory (BFI), the 30 items we use in this study were the only personality measures available in the

MIDUS dataset. It is important to note that MIDUS researchers were very deliberate in choosing personality items. A technical report on the measurement of personality in the MIDUS Study notes,

Most of the adjectives were selected from existing trait lists and inventories (see Bem, 1981; Goldberg, 1992; John, 1990; Trapnell and Wiggins, 1990); a few items were generated by Margie Lachman and Alice Rossi. For each personality dimension, a list of all adjectives appearing in the literature was compiled (John, 1990). The adjectives which appeared most consistently as markers and had the highest item to total correlations or factor loadings were identified. Initially, four adjectives were selected to mark each trait dimension. Given the time constraints for MIDI (Midlife Development Inventory) the goal was to create the shortest possible set of items to measure personality reliably in less than five 5 minutes by telephone or mail survey. A pilot study was conducted in 1994 with a probability sample of 1000 men and women between the ages of 30 and 70. Items with the highest item to total correlations and factor loadings were selected from MIDI. Forward regressions were also run to determine the smallest number of items needed to account for over 90% of the total scale variance. Many of the negatively worded items (unemotional, unreliable, unsophisticated, unsympathetic, shy, unsociable) were dropped due to very low variance. New items were added to increase reliabilities on some scales.

For additional information, see the technical report at <http://www.brandeis.edu/departments/psych/lachman/pdfs/midi-personality-scales.pdf>

17. To address the concern that our dependent variable, the sense of duty to vote, is simply capturing the Conscientiousness personality trait, we conducted a factor analysis using the four items for Conscientiousness and our measure of civic duty. The results of the factor analysis indicate that there is one factor with an eigenvalue of more than 1 (eigenvalues were 1.076, 0.029, -0.010, -0.150, and -0.212) and that the four personality items have the highest factor loadings (factor loading for organized was .526, factor loading for responsible was .613, factor loading for hardworking was .542, and factor loading for careless was .300). The factor loading for the civic duty item was .196, a fairly low loading. If our civic duty measure was simply the same as Conscientiousness, we would expect to see a much higher factor loading.
18. Weischenk (2014) reported alpha scores of .84 for Extraversion, .80 for Agreeableness, .60 for Conscientiousness, .74 for Emotional Stability, and .78 for Openness.
19. For a primer of biometric modeling geared for political scientists see Medland and Hatemi (2009).
20. A more detailed description of the univariate model is presented in the online appendix.
21. A more detailed description of the bivariate model is presented in the online appendix.
22. We denote the genetic correlation as r_g , the common environment correlation as r_c , and the unique environment correlation as r_e and the percentage of correlation

- accounted for by genetic factors as $\%r_g$, accounted for by common environment $\%r_c$, and by unique environment as $\%r_e$. By construction $\%r_g$, $\%r_c$, $\%r_e$ must sum to one but r_g , r_c , r_e do not (necessarily) sum to one. Formal derivations of each quantity are presented in the online appendix.
23. The twin models are estimated using the Mx software package (Neale, Boker, Xie, & Maes, 2003).
 24. We present the results for the unrestricted models, as well as fit statistics comparing the restricted and unrestricted models, in the online appendix. We also tested whether $r_g = 0$. The results of the tests are included along with the results of whether $r_c = 0$ in Table 5 of the online appendix. For all of the models, we can reject that $r_g = 0$ ($p < .05$). In other words, the models fit significantly worse if we drop r_g (that is not the case with dropping r_c , as the fit statistics illustrate).
 25. Oskarsson et al. (2015) have noted that “[w]hen the phenotypic relationships are weak, the bivariate model requires very large samples to be adequately powered. Therefore, we limit further analyses to those relationships that had at least moderately strong correlations equal to or greater than 0.15” (p. 659). We should point out that other studies have reported phenotypic correlations that are in line with the correlations we report in this article. For example, Dawes et al. (2014) report correlations between personality traits and political traits that range from .09 to .30. In addition, Littvay et al. (2011) report correlations that range from .096 to .189. Most of the phenotypic correlations we report in this article are above the .15 threshold used by Oskarsson et al. (2015). Indeed, the correlations between Extraversion, Openness, and Conscientiousness and civic duty to vote are above .15; the only trait with a correlation below .15 is Emotional Stability (phenotypic correlation of .11). Thus, we note that the results for Emotional Stability presented here should be interpreted with caution. Replication will be important in determining whether the relationship we report in this article holds up across different samples and contexts.
 26. Due to data limitations, we could not estimate male genetic and environmental correlations for Conscientiousness and Emotional Stability.

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