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Correlation not Causation: The Relationship between Personality Traits and Political Ideologies

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Abstract

The assumption in the personality and politics literature is that a person's personality motivates them to develop certain political attitudes later in life. This assumption is founded on the simple correlation between the two constructs and the observation that personality traits are genetically influenced and develop in infancy, whereas political preferences develop later in life. Work in psychology, behavioral genetics, and recently political science, however, has demonstrated that political preferences also develop in childhood and are equally influenced by genetic factors. These findings cast doubt on the assumed causal relationship between personality and politics. Here we test the causal relationship between personality traits and political attitudes using a direction of causation structural model on a genetically informative sample. The results suggest that personality traits do not cause people to develop political attitudes; rather, the correlation between the two is a function of an innate common underlying genetic factor.

The field of political science is witnessing a renaissance in the exploration of the relationship between personality traits and political preferences (Gerber et al. 2010; Jost et al. 2003; Mondak and Halperin 2008; Mondak et al. 2010). The belief that personality traits are innate, genetically influenced, and develop in infancy (Bouchard et al. 1990; Eaves et al. 1999; Eysenck 1967; Loehlin 1992; McRae et al. 2000), whereas political attitudes develop in adulthood, has led to the assumption that personality traits *cause* the subsequent

Supporting Information: Additional Supporting Information may be found in the online version of this article:
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Online Appendix 2: Confirmatory Factor Analysis
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development of political attitudes. Recent scholarship, however, has demonstrated that political attitudes develop much earlier than previously suspected (Block and Block 2006; Hess and Torney 1967), the precursors of which are present prior to a child's first year in school (Persson 2010) and are also influenced by genetic factors (Alford, Funk, and Hibbing 2005; Eaves, Eysenck, and Martin 1989; Hatemi et al. 2010; Martin et al. 1986). Furthermore, the relationship between personality traits and political attitudes has been found to be largely a function of latent shared genetic influences (Eaves and Eysenck 1974; Verhulst, Hatemi, and Martin 2010). These findings cast doubt on the critical foundations necessary for the assumed causal structure expounded throughout the extant literature (e.g., Gerber et al. 2010; Mondak et al. 2010). In light of these empirical inconsistencies, it is important to reconsider this basic assumption to gain a more accurate understanding of the complex interplay between an individual's disposition and their political attitudes.

The recent introduction of behavioral genetic models plays a pivotal role in expanding our understanding of the nature of the relationship between personality traits and political attitudes. These models allow us to examine whether the relationship is best accounted for by common genetic or environmental influences shared between the two phenotypes (e.g., Verhulst, Hatemi, and Martin 2010) or whether a causal relationship exists between personality and political attitudes (e.g., Heath et al. 1993). To test the assumed causal relationship between personality traits and political attitudes, we first highlight the critical findings that both underscore and challenge the causal assumption. In doing so, we evaluate recent evidence which has identified genetic sources of variance on attitudes and personality. Then, using a series of behavioral genetic analyses on data collected from a large sample of twins (5,748 pairs), we partition the covariation between personality traits and political attitudes into environmental and genetic sources that are shared between the two traits. Finally, we conduct a direction of causation analysis which explores a variety of scenarios that may underlie the established association between personality traits and political attitudes (Duffy and Martin 1994; Heath et al. 1993; Neale and Cardon, 1992). These types of analyses allow us to empirically test the assumption that personality traits cause people to develop attitudes or if other possible avenues exist for the relationship between attitudes and personality. Specifically, we compare how the data fit four possible causative models: the assumed causal structure, a reverse causal structure where attitudes cause personality traits, a reciprocal causal structure where personality traits and political attitudes both have a causal influence on each other, and a correlational structure where a latent set of genes influences both personality traits and political attitudes.

The Relationship between Personality Traits and Political Attitudes

Before delving into the causality assumption, it is first useful to explicate both personality traits and political attitudes. Personality traits are typically conceptualized as stable individual differences that, in a general sense, guide behavior (Cattell 1957; Winter and Barenbaum 1999). Although there is no universally accepted definition of personality, most research views personality traits as the culmination of life events, personal adaptations, and biological mechanisms (Buss 1999; Caprara and Cervone 2000; Eysenck 1967; for a review, see Pervin and Oliver 1999). Consistent with this logic, research in developmental psychology has established that many personality traits can be assessed early in life as temperaments, which are predictive of adult personality traits (Roberts and DelVecchio 2000; Young, Eaves, and Eysenck 1980). This early emergence and relative stability across time insinuates that personality traits precede other social dispositions, such as political attitudes. In this view, personality traits are not conceptualized as proximate causes that can explain specific behaviors, but rather as distal causes that explain response tendencies across a wide range of situations ignoring specific situational pressures (Bandura 2001; Mischel

1968; Mischel and Shoda 1998). As such, multiple intervening processes mediate the impact of personality traits on observed behaviors.

Ideological orientations, on the other hand, are typically conceptualized as an interrelated set of attitudes that reflect an individual's liberal or conservative preferences across a range of interrelated policies (Campbell et al. 1960), which can be clustered along multiple ideological dimensions (Conover and Feldman 1981, 1984; McClosky and Zaller 1984; Treier and Hillygus 2009). In contrast to personality traits, political attitudes are thought to emerge only after the individual begins to engage with the political world. Thus, young voters are more susceptible to political tides because they have relatively weak attitudes that do not crystallize until their mid to late twenties (Alwin, Cohen, and Newcomb 1991; Jennings and Markus 1984; Jennings and Niemi 1981). Accordingly, if the development of political attitudes occurs much later than personality development, it is reasonable to assume that personality traits cause the development of political attitudes.

Such a view has been used to explain the relationship between specific attitudinal scales and specific personality traits. In research exploring the relationship between these two constructs, the most common personality trait linked to politics has been Openness to Experience and more liberal social/moral issues (Gerber et al. 2010; Jost et al. 2003; McCrae 1996; Mondak and Halperin 2008; Mondak et al. 2010). Specifically, Openness to Experience has been found to be negatively related to a variety of ideological measures, such as conservative political attitudes, right-wing authoritarianism, and social dominance orientation (Adorno et al. 1950; Altemeyer 1996; Carney et al. 2008; Duckitt 1989; Jost et al. 2003; Stenner 2005; Van Hiel, Kossowska, and Mervielde 2000; Van Hiel, Pandelaere, and Duriez 2004). This relationship has been attributed to the “fact” that people who are more open to new experiences are less tied to the conventional ways of doing things, and this “Openness” extends into every facet of a person's life, including political orientations.

The relationship between political orientations and personality traits is multifaceted, however, and extends far beyond Openness and general liberalism-conservatism. Research has also demonstrated a consistent, but weaker, relationship between conservative political attitudes and Conscientiousness (Carney et al. 2008; Gerber et al. 2010; Jost 2006). Political conservatism has been associated with dogmatism (Rokeach 1960), Eysenck's *P* (Eysenck and Eysenck 1985; Verhulst, Hatemi, and Martin 2010), intolerance of ambiguity or uncertainty, a personal need to achieve order (Sanford 1973), desire for structure and closure, integrative complexity, and fear of threat or loss (Jost et al. 2003). It has also been suggested that conservatism should be associated with high levels of anxiety, a major component of the personality trait Neuroticism. This link, however, has eluded empirical validation (Eaves and Eysenck 1974; Fromm 1947; Kline and Cooper 1984; Ray 1972; Wilson 1973; Wilson and Brazendale 1973). Intriguingly, the empirical link between ideology and Neuroticism suggests the relationship is actually between certain facets of liberalism and Neuroticism (Gerber et al. 2010; Van Hiel, Pandelaere, and Duriez 2004; Verhulst, Hatemi, and Martin 2010). These empirical relationships have been replicated across time and in different political contexts.

In the majority of studies, the causal ordering between personality traits and political attitudes was assumed, but has yet to be empirically evaluated. Furthermore, the theoretical development connecting these varied findings remains embryonic. However, more developed theoretical justifications are beginning to emerge. For example, Jost et al. (2003) suggest that exposure to threat and uncertainty in the political environment evokes fear and anxiety which heightens epistemic and existential motivations, resulting in increased confidence in the “correctness” of one's attitudes and bolstering one's self-concept. From this perspective, political conservatism serves as a coping mechanism that allows people to

manage these threats, leaving conservatives more intolerant of ambiguity and desiring high levels of order, structure, and cognitive closure (Carney et al. 2008; Jost et al. 2003). Essentially, fluctuations in the broad political environment create political circumstances that require adaptive attitudinal responses. However, even in this view, the causal path remains unchanged (Jost 2006); attitudinal modulations are a function of an individual's personality adapting to their political environment.

Questioning the Causality Assumption

The assumption that personality traits cause or trigger the development of political attitudes is largely predicated on the interpretation and extension of two empirical findings: personality traits emerge early in life and guide behavior, and they are genetically influenced and part of one's "fixed" disposition. According to temporal logic, the construct that develops first should guide the development of the constructs that develop afterward. This has reinforced previous assumptions that the early development of personality traits leads to the development of political preferences in a causal manner.

Recent findings regarding the development of political attitudes have begun to challenge this assumed causal relationship. Studies assessing political attitudes in children find that the building blocks of political attitudes are present quite early in life. For example, sharing, allocation of resources, leadership roles in play, equity versus equality, hierarchy, and organization are all present in early childhood (Block and Block 2006; Moore 1986). Other studies focusing on explicit political attitudes have used stories and pictures to demonstrate that children, some as young as four or five and even prior to their first year of school, possess independent political attitudes (Coles 1986; Hatemi et al. 2009a; Hess and Torney 1967; Persson 2010; Torney-Purta 2004; Torney-Purta and Amadeo 2003). Thus, the finding that political attitudes also develop early in life questions the temporal causal priority of personality traits.

The strongest challenge to the prevailing causality assumption is the finding that genes influence political attitudes. These findings suggest that even though attitudinal measures cannot effectively assess political attitudes in infancy, the precursors of these attitudes are present nevertheless. In their landmark study, Nicholas Martin, Lindon Eaves, and their colleagues (1986) demonstrated substantial heritability of political attitudes, a finding that has been replicated in a variety of different political climates, countries, time periods, and by various different methods (Alford, Funk, and Hibbing 2005; Bouchard et al. 1990; Eaves, Eysenck, and Martin 1989; Eaves and Hatemi 2008; Eaves et al. 1999; Hatemi et al. 2007, 2009a; Hatemi, Hobolt, and Nørgaard 2010; Hatemi, Medland, and Eaves 2009; Klemmensen et al. 2010). The fact that both personality traits and political attitudes have substantial genetic components opens the possibility that the relationship between the two constructs may not be as simple as commonly assumed.

Unfortunately, findings from the genetics and politics literature have been poorly integrated into the personality and politics literature. For example, rather than instigating a general debate on the connection between the innate components of political attitudes and personality traits, the extant causal assumption has only been slightly modified to suggest that genetic factors lead to the development of personality traits, which in turn "cause" people to develop political attitudes either by motivating them to select environments that promote the development of these attitudes or directly by the genetic variance in personality accounting for all of the genetic variance in political attitudes (e.g., Mondak et al. 2010). However, these assumptions were never explicitly tested.

In Figure 1 we summarize the assumed casual pathway and alternative relationships between personality traits and political attitudes. The assumed causality hypothesis would follow the

pathways in the left panel of Figure 1: biological factors are the primary contributors to an individual's personality, and an individual's personality then either directly causes them to develop their political attitudes (pathway *A*), motivates them to select into a specific environment which then shapes their attitudes (pathway *B*), or interacts with the environment to produce their attitudes (pathway *C*).

Complete mediation (pathway *A*) would be entirely plausible if all of the genetic variance in attitudes is accounted for by the genetic variance in personality traits. That is, if the genetic component of personality traits directly causes people to develop political attitudes, we would expect the genetic variance in personality to account for the majority of the genetic variance in political attitudes. Alternatively, if political attitudes were overwhelmingly environmental and had virtually no genetic component, genetic factors would promote the development of personality traits, which in turn would motivate individuals to select into environments (pathway *B*). On the other hand, if the genetic component of an individual's personality moderates the impact of the environment (pathway *C*) on the development of either liberal or conservative political attitudes, we would expect the majority of the shared variance between personality traits and attitudes to be shared at the environmental level.[1] So far this has also not been the case at all. Rather, as depicted in the right panel of Figure 1, Verhulst, Hatemi, and Martin (2010) expanded on the earlier formulations by Eaves and Eysenck (1974) and found that the vast majority of the covariance between personality traits and attitudes was a function of a shared latent genetic factor, and the majority of genetic variance within attitudes was not explained by the genetic variance on personality traits.

The fact that both personality traits and political attitudes have nontrivial genetic components and that the genetic variance in attitudes remains largely independent suggests an alternative hypothesis: a latent genetic trait mutually influences both personality and attitudes. This view is more consistent with a modern understanding of genetics: there are no specific genes for a given political attitude or personality trait. Genes encode protein messengers that execute a series of physiological processes culminating in behaviors, personality traits, and attitudes in conjunction with environmental stimuli. Thus, the same set of genes may result in myriad distinct behavioral phenotypes, two of which are political attitudes and personality traits. In genetics, this is called pleiotropy (see Carey 2003). This common cause model—pleiotropy—is depicted in the right panel of Figure 1. According to this hypothesis, the relationship between personality traits and political attitudes is not causal in nature. Specifically, if the majority of the covariance between personality and political orientations is the result of shared genetic variance, but the majority of genetic variance in political attitudes is unique, then the blanket assumption that personality is driving political orientations is untenable. In such a case, a latent genetic variable would be a common cause of both personality traits and political attitudes, leaving the resulting relationship between the two traits a function of genetic covariation and not causation. To discriminate between these alternatives, we conduct a series of genetic analyses using a very large twin dataset that contained both personality and attitudinal items.

[1]Selection into an environment is called gene-environment covariation. If the latent genetic component is correlated with the shared (unique) environment, estimates of the shared (unique) environmental component will be inflated. As for gene-environment interactions, if the latent genetic component interacts with the common environment, the additive genetic component will be inflated. Alternatively, if the latent genetic component interacts with the common environment, the unique environmental component will be inflated. In general, personality traits have little common environmental variance (Bouchard and McGue 2003); thus, gene-environment interactions would inflate estimates of the unique environmental component. See Keller, Medland, and Duncan (2009) for a detailed explanation of biases in the twin model under nonzero gene-environment interactions and correlations.

Data, Methods, and Results

Respondents

The sample is derived from the Mid Atlantic Twin Registry (MATR) based on a survey conducted in the late 1980s, dubbed the Virginia 30,000. Approximately 40% of the sample was recruited from the larger Virginia area, and the remaining were solicited through a national AARP mailer. At the time, both groups favored slightly more conservative political attitudes. The sample contains 28,877 individuals who are all familial relatives of the core population of roughly 12,000 twins. For more detail on the sample structure, ascertainment, and questionnaire, see Eaves et al. (1999).

Personality Traits

There is no general agreement on the “best” way to measure personality; however, the Five-Factor Model (FFM) has arguably become the most popular. In this article, we focus on an older, but equally valid measure of personality, the Eysenck Personality Questionnaire (EPQ Eysenck and Eysenck 1985, 1991). The underlying theory for the FFM is lexical, whereas the underlying theory for EPQ is biological and pathological. However, both are highly related in their measurement and are composed of similar constructs (Avia et al. 1995; Costa and McRae 1995b; Saggino 2000). Debates about the “best” measure of personality obscure the fact that the FFM and Eysenck's theories were in great agreement regarding human personality structure. Indeed, regarding Cattell's (1957) theory of personality, which is regarded as the foundation for modern FFM theories, Eysenck acknowledged that both “constructs and theories should be seen, not as mutually contradictory, but as complementary and mutually supportive” (1984, 336). Both theories include Extraversion and Neuroticism as core traits and define them in a virtually equivalent manner. The theories differ in that Eysenck's “Big 3” amalgamates the remaining variability of personality into Psychoticism and subscales such as Social Desirability, whereas the FFM segregates the remaining variability into three separate core personality traits: Openness to Experience, Agreeableness, and Conscientiousness (Eysenck 1992; Goldberg and Rosolack 1992; McRae and Costa 1985).

Eysenck's Psychoticism measure was poorly labeled. Hence, going forward, we use the less pejorative, abbreviated label *P*, which was also adopted by Eysenck. Having a high Psychoticism score is not a diagnosis of being clinically psychotic or psychopathic. Rather, *P* is positively correlated with tough-mindedness, risk-taking, sensation-seeking, impulsivity, and authoritarianism (Adorno et al. 1950; Altemeyer 1996; Eysenck and Eysenck 1985, McCourt et al. 1999). In social situations, those who score high on *P* are more uncooperative, hostile, troublesome, and socially withdrawn, but lack feelings of inferiority and have an absence of anxiety. At the extremes, those scoring high on *P* are manipulative, tough-minded, and practical (Eysenck 1954). By contrast, people low on *P* are more likely to be more altruistic, well socialized, empathic, and conventional (Eysenck and Eysenck 1985; Howarth 1986). As such, we expect higher *P* scores to be related to more conservative political attitudes, particularly for militarism and social conservatism.

Eysenck's *P* has a complex relationship to the FFM. Specifically, the Openness to Experience dimension, which has received the majority of the attention within personality and politics studies, is not well captured by Eysenck's taxonomy (McCrae 1987; McCrae and Costa 1985). While *P* predicts conservative political attitudes in a similar manner as Openness predicts liberal political attitudes (Eysenck 1954; McCrae 1995), and limited evidence finds *P* moderately negatively correlated with the greater Openness to Experience dimension (Eysenck and Eysenck 1985; Larstone et al. 2002), *P* also correlates positively with certain subfacets of Openness, such as creativity and originality (Eysenck and Eysenck

1985; Rawlings et al. 1998). Furthermore, *P* is negatively correlated with Conscientiousness (McCrae and Costa 1985; Zuckerman et al. 1993), even though both traits correlate positively with political conservatism (Carney et al. 2008; Verhulst, Hatemi, and Martin 2010). The remaining relationship, *P* being negatively correlated to Agreeableness, is perhaps the least complex, as measures of Agreeableness are part of the measure of *P* with regard to tough-mindedness and being uncooperative.

Finally, the Social Desirability scale measures the tendency to overestimate one's perceived positive characteristics and underestimate perceived negative ones. High scores indicate a propensity for social acquiescence and conformity, or a lack of self-insight (Francis, Brown, and Pearson 1991). The conformity component is related to individual self-presentation concerns, while the second component captures an overestimation of desirable but unlikely behaviors and an underestimation of undesirable but likely behaviors. Social Desirability has only sparingly been explored as it relates to ideological orientations. This is likely due, in part, to its having a more complex structure than other traits and its inherent contextual component.

While Eysenck's measures have been used less frequently than the FFM in the last decade, there are some unique benefits of using the EPQ. There is a wealth of both psychological and behavior genetic work on the EPQ (Bouchard et al. 1990; Eysenck and Eysenck 1985). And, the EPQ is relatively untainted by explicitly political items—as is the case with several facets of the FFM. For example, Costa and McCrae's (1995a) FFM was originally designed to include a political values dimension and includes politically charged questions such as “I don't take civic duties like voting very seriously,” “I believe that laws and social policies should change to reflect the needs of a changing world,” or “I believe that the ‘new morality’ of permissiveness is no morality at all.”

Measuring Political Attitudes

Consistent with our conceptualization of ideology as a set of interrelated attitudes, we specified a confirmatory factor analysis (CFA) to capture three latent attitudinal dimensions from a Wilson-Patterson (1968) inventory: social attitudes (e.g., Gay Rights, Abortion), economic attitudes (e.g., Foreign Aid, Federal Housing), and defense/military attitudes (e.g., The Draft, Military Drill; see online Appendix 1), with higher scores indicating the more conservative response. These dimensions loosely reflect the classic social, fiscal, and foreign policy ideological dimensions of the American electorate (Converse 1964; Conover and Feldman 1981, 1984; McClosky and Zaller 1982). As political ideology has a multifaceted structure that can be obscured by focusing on a unitary Left-Right dimension (Treier and Hillygus 2009), this measurement strategy allows us to examine the specific ideological subfactors rather than overwhelm the reader with the relationship between the personality traits and all of the individual political attitudes.

Confirmatory Factor Analysis Model Fit Indices

A CFA was used to estimate seven latent factors: four personality factors (*P*, Extraversion, Neuroticism, and Social Desirability) and three political ideology factors (an economic, a social, and a military/defense dimension). The specific items and factor loadings are banished to online Appendix 2. In general, our CFA model fits the data well. The root mean square error of approximation (RMSEA) of 0.045 suggests that our model accurately captures the intricacies of the data despite the fact that the model is very complex and the sample size is very large.

Analyses

We present our analyses in four stages. First, we estimate the correlations between the latent personality traits and the ideological dimensions using the latent factor correlations estimated in the CFA model to identify the moderate to strong phenotypic relationships between personality traits and political attitudes. Next, we use a maximum likelihood-based structural equation model to partition the variance into additive genetic, common environment, and unique environmental variance (Neale and Cardon 1992). Then, we use a multivariate genetic model (Cholesky decomposition) to identify the magnitude of shared genetic or environmental covariation between the personality traits and the ideological dimensions. The Cholesky decomposition is a completely saturated model that serves two separate purposes. First, it identifies the level on which personality traits and political attitudes covary. Second, it serves as a baseline model that can be used in hypothesis testing for more parsimonious models. Finally, we conduct a direction of causation (DoC) analysis to explicitly test whether the covariance between the personality traits and the political attitudes is best captured by a model where personality traits cause political attitudes, where political attitudes cause personality traits, where reciprocal causation between the two constructs exists, or where a correlational relationship provides the best fit to the data.

We restrict our analyses to the substantively meaningful relationships identified in the previous stages. This stage of the analysis uses only the 2,665 pairs of monozygotic (MZ) twins and 3,083 pairs of dizygotic (DZ) twins, with the knowledge that more extensive extended kinship models have provided similar estimates to twin-only designs with regard to political attitudes (Eaves and Hatemi 2008; Hatemi et al. 2010) and personality traits (Eaves et al. 1999). Due to known sex differences in both variance components models (Hatemi, Medland, and Eaves 2009) and phenotypic assessments (Shapiro and Mahajan 1986) for political attitudes, we estimate models for males and females separately.

Correlations between Personality Traits and Ideological Dimensions

The correlations between the latent personality traits and ideological dimensions are presented in Table 1. It is important to note that there are only a few substantively significant correlations. Based on the inherent difficultly in reliably disentangling variance components if the phenotypic relationship between traits is small, we pursue the connection between personality traits and ideological dimensions if the effect size is in the medium to large range for both sexes (if the correlation for both sexes is above 0.20; Cohen 1988).

There are several correlations that merit further attention. First, in line with our expectations, higher *P* scores correlate with more conservative military attitudes and more socially conservative beliefs for both females and males. For males, the relationship between *P* and military attitudes ($r = 0.388$) is larger than the relationship between *P* and social attitudes ($r = 0.292$). Alternatively, for females, social attitudes correlate more highly with *P* ($r = 0.383$) than military attitudes ($r = 0.302$).

Further, we find a negative relationship between Neuroticism and economic conservatism ($r_{\text{females}} = -0.242$, $r_{\text{males}} = -0.239$). People higher in Neuroticism tend to be more economically *liberal.* What is intriguing about this relationship is that it is in the opposite direction of what past theories would predict (Fromm 1947; Wilson 1973), but consistent with more recent evidence (Gerber et al. 2010; Van Hiel, Pandelaere, and Duriez 2004; Verhulst, Hatemi, and Martin 2010). That is, neurotic people are more likely to support public policies that provide aid to the economically disadvantaged (public housing, foreign aid, immigration, etc). Moreover, Neuroticism is unrelated to social ideology ($r_{\text{female}} = -0.016$, $r_{\text{male}} = -0.050$). This finding suggests that neurotic individuals cope with their

anxiety by supporting a "social safety net" or more "liberal" economic policies rather than "liberal" social policies.[2]

There is also a substantively interesting relationship between Social Desirability and social ideology, which is larger for females ($r_{females} = -0.335$; $r_{males} = -0.255$). This facet of personality is highly context dependent, and therefore we can only speculate on this relationship, though our results are consistent with other conceptually similar findings. During the same time period in nationally representative samples, in several other attitude domains, liberal responses were also seen as more socially desirable (Kinder and Sears 1981). Thus, it appears that people who are motivated to present themselves in a socially desirable light also present themselves as socially liberal. This is only the second study we are aware of to explore the relationship between any ideological dimension and social desirability, yet the findings replicate the Verhulst, Hatemi, and Martin (2010) study on an Australian population.

The analysis above extends the existing personality and politics literature in several important ways. In line with our expectations, *P* (positively related to tough-mindedness and authoritarianism) is associated with social conservatism and conservative military attitudes. Intriguingly, the strength of the relationship between *P* and political ideology differs across sexes. *P*s link with social conservatism is stronger for females while its link with military attitudes is stronger for males. We also find individuals higher in Neuroticism are more likely to be economically liberal. Furthermore, Neuroticism is completely unrelated to social ideology, which has been the focus of many in the field. Finally, those higher in Social Desirability are also more likely to express socially liberal attitudes.

Variance Components Analysis

In the second stage of our analysis, we decompose the variance of the individual personality traits and ideological dimensions into three separate sources of variance: additive genetic, common environment, and unique environment. The additive genetic factor (A) is the sum of the linear additive influence of all individual genes on the dimensions. The common or shared environmental factor (C) accounts for systematic attempts at socialization, within-family similarity in environment, and common social background (e.g., family income, neighborhood, etc). The unique environment factor (E) represents unique, random, idiosyncratic environment influences that are not shared by members of the same family (for a detailed explanation of the methodology and theory, along with limitations and criticisms, see Medland and Hatemi 2009).

The results of the variance components estimates for the individual personality traits and ideological dimensions are presented in Table 2. All of the variance components models were estimated in OpenMx (Boker et al. 2010) using a maximum-likelihood estimator. We estimate the full model with all three components (ACE) and allow the variance components to differ across the sexes. The model-fitting results are presented in online Appendix 3.

Consistent with our expectations and nearly all other behavior genetic studies of personality traits, the best model for Extraversion, Neuroticism, and *P* is one that partitions the variance into additive genetic and unique environment components for both sexes. The common environment is not significant in any of these variables (Table 2). This reduced model is

[2]Evidence from the authoritarianism literature suggests that social threats activate latent authoritarian predispositions, resulting in more conservative behaviors and preferences in those high in authoritarianism when they are threatened (Duckitt 1989; Stenner 2005). The person-situation interaction cannot be tested with our data. However, our findings are not necessarily inconsistent with this expectation as they suggest an interaction between a person and his or her immediate environment. Specifically, filling out a survey is unlikely to create the levels of anxiety necessary to activate any latent predisposition.

typically referred to as an AE model, as the C parameter drops out of the model due to a lack of statistical significance.

The only personality trait that deviates from this trend is Social Desirability. Social Desirability is characterized by large genetic and unique environmental variance components; however, there is also a significant, though more subtle, common environmental influence.

For political attitudes, the results are notably different. For the social and economic dimensions, the best-fitting model is the full model of additive genetic, common environmental, and unique environmental influences (ACE). There are sizable additive genetic components and substantial common environmental components to the attitudes, suggesting that individual differences in these attitude constructs are a mixture of genetic, shared, and unique environmental components. In contrast, military attitudes display a pattern of transmission similar to that of personality traits (AE), suggesting that attitudes toward the military are a function of what is learned through unique environmental (nonfamilial) influences and genetic transmission, more so than any common environmental influences.

Cholesky Decomposition

The preceding steps lay the foundation for the examination of the relationships between the specific variance components of personality traits and political ideologies. Specifically, we seek to identify what part of the relationship between personality and political attitude dimensions are due to shared genes or shared environments and by doing so, gain insight into the potential for, or lack of, a causal relationship between the two constructs.

To explore this relationship, we utilize a common multivariate genetic technique called the Cholesky decomposition.[3] The Cholesky builds on the univariate ACE model by simultaneously decomposing the variance of multiple traits into additive genetic, common environment, and unique environment variances and explores the amount of the relationship between the personality trait and the political attitude factor that can be accounted for by each level of variance. The bivariate Cholesky decomposition estimates six latent factors (A_1, C_1, and E_1, and A_2, C_2, and E_2). The estimation procedure ensures that all variance in the personality trait as well as all of the covariance between the personality trait and the political attitude dimension loads on the first factor (e.g., A_1, C_1, or E_1), and the residual variance in the political attitude loads on the second factor (e.g., A_2, C_2, or E_2). Thus, the cross-over pathways, A_{12}, C_{12}, or $E_{12,}$ determine the extent to which the correlation between the personality traits and the political attitude is a function of common additive genetic variance, common shared environmental variance, or common unique environmental variance. A relatively large coefficient for the crossover pathways would suggest that the correlation between a personality trait and an attitude is primarily a function of additive genetic variance, shared environmental, or unique environmental variance, respectively.[4]

We first examine the relationship between *P* and the social ideology dimension. The standardized path coefficients are presented in the top-left panel of Figure 2. As can be seen, the relationship between *P* and social ideology is primarily a function of a common latent additive genetic factor. Specifically, the path from A_1 to social attitudes is significantly

[3]The Cholesky decomposition is a saturated model and can be mathematically transformed in a number of different ways that may be easier to interpret for some readers. Two transformations are presented in online Appendix 4: the proportion of variance accounted for by genetic and environmental components and the genetic and environmental correlations.

[4]For multivariate Cholesky decompositions, the ordering of items can be important (Loehlin 1996). The order of variables is less of a concern for bivariate analyses, as the model fit and covariance are equivalent regardless.

larger than the path from E_1 to social attitudes. Importantly, the vast majority of the genetic variance in social ideology is not shared with *P*, as can be seen by the large path coefficient from A_2 to social ideology. Accordingly, although the relationship between *P* and social ideology is primarily a function of a common additive genetic variance, the majority of the additive genetic variance in social ideology remains unaccounted for after accounting for the covariance with *P*. Moreover, approximately two-thirds of the phenotypic correlation is a function of common genetic variance.

As can be seen in the top-right panel of Figure 2, a similar pattern of findings emerges for *P* and military attitudes. There is a meaningful path between A_1 and military attitudes and a smaller path from E_1 to military attitudes, suggesting the majority of the relationship between the two dimensions is a function of additive genetic variance shared between the two traits. Importantly, there are very strong residual paths from A_2 and E_2 to military attitudes, again suggesting a large amount of independence between the traits. Thus, approximately 60% of the relationship between *P* and military attitudes is driven by common genetic factors.

The bottom-left panel of Figure 2 presents the analysis for Social Desirability and social ideology. In this analysis, the paths from A_1 and E_1 to social ideology are relatively small, suggesting the genetic and unique environmental influences are not significantly shared for these traits. Thus, the relationship between Social Desirability and social ideology seems to be primarily a function of the common environmental variance shared between these two traits. This is compatible with theoretical implications of Social Desirability, as it is not generally considered a core personality trait. This is an important finding, as it differs from any other result on personality and political preferences.

Finally, the relationship between Neuroticism and economic ideology is very similar to the relationship for *P* and ideological dimensions. The A_1 cross-path is substantively meaningful while the E_1 cross-path is not, suggesting that the relationship between Neuroticism and economic liberalism is primarily a function of shared genetic variance, with approximately two-thirds of the correlation being a function of additive genetic covariance in both sexes. Again, the loadings of A_2 and E_2 to economic ideology are strong and consistent for both males and females, suggesting that the constructs are substantively distinct.

Overall, the Cholesky decompositions provide several important insights into the broad understanding of the relationship between personality traits and political attitudes. First, the vast majority of genetic variance in political attitudes is *not* accounted for by the covariance with the personality dimensions, underscoring the distinctiveness between the constructs. This suggests pathway A in Figure 1 is unlikely to be true. Second, because the majority of the relationship between attitudes and personality is localized in the additive genetic variance component, it is also unlikely that people are selecting into environments based on their personality which subsequently foster the development of political attitudes (pathway B) or that the environment is moderating the impact of personality on their political attitudes (pathway C), as these pathways imply that the predominant source of covariance between personality and attitudes would be localized in the environmental variance components.

The results so far suggest that the relationship between personality traits and political attitudes is more likely a function of a common set of genes shared between the personality traits and the political attitudes (depicted in the right panel of Figure 1). These results imply that the current understanding of the relationship between personality and political attitudes needs revision. Strictly speaking, however, the Cholesky decomposition does not test causation. Rather, the Cholesky decomposition is a fully saturated model and cannot disentangle whether the phenotypic relationship between the personality traits and the

political attitudes is causal or what direction that causality flows, should it be present. It remains possible, though implausible, that personality traits could cause people to develop political attitudes, even though the variance between the personality traits and the social attitudes was primarily shared at the additive genetic level. To examine the causal structure that exists between personality traits and political attitudes, therefore, we estimate a direction of causation (DoC) model.

The Direction of Causation Model

The final analyses explicitly test the possibility of causal relationships between the personality traits and political attitudes. The DoC model explores the four scenarios which may underlie the association between personality traits and political attitudes. The first possibility is the unidirectional causal model where the variation in personality traits drives the variation in political attitudes. This is what is implied by the causality assumption. The second possibility points the causal arrow in exactly the opposite direction: the set of genes that influence variation in political attitudes in turn leads to variation in personality traits. The third possibility is reciprocal causation, where personality traits and political attitudes have a nonrecursive causal structure. The final possibility is pleiotropy or a common set of genes that influences both personality traits and political attitudes. This is essentially what is suggested by the Cholesky results presented above (Neale and Cardon 1992). To evaluate the models, we compare the model fit of the two unidirectional DoC models and the reciprocal causation model against the fully saturated Cholesky models. To satisfy both the explanatory and parsimony criteria, each DoC model is compared with the saturated Cholesky using a Likelihood Ratio test. Accordingly, the model that fits the data best is the model where the exclusion of an additional parameter does not decrease the overall fit of the model (and therefore does not fit the data worse than the saturated model).

To determine which causal direction best fits the data, the DoC model leverages the genetic relatedness of individuals within the same family to parse the causal structure between personality traits and political attitudes by utilizing the cross-twin cross-trait covariance to determine the causal direction.[5] Mathematically, the DoC model compares the cross-twin cross-trait covariance with the two products of the cross-twin withintrait covariance with the within-person cross-trait. If the pattern of cross-twin cross-trait covariance mimics the product of cross-twin personality covariance and the within-person personality and attitudes covariance, then the best-fitting model will suggest that personality causes people to develop their political attitudes. If the cross-twin cross-trait covariance corresponds with the product of cross-twin attitudes covariance and the within-person personality and attitudes covariance, then the best-fitting model will suggest that attitudes cause people to develop their personality. If both products correspond with the cross-twin cross-trait covariance, causality cannot be determined, suggesting a correlation rather than causation (Heath et al. 1993). As such, the DoC model has the most power to detect causality when the pattern of phenotypic transmission is clearly distinct and becomes more difficult as the pattern of transmission becomes more similar.

Figure 3 presents the best-fitting DoC models for each of the relationships discussed above, with the complete model-fitting results presented in Table 3. As can be seen in Figure 3, the model that best captures the covariance structure of the data for both *P* and social ideology and Neuroticism and economic ideology is the reverse causation model where the political

[5]To identify the model, it must be specified in terms of phenotypic causality. Thus, strictly speaking, we cannot directly test whether the genetic components of personality traits cause the genetic components of the political attitudes, or vice versa, but rather whether personality traits at the phenotypic level cause political attitudes at the phenotypic level or the reverse. Because the previous analyses suggest that relationships between the personality traits and the political attitudes are primarily a function of additive genetic variance, it is reasonable to suggest that what causality may be found is primarily a function of additive genetic variance as well.

attitude causes the personality trait. Thus, in direct contrast with the existing assumption regarding the causal ordering of political attitudes and personality traits, across two completely independent analyses, the causal ordering appears to be the complete opposite of what is typically assumed.

The relationship between Social Desirability and social ideology is more complex. In this case, the best-fitting model is the reciprocal causation model with a negative feedback loop. Because the phenotypic correlation is negative, the product of the two pathways must also be negative, which is precisely what we find. Here, socially liberal attitudes causally result in more social desirability responses, as can be seen with the strong negative causal pathway. This strong negative causal effect is dampened by a weaker, though significant, positive causal effect flowing in the opposite direction.

The DoC analysis for the relationship between *P* and military attitudes supports a correlational, not causal, relationship. Specifically, because both constructs have an AE structure, the reciprocal causality DoC model and the Cholesky have the same degrees of freedom, and the DoC model is unable to accurately estimate a *reciprocal* causation model. In this case, both of the unidirectional models fit the data significantly worse than the Cholesky. Therefore, the model that most accurately fits the data is one with a common latent additive genetic factor accounting for the relationship between the two constructs. In other words, it is more plausible that the relationship between *P* and military attitudes is indicative of a common causal mechanism, or pleiotropy, rather than a sequential chain of causality.

Limitations

One potential criticism is the focus on Eysenck's personality traits, instead of the more common Five-Factor Model. Eysenck's personality theory, however, has been examined in tandem with a variety of other personality theories, and the relationships between Eysenck's constructs and the core constructs of the Five-Factor Model of personality is well established (Eysenck 1992). Eysenck's Neuroticism and Extraversion are effectively the same as those in the FFM, while *P* is a complex combination of the remaining three FFM personality traits. More importantly, the transmission of Eysenck's core personality traits is essentially the same as nearly all other constructs from any personality theory (Bouchard et al. 1990). Thus, it seems reasonable that the pattern of genetic and environmental relationships between political attitudes and other personality traits will likely mimic the relationships presented here.

The final criticism of the current analyses is that all the traits we have utilized have some level of measurement error and if the errors in measurement are larger in one variable, the results may be biased (as is the case with measurement error in predictor variable in an ordinary least squares regression). In the DoC model, the causal pathway from the variable with more measurement error to the variable with less measurement error will be attenuated. We have attempted to minimize the impact of measurement error on our results by using confirmatory factor analysis to predict factor scores rather than constructing simple additive scales or individual items. Although the use of factor scores minimizes errors in measurement, it does not negate the problem of measurement error entirely.

Discussion

Although the causal relationship between personality and political ideology has been assumed by many, and the heritability of both personality traits and political orientations has been established, to our knowledge this is the first attempt to systematically examine the

casual relationship between the genetic influences on political ideology and personality traits as we have done here.

In the first stage of our analysis, we demonstrated that there are several substantively significant relationships between the personality traits and political ideology dimensions. Most notably, *P* is substantially correlated with conservative military and social attitudes, while Social Desirability is related to liberal social attitudes, and Neuroticism is related to liberal economic attitudes. Our findings at the phenotypic level are highly consistent with similar explorations in an Australian population (Verhulst, Hatemi, and Martin 2010).

The second stage of our analyses replicates the findings of substantial genetic and unique environmental influence on personality traits as well as the ideological attitude dimensions, but expands on the literature by grouping the individual attitudes into ideological dimensions which roughly reflect those established in the literature. Although the common environment was generally unimportant for personality traits, it did account for a significant amount of variance in the social and economic ideological dimensions.

These analyses provide the backdrop for the more pivotal third and fourth sets of analyses: the examination of the relationship between personality traits and political attitudes. These analyses show that the majority of covariance between personality and attitudes was due to shared genetic variance, while the relationship between the idiosyncratic environmental components of politics and personality was notably smaller. Furthermore, the majority of genetic influence on attitudes was not explained by the genetic influence on personality traits. In total, the Cholesky analyses validate the possibility of an alternative relationship between personality traits and political attitudes, whereby a latent common genetic factor drives the development of both personality traits and political attitudes.

The fourth and final analysis explicitly tests the direction of the causal arrows. In two situations, the causal arrow flows from political attitudes to personality traits, contrary to the assumed causal hypothesis. In another, there is reciprocal causation with the dominant arrow again flowing from attitudes to personality. In the last situation, the relationship is correlational. In no case does the data support that the direction of causation (DoC) flows from personality traits to political attitudes.

These findings directly challenge the causal pathway assumed in the extant literature (e.g., Gerber et al. 2010; Mondak et al. 2010). Rather than personality traits causing people to develop liberal or conservative political attitudes, the current results suggest two alternative relationships. First, the combined Cholesky and DoC analyses suggest that a common set of genes mutually influences personality traits and political attitudes, implying the relationship between personality and politics is a function of an innate common genetic factor rather than a sequential personality to politics model (see the right panel of Figure 1). The results from the DoC analysis also suggest an alternative causal model. That is, the latent set of genes shared between political attitudes and personality traits directly influences attitudes and indirectly influences personality traits. In other words, the genetic component of political attitudes partially mediates the genetic influence on personality traits. This finding is completely opposite from the basic assumption in the most recent literature (e.g., Gerber et al. 2010; Mondak et al. 2010). Thus, it appears the genetic component of political attitudes measured relatively later in an individual's life contributes to the development of an individual's personality along the way. In this view, attitudes are more than what is expressed in adulthood, but part of one's disposition which guides behavior and selection into environments, which later are recognized and measured as attitudes in adulthood. Regardless of whether the final analysis supports a latent genetic source of covariance or a

mutual causal structure, both perspectives require a major revision to the prevailing assumptions about political attitudes and personality traits.

Implications

Personality psychologists have long held the view that political attitudes are part of a person's personality. The Openness dimension of the Five-Factor Model was explicitly designed to include a values dimension to capture moral beliefs and include attitudinal content that resembles political conservatism (Costa and McCrae 1995a; Van Heil, Kossowska, and Mervielde 2000). This part of Openness has been described as the readiness to re-examine traditional social, religious, and political values (Moutafi, Furnham, and Crump 2006; Zimprich, Allemand, and Dellenbach 2009). That is, personality psychologists consider political values part of one's personality, and not independent constructs. However, this understanding is often missing in the current literature. This might be due in part to the use of abbreviated scales. The values dimension in the original 244-item NEO-PI-R explicitly measures political values (McRae and Costa 1987). Due to the length of the scale and copyrights placed on it, other personality psychologists have reduced the factors into scales that do not include all the subfactors theorized by McCrae and Costa. However, the reduced measures of Openness were designed to capture the variance in the original Openness super-factor, which contained the explicit political values subdimension. As such, because political values are viewed as a subcomponent of Openness and not as an independent factor, political attitudes should be viewed as part and parcel of the same latent construct. From this perspective, when it comes to Openness predicting political attitudes, researchers have been not only comparing apples to apples, but predicting an apple with the same apple.

We believe that while ideological and attitudinal dimensions are correlated with personality traits and share certain elements, the two constructs are also conceptually and statistically distinct. The correlations between the items within the ideological or trait dimensions are much higher than the correlations between the items across the dimensions. Furthermore, the majority of the variance on every level was not shared between the personality traits and the political attitudes (the residual variance components in Figures 2 and 3 were very large), suggesting that each construct is unique. Thus, the two constructs are undeniably related, but not necessarily in the assumed causal manner. Rather, what is shared between personality traits and attitudes is most likely due to a common underlying genetic influence.

Based on the current results, the claim that personality traits lead to political orientations should no longer be assumed, but explicitly tested for each personality and political trait prior to making any claims about their relationship. We recognize that no single analysis can provide a definitive answer to such a complex question, and our analysis did not include the Agreeableness, Conscientiousness, and Openness Five-Factor Model measures. Future studies which use different personality measures, or other methodological designs, including panel studies that examine the developmental trajectories of personality and attitudes from childhood to adulthood, would be invaluable for investigating more nuanced relationships between personality traits and political attitudes. These would also include models which capture the nonrandom selection into environments that foster the development of more liberal or conservative political attitudes (active gene-environment covariation) as well as the possibility for differential expression of personality traits and political attitudes at different stages of the developmental process that may illuminate “critical periods” for the interface of personality and attitudes.

Conclusion

Researchers in personality and politics have assumed a causal link between personality traits and political ideology. The results presented here do not support this assumption. Rather, the primary connection between personality traits and political ideology rests on common genetic precursors of each. At this stage of research, we find no support for the reigning assumption that personality traits cause people to develop political attitudes. Our results imply that humans are, at heart, political animals. Political attitudes are not simply an afterthought and while largely measured in adulthood, the foundation elements exist as part of our core disposition and appear to be just as important to shaping our behavior as our personalities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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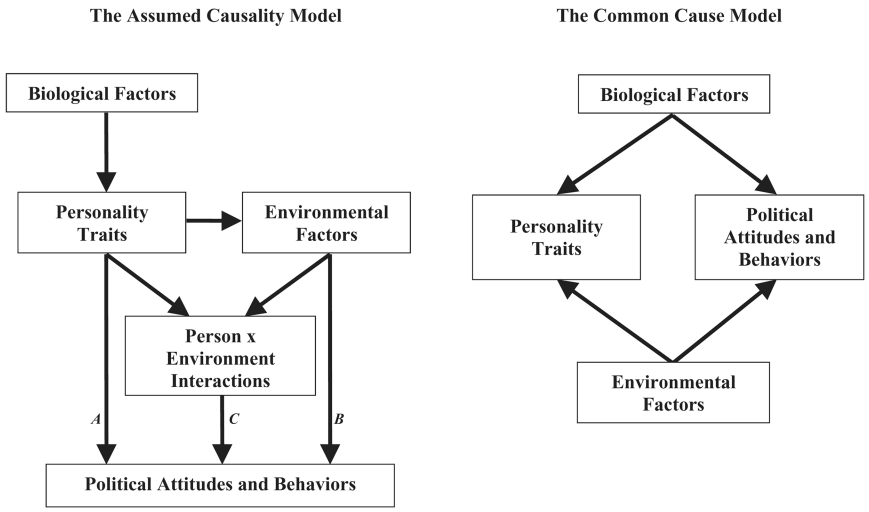

Figure 1. Theoretical Models Underlying Two Hypothesized Relationships between Personality Traits and Political Attitudes and Behaviors

Note: The left panel was re-created from recent explorations of personality and political attitudes (see Mondak et al. 2010 for a similar figure).

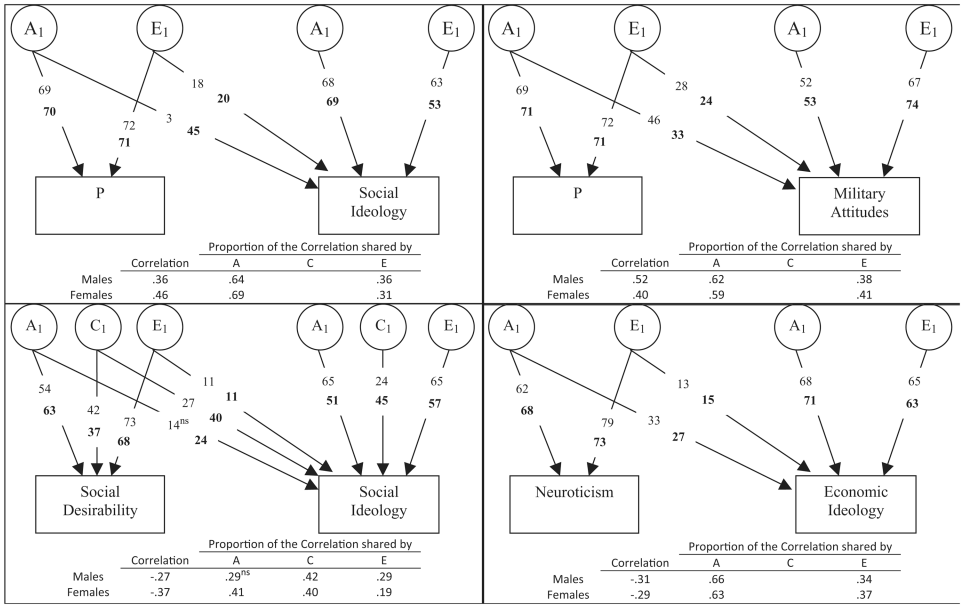

Figure 2. Cholesky Decompositions for the Moderate and Strong Relationships between Personality Traits and Attitudes

Note: To simplify the path diagrams, models are presented for one twin only, with the standard CTD assumptions. The coefficients presented in the path diagram are standardized coefficients and the coefficients for females are in bold. An *ns* indicates that the path is not significant. Variances of the latent variables are constrained to unity. The embedded tables indicate the phenotypic correlations and the proportions of the correlation that are accounted for by the additive genetic (A), common (C), and unique environmental (E) variance components, respectively.

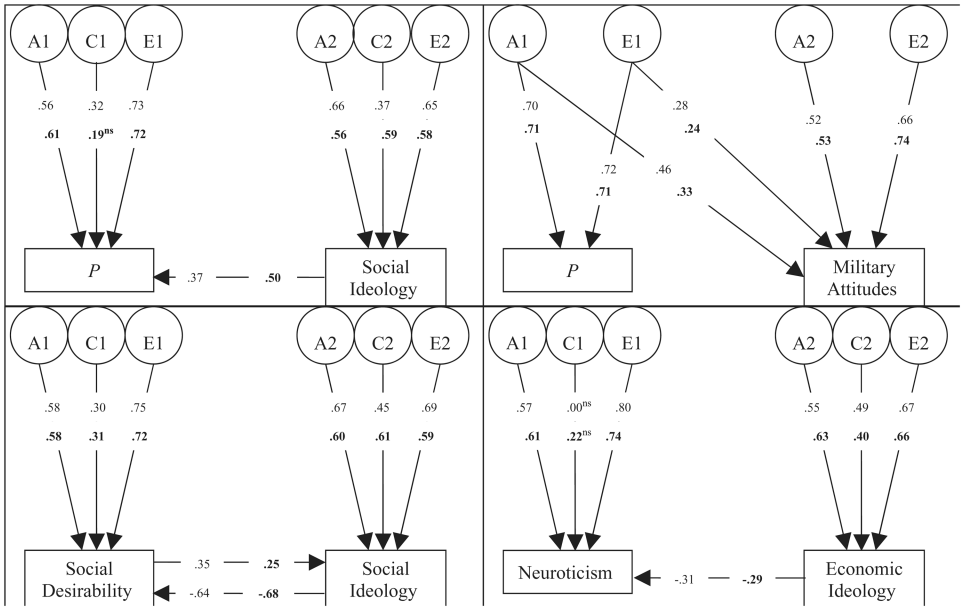

Figure 3. Best-Fitting Direction of Causation Models for the Moderate and Strong Relationships between Personality Traits and Attitudes

Note: The path diagrams are for the best-fitting models. To simplify the path diagrams, models are presented for one twin only, with the standard CTD assumptions. The coefficients presented in the path diagram are standardized coefficients, and the coefficients for females are in bold. An *ns* indicates that the path is not significant at the 95% level.

Table 1

Correlations between Personality Variables and Political Attitudes for Females and Males

		Neuroticism	*P*	Extraversion	Social Desirability
Females	Military	0.101	**0.302**	−0.069	−0.074
	Social	−0.016	**0.383**	0.136	**−0.335**
	Economic	**−0.242**	−0.142	0.074	−0.205
Males	Military	0.141	**0.388**	−0.070	−0.062
	Social	−0.050	**0.292**	0.095	**−0.255**
	Economic	**−0.239**	−0.253	0.080	−0.143

Note: The boldfaced correlations are those large enough for further consideration. Correlations are taken from the full structural model with all twins and relatives (N = 28,877). Respondents were excluded if they had a nonresponse rate of 20% or higher.

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Table 2

Univariate Variance Components Analyses for Personality Traits and Ideological Dimensions

	Males			Females		
	a^2	c^2	e^2	a^2	c^2	e^2
P	0.379	*0.094*	0.527	0.395	*0.102*	0.503
	(0.21, 0.52)	*(0.00, 0.24)*	(0.48, 0.58)	(0.28, 0.51)	*(0.00, 0.20)*	(0.47, 0.54)
Extraversion	0.455	*0.000*	0.545	0.512	*0.000*	0.488
	(0.35, 0.50)	*(0.00, 0.09)*	(0.50, 0.60)	(0.48, 0.54)	*(0.00, 0.02)*	(0.46, 0.52)
Neuroticism	0.377	*0.000*	0.623	0.366	*0.008*	0.550
	(0.22, 0.43)	*(0.00, 0.133)*	(0.57, 0.68)	(0.25, 0.48)	*(0.00, 0.19)*	(0.52, 0.59)
Social Desirability	0.265	0.200	0.535	0.401	0.140	0.459
	(0.09, 0.44)	(0.04, 0.35)	(0.49, 0.59)	(0.29, 0.51)	(0.04, 0.24)	(0.43, 0.49)
Social	0.352	0.232	0.417	0.320	0.363	0.317
	(0.21, 0.50)	(0.10, 0.36)	(0.38, 0.46)	(0.24, 0.41)	(0.28, 0.44)	(0.30, 0.34)
Economic	0.322	0.228	0.450	0.401	0.167	0.432
	(0.17, 0.48)	(0.09, 0.36)	(0.41, 0.50)	(0.30, 0.51)	(0.07, 0.26)	(0.40, 0.46)
Military	0.443	*0.031*	0.526	0.302	*0.082*	0.616
	(0.27, 0.52)	*(0.00, 0.18)*	(0.48, 0.58)	(0.18, 0.42)	*(0.00, 0.19)*	(0.58, 0.65)

Notes: Maximum likelihood-based 95% confidence intervals are presented in parentheses. Italicized entries are not statistically significant at conventional levels.

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Table 3

Direction of Causation Model-Fitting Results

			Males			Females		
	Model	**Estimated Parameters**	**LR Test Statistic**	**df**	**Probability**	**LR Test Statistic**	**df**	**Probability**
P and Social Atts	Cholesky	11	–	–	–	–	–	–
	Reciprocal Causation	10	1.14	1	0.29	0	1	0.94
	Personality Causes Attitudes	9	13.06	2	0	104.76	2	0
	Attitudes Cause Personality	**9**	**2.97**	**2**	**0.23**	**0.15**	**2**	**0.93**
P and Military Attitudesa[a]	**Cholesky**	**11**	–	–	–	–	–	–
	Personality Causes Attitudes	9	20.34	2	0	13.04	2	0
	Attitudes Cause Personality	9	21.26	2	0	49.86	2	0
Social Desirability and Social Attitudes	Cholesky	11	–	–	–	–	–	–
	Reciprocal Causation	**10**	**1.64**	**1**	**0.2**	**1.91**	**1**	**0.17**
	Personality Causes Attitudes	9	19.64	2	0	126.39	2	0
	Attitudes Cause Personality	9	9.87	2	0.01	37.49	2	0
Neuroticism and Economic Attitudes	Cholesky	11	–	–	–	–	–	–
	Reciprocal Causation	10	1.82	1	0.18	1.06	1	0.3
	Personality Causes Attitudes	9	25.24	2	0	21.02	2	0
	Attitudes Cause Personality	**9**	**3.79**	**2**	**0.15**	**3.74**	**2**	**0.15**

Note: The best models are presented in bold. LR test denotes the likelihood ratio test, df indicate degrees of freedom, and probability is the probability of improved model fit as a function of the inclusion of an additional parameter.

[a]The reciprocal causation model has psychoticism and military attitudes as fatal identification issues because both variables have AE modes of transmission. This results in the reciprocal causation model having the same number of estimated parameters as the Cholesky.