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The Influence of Major Life Events on Economic Attitudes in a World of Gene-Environment Interplay

Peter K. Hatemi

Associate Professor, Political Science, Microbiology and Biochemistry, Research Fellow, The United States Studies Centre, University of Sydney Pennsylvania State University, 307 Pond Lab, University Park, PA 16802

Peter K. Hatemi: phatemi@gmail.com

Abstract

The role of “genes” on political attitudes has gained attention across disciplines. However, person-specific experiences have yet to be incorporated into models that consider genetic influences. Relying on a gene-environment interplay approach, this study explicates how life-events, such as losing one’s job or suffering a financial loss, influence economic policy attitudes. The results indicate genetic and environmental variance on support for unions, immigration, capitalism, socialism and property tax is moderated by financial risks. Changes in the magnitude of genetic influences, however, are temporary. After two years, the phenotypic effects of the life events remain on most attitudes, but changes in the sources of individual differences do not. Univariate twin models that estimate the independent contributions of genes and environment on the variation of attitudes appear to provide robust baseline indicators of sources of individual differences. These estimates, however, are not event or day specific. In this way, genetic influences add stability, while environment cues change, and this process is continually updated.

Keywords

life events; economic attitudes; financial risk; gene-environment interaction

A growing body of scholarship focuses on behavioral genetic approaches and the biological and social pathways that lead to political attitudes (for a review see Hatemi and McDermott 2012). This work includes twin and family models that partition sources of human variation into elements of “genes” and “environment” (Alford, Funk and Hibbing 2005; Bouchard et al. 1990; Cranmer and Dawes 2012; Eaves, Eysenck and Martin 1989; Hatemi et al. 2007;

Replication data for this article is available at <http://dvn.iq.harvard.edu/dvn/dv/phatemi>.

Supporting Information:

Additional Supporting Information may be found in the online version of this article at the publisher’s web site:

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Klemmensen et al. 2012; Martin et al. 1986; Smith et al. 2012; Stam, Von Hagen-Jamar and Worthington 2012; Sturgis et al. 2010; Verhulst, Eaves and Hatemi 2012). As a matter of statistical application, the classic twin design (CTD) estimates genetic and environmental influences independently; yet the theoretical premise behind the twin model is based upon quantitative genetics and assumes that within each of the genetic and environmental parameters resides the potential for an individual's genes to be correlated with, or conditional upon, environmental stimuli (Plomin 1994; Rutter 2006). That is, genetic and environmental factors interact, and person-specific events may alter the sources of individual differences within a subset of the population (Boardman 2011; Boardman et al. 2011; Boardman et al. 2012; Hatemi et al. 2011). Thus far, the extent to which environmental experiences moderate estimates of genetic and environmental influences on political attitudes remains largely unexplored. This concern is especially important with regard to economic attitudes because of the influence that life events and personal circumstances exert upon them (De Witte 1996; Hainmueller and Hiscox 2010; Mach and Jackson 2006; Visser 1995).

Here I begin to address this lacuna by examining whether estimates of genetic and environmental sources of influences on economic attitudes are stable, or if they change in response to economic life events. The paper begins with a thorough elucidation of gene-environment interaction (GxE), which occurs when genetic influences are moderated by environmental stimuli, and gene-environment correlation (rGE), which occurs when an individual's genotype influences his or her probability of exposure to certain experiences that affect the trait of interest. The paper continues with a review of the literature on the relationship between life events and economic attitudes, which sets the basis for the choice of measures and expected phenotypic relationships. The analyses follow, and the results indicate that genetic and environmental influences on economic attitudes are malleable in response to life events. Specifically, genetic influences on unions, immigration, capitalism, socialism, property tax, and federal housing attitudes are moderated by losing one's job, suffering a major financial loss, and getting a divorce. However, changes in the magnitude of genetic influences are only temporary. The findings suggest that univariate twin models, which estimate the independent contributions of genes and environment on the variation in political attitudes, provide robust baseline indicators of sources of individual differences. These estimates, however, are not event specific.

Rationale for the Study of Gene-Environment Interaction and Gene-Environment Correlation

Contemporary scholars adhere to the belief that individuals construct opinions in response to stimuli, and are socialized during various stages of their lives to evaluate a given position, ideology or group (e.g., Campbell et al. 1960; Zaller 1992). Such processes are subject to cognitive and evaluative mechanisms unique to the individual (Balleine and Dickinson 1998; Cardinal et al. 2002; Everitt and Robbins 2005; Lang 1995; Raichle et al. 1994; Schultz, Dayan and Montague 1997; Seger 2009). In this view, responses or behaviors are developed, strengthened, maintained, inhibited or extinguished by contingent rewards and punishments in the environment; yet the degree, direction and source of the response to

stimuli differs across biologically unique individuals (e.g., Wilson, Stevenson and Potts 2006). Indeed, Druckman and Lupia (2000, 4) make a compelling case that evaluations and beliefs are based on some combination of “brain, body and world; and understanding these interactions are the key” to understanding preference formation.

Humans reveal great variability in individual responses to a variety of environmental stimuli. Heterogeneity in response characterizes even the most overwhelming of life events (Caspi and Moffitt 2006). This response is a complex function of one’s genetic and neurobiological disposition, inherited and modified from the moment of conception, through upbringing, parenting, resources, and constant interplay with the environment. Genetic, physiological, social, neurological, and environmental influences occurring both outside and within the body inform one another, taking primacy only temporarily through developmental stages and life experiences.

Behavioral genetic perspectives that model gene by environment interplay fit within, and are consistent with, the social science and life science paradigms referenced above. In behavioral genetics, the interplay between genes and environment is modeled as gene-environment interaction (GxE) and gene-environment correlation (rGE). GxE is commonly understood as genetic control of one’s sensitivity to the environment (Rowe, Jacobson and Van den Oord 1999; Rutter 2006). In other words, the effect of exposure to an environmental factor is conditional upon a person’s genotype, or the genotype’s effect is moderated by some environmental effect. Gene-environment interactions are operationalized in numerous ways, each providing unique benefits and certain limitations. Thus, it is important to clarify the different applications of GxE, and the method used in the current study.

A *measured GxE* approach examines if behavioral effects are due to the interdependence between specific genetic markers and measured environments. This approach has been undertaken for a wide array of behaviors. For example, individuals with the low activity MAO-A genotype display higher levels of aggression, but only when provoked (McDermott et al. 2009). These studies provide clues to the larger pathways involved in behavior but have only begun to emerge in explorations of political behavior (Dawes and Fowler 2009; Hatemi et al. 2011; McDermott et al. forthcoming; Settle et al. 2010). The major limitations of candidate gene studies, even those which are replicated, include the potential for publication bias, their inability to take into account the influence of all other genetic markers, and that they explain little of the overall variance on a given trait (Duncan and Keller 2011).¹

Epigenetic models of GxE explore post-translational modifications of DNA and nuclear proteins that result in modifications in the structure and patterns of gene expression. These effects do not indicate that sensitivity to the environment is moderated by genetic variation. Rather, environmental effects mediate gene expression. For example, Reul and Chandramohan (2007) find that stressful events evoke a distinct gene transcriptional

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¹For a recent criticism of candidate GxE approaches in political science see Charney and English (2012); for a rebuttal see Fowler and Dawes (forthcoming).

response in neurons involved in the encoding of memory of the event. These studies are critically informative, but among the most complex, requiring specific measures of gene expression, specific environments, extensive laboratory protocols, and longitudinal measures of genes and environments. Epigenetic studies are particularly difficult to conduct on social behaviors, as measurement of gene expression is tissue specific, meaning in order to explore much of human social behavior, brain tissue samples may be required.

The study of *latent GxE*, which is the approach used in the current study, explores whether the balance of heritable versus environmental influence on a phenotype's variation differs across subsegments of the population (Rowe, Jacobson and Van den Oord 1999). Models of heritability-environment interaction are more akin to traditional models of political behavior. Instead of isolating a single genetic marker among the sea of genetic, epigenetic, and other processes, latent GxE models focus on overall latent genetic influences. The major shortcoming in this form of analysis is that the precise neurobiological pathways remain unknown. Nevertheless, such an approach provides great promise for understanding the larger pathways of transmission. This approach is particularly beneficial for developing a better understanding of the sensitivity of genetic variance on a given political phenotype under varying environmental conditions. Indeed, the idea that genes influence behavior is often misinterpreted to imply that a certain "fixed" genetic disposition influences a "fixed" attitude (e.g., Charney 2008). Such a view, however, runs counter to the foundations of behavioral genetics, and gene-environment interplay, which suggest genetic influences on any complex social trait, attitude or otherwise, are not fixed (Hatemi et al. 2011; Rutter 2006). Rather, genetic influences are part of a complicated process, and include protein production and hormone regulation in both state and trait circumstances. These influences operate through one's neuropsychological architecture, which responds to, and is modified by, exposure to environments. One's genotype correlates with the potential for higher or lower promotion of specific hormones that regulate cognitive and emotive states, which then correlate with behavioral differences. Yet, gene expression and the mechanisms by which genes regulate hormones are environmentally contingent.

Critical to the discussion of gene-environment interaction is gene-environment correlation (rGE), defined as a person's genotype influencing their probability of exposure to certain environmental influences (Purcell 2002). In effect, individuals may be "choosing" their environment based in part on their genetic makeup (Eaves et al. 1977). This correlation is classified as *active* when an individual's genes influence their exposure to certain environments. For example, if the willingness to take economic risks, which is genetically influenced (Kuhnen and Chiao 2009), covaries with the probability of suffering a financial crisis, and this crisis influences one's attitudes, then it is likely that some portion of the genetic influence found on economic attitudes will covary with the genetic influences on the willingness to take risks associated with the crisis. Thus, analyses that explore the influence of financial risk events on economic attitudes in a GxE model will benefit by accounting for the potential of rGE.

The current study focuses on active rGE; however it is useful to discuss *passive* and *evocative* rGE. *Passive* rGE is when the environment of an individual is influenced by the genetic disposition of a relative (Medland and Hatemi 2009). For example, if one or both of

an individual's parents suffer from a high level of social phobia, it creates a specific environment for their children, in part due to the genes of the parents (Kendler et al. 2008). This environment may influence the child to be more anxious, even if the child did not genetically inherit the phobic disposition. Regarding political attitudes, there is little evidence of passive rGE (Eaves et al. 2011; Hatemi et al. 2010). *Evocative* rGE is when an individual induces particular behaviors from the people who constitute their environment (Posner et al. 1996). For example, reversing the scenario above, an anxious child may evoke particular behaviors from their parents, which in turn shape the environment the child experiences.

When addressing gene-environment interplay it is important to differentiate between proximal and distal experiences. Proximal environmental influences directly influence an outcome, such as meeting a presidential candidate during an election cycle, or recently losing one's home. In contrast, distal environmental influences include enduring demographic, historical, cultural, or geographic characteristics. Distal influences are not unimportant; they increase the likelihood of related proximal influences, but rarely are they a specific and immediate impetus for behavior (McLeod and Kessler 1990). With regards to sources of individuals differences, there is limited evidence that distal factors such as region, marital status, or income, substantially moderate genetic or environmental variance components estimates of political attitudes (Hatemi, Funk, et al. 2009; Hatemi et al. 2012; Littvay 2012; Smith et al. 2012). This may be in part because long-term contextual factors are captured within the larger trait, and distal traits are often confounded with potential self-selection or moderation effects. Univariate variance components estimates reflect the product of all influences that covary and interact with the expressed trait of interest. However, such estimates do not often display the influence of short-term proximate forces specific to the individual, as these are washed out by longer-term enduring influences common to the greater population. Even if proximal influences are experienced by all members of the same family, they are likely to be internalized differently by each family member, and have an independent influence on behavior. Therefore, proximal environmental factors such as financial life events are of greater interest than distal factors for gene-environment approaches on political attitudes.

The Relationship between Life Events and Economic Political Attitudes

Numerous studies explore the influence of personal circumstances on political behaviors (Abramowitz, Lanoue and Ramesh 1988; Kiewiet 1981; Kinder, Gordon and Gronke 1989; Kinder and Kiewiet 1979; Kuklinski and West 1981; Page and Shapiro 1992; Sears et al. 1980). Many of these studies concentrate on evaluating candidate performance or political party support in light of national economic conditions. While vote choice and attitudes are linked, in this study I focus on the influence that person-specific economic conditions, including unemployment, financial losses, and perceived financial stress, have on economic attitudes. The majority of this literature has focused on attitudes toward capitalism, socialism, taxation, unions, and immigration (Markus 1988; Schlozman and Verba 1979; Sears and Citrin 1985; Sears and Funk 1990).

Regarding unemployment, Schlozman and Verba (1979) find that the unemployed are no more sympathetic to ending capitalism or increasing taxes for the rich to redistribute wealth. They did find that the threat of job insecurity, or the likelihood of job loss in the near future and a history of unemployment, has a significant influence on policy preferences that might alleviate job loss. More recent scholarship focusing on countries with higher levels of unemployment extend these findings. While ideological and socio-cultural influences have a large effect on attitudes and voting decisions, unemployment has an independent influence on policy attitudes (Fidrmuc 2000a, 2000b; Kunovich 2002). For example, Mach and Jackson (2006) find that changes in one's employment status are associated with changes in attitudes about economic policies, which in turn change how people vote. The unemployed are more likely to support government intervention and constraints on pro-capitalism reforms, and they are more likely to vote for parties proposing to slow reforms. Conversely, those who become self-employed or business owners are more likely to support economic reforms and less government support. In addition, changes in the local economy in the form of higher employment are associated with anti-reform attitudes, but these influences are independent of an individual's employment status. The results imply that people who experience positive results of economic policies are more likely to form attitudes in support of such policies, and vice versa.

Industrial labor and psychological studies have also produced considerable evidence in this area, specifically around union membership. Union support increases during times of macro-economic downturn, and perceived personal financial instability. A high percentage of individuals who join unions claim to do so as a protectionist measure against potential future job loss (De Witte 1996; Visser 1995).

Anti-immigration attitudes also increase during periods of economic recession (Lapinski et al. 1997). It is proposed that economic concerns and fears about labor market competition, competition for government resources, and increased taxpayer burden, promote anti-immigration attitudes (Hanson, Scheve and Slaughter 2007; Mayda 2006). As such, immigration is often used as a wedge issue to mobilize the public over the threat of losing jobs or increased economic stress (Kluegel and Smith 1983). Anxiety due to worsening macro-economic conditions decreases support for immigration, but the evidence is mixed regarding person-specific economic situations. Economic self-interest appears to play a lesser role on immigration attitudes (Citrin et al. 1997; Sears and Funk 1990). Rather, psychological, affiliative and affective concerns, including partisan, sociotropic, symbolic, ethnocentric, and cultural tensions, as well as elite manipulation, operate on immigration attitudes (Brader, Valentino and Suhay 2008; Feldman 1982; Kinder and Sears 1981). Indeed, there is a growing literature exploring the intertwined roles of ethnocentrism, anxiety over the economy, local conditions, and personal benefit on immigration attitudes. For example, Hainmueller and Hiscox (2010) find that sociotropic and ethnocentric considerations mediate self-interest; poor natives are more concerned about competing for welfare benefits as a result of immigration, while the rich are more concerned about increased taxes.

The direction and intensity of anxiety's influence on out-group attitudes is not uniform. Increasing anxiety may also lead to greater affiliation with others who are awaiting the same

threat (Sarnoff and Zimbardo 1961) and this type of anxiety leads to increased cooperation, empathy and pro-social affiliative tendencies with those in a similar state (Gallese 2005; Schachter 1959). In this way, being jobless or in a financial crisis, or being anxious of what is to come because of financial risks, might instigate negative attitudes toward immigration based on some combination of economic self-interest and out-group threat, or these conditions may elicit a sense of shared fate or affiliation, resulting in positive attitudes toward immigration.

Perhaps the strongest findings connecting person-specific economic conditions and life events with political attitudes revolve around the public's view on property tax (Citrin et al. 1997; Sears and Funk 1990). Sears and Citrin (1985) focus on three California ballot propositions, proposing severe state and property tax reductions and a cap on state spending. They find taxpayers self-interested and supportive of the reductions. Several other studies provide comparable results (e.g., Courant, Gramlich and Rubinfeld 1980). Similarly, potential recipients of government services show increased support for additional spending on services, which include higher taxes for homeowners and the wealthy. The effect sizes, however, are modest in comparison to the taxpayers' desire to reduce tax.

In summary, immediate proximate life events threatening one's personal economic situation hold promise for exploring gene-environment interaction on political issue positions that may alleviate or exacerbate one's economic future. The mechanisms by which genetic influences operate may be through self-interested rational-cognitive processes, or through the elicitation of psychological states of anxiety, empathy or affect. In this regard, it is critical to recognize the benefits and limitations of latent gene-environment interaction models. Latent GxE models do not explicate whether the difference in attitudes is due to cognitive, rational or emotive processes, nor do they explicitly focus on the direction of attitude change. Rather, they identify changes in the relative sources of variance, be that genetic or environmental, that are informing those rational or emotive processes that drive differences on the trait.

Methods, Analysis and Results

The analyses are comprised of four phases. First, attitude scores are compared between the population who experienced an economic risk event and the population that did not. Second, a series of gene-environment interaction models, which include the potential for gene-environment correlation, estimate the influence life events have on the genetic and environmental variance components estimates of economic attitudes. Third, the stability of economic attitudes is displayed by comparing the attitudes of those exposed to financial risk events with those who were not, in a subset of the population approximately two years later. Finally, a second series of GxE models explore if the changes in the genetic and environmental sources of variance remain after two years.

Sample

The sample consists of a large study of kinships ($n=29,682$), aged 18–96 years ($\mu=49.5$, $\sigma=17.6$), comprised of 14,781 twins, 3,184 non-twin siblings, 4,391 spouses, 2,360 parents, 195 other relatives and 4,771 children of twins. Complete twin pairs include 1,885 female

monozygotic (MZ) twin pairs, 1,183 female dizygotic (DZ) twin pairs, 790 male MZ pairs, 583 male DZ pairs, and 1,134 female-male twin pairs. The population was drawn from Virginia's Vital Records Office and further supplemented by a national mailer sent to the American Association of Retired Persons (Eaves et al. 1999). A large questionnaire on "Health and Life Styles" (HLQ), which contained measures of political attitudes and life events, among many other traits, was administered to the population in the late 1980's. In addition, 4,119 of the twins, comprised of 744 female MZ twin pairs, 421 female DZ twin pairs, 195 male MZ pairs, 93 male DZ pairs, and 339 female-male twin pairs, aged 40–93 ($\mu=64$, $\sigma=7.9$), took part in a follow-up two years later. This *Health Habits and Opinions* study (HHO) assessed many of the same political attitudes in the HLQ. However, the life events questions were not similarly assessed in the second wave.

Measures

Political attitudes in the HLQ are measured by a 28-item Wilson and Patterson (1968) inventory of contemporary political and social attitudes (see Web Appendix 1 for the individual attitudes, construct validity and questionnaire). This type of measure has a long history in psychology (Bouchard and McGue 2003; Wilson 1973) and is increasingly used by political scientists (Alford, Funk and Hibbing 2005; Hatemi, Eaves and McDermott 2012; Smith et al. 2012; Verhulst, Hatemi and Martin 2010). The Wilson-Patterson (WP) inventory is administered by presenting subjects with a list of simple phrases such as "Unions", and eliciting an "agree or yes," "uncertain or don't know", or "disagree or no" response. The design captures the immediate opinions of respondents and allows for a quick assessment of the multidimensionality of political ideology. Five attitudes in the WP inventory measure economic interests and reflect the attitudes explored in the extant literature: support for *Capitalism*, *Immigration*, *Property Tax*, *Socialism*, and *Unions*. Two additional attitudes, *Foreign Aid* and *Federal Housing*, while not identified in the literature, are also included in the study for completeness, due to their economic nature and potential links to larger value systems. The attitudes in sum represent policy implications for financial relief or loss through governmental action, larger value systems, and economic ideologies. All seven attitudes were assessed in the HHO follow-up two years later.

The study assesses a wide array of life events through a shortened version of the Holmes and Rahe (1967) stressful life events (SLE) inventory. The SLE asks respondents to answer if they had experienced any of the following events within the last 12 months: *Divorce*, *Marital Separation*, *Broken Engagement*, *Separation from Loved one*, *Serious illness/injury*, *Serious accident*, *Robbed*, *Assaulted/mugged*, *Laid off/fired*, *Other Serious difficulties at Work*, *Major financial problems*, and *Legal Troubles with Police* (see Web Appendix 2 for questions, format and response rates). These types of scales have high test-retest reliability and are consistent with independently rated measures derived from semi-structured interviews (Brugha and Cragg 1990).

Four life events in the SLE scale are related to financial loss and risk: experiencing *Major Financial Problems*, being *Laid off/fired*, *Divorce*, and *Marital Separation*. The first two events are explicitly linked to financial loss. The latter two, though most often not inspired by economic loss, incur substantial financial costs. Relocation of home, developing new

credit, loss of property, and the associated costs of divorce, including possible alimony and child support, necessitate inclusion of these events (Duncan and Hoffman 1985; McManus and DiPrete 2001). Because *Divorced* and *Marital Separation* incur similar costs, and respondents could respond yes to both (see Web Appendix 3 for a comparison), a single measure is constructed (*Divorced or Separated*), and scored 0 if neither event was experienced, or 1 if either event was experienced.

The Influence of Life Events on Attitudes

Table 1 provides the frequency of endorsement for the economic attitudes under each of the life event conditions. Table 2 confirms there are significant differences in economic attitudes between individuals exposed to economic life events and those who were not. However, the attitudes measures are ordinal, and while parametric methods are often suitable to analyze ordinal data (Gaito 1980; Norman 2010), nonparametric tests have considerable advantages for likert-type data, particularly if the data violate normality or homogeneity of variance assumptions. Therefore, while Table 2 provides the means, standard deviations and Cohen's *d*, I use the Wilcoxon procedure to test if the populations are significantly different from one another. The Wilcoxon Z test can be considered a non-parametric version of a t-test but it compares the medians and mean ranks of the two groups, not the means.

Regarding attitudes on larger value systems, individuals who suffered economic risk events are less supportive of *Capitalism* and more supportive of *Socialism*. The findings are generally modest and reflect the broader literature on the relationships between job insecurity and support for socialism. Individuals who might benefit from more governmental support are more likely to endorse social welfare policies or positions (Mach and Jackson 2006; Zeitlin 1966). However, other research has not found person-specific economic conditions to be significant predictors of larger value systems (Feldman 1982; Schlozman and Verba 1979). The lack of support for self-interested policies in earlier research might be due to sample size limitations or lack of salience (see Citrin et al. 1997; Sears and Funk 1990). For example, in a random sample of 1,000 individuals, in most years, it is likely that on average less than 50 have suffered a specific financial life event (National Center for Health Statistics 1991), making statistical significance for measured effects unlikely. As such, it might be that the larger sample used here, akin to studies of developing democracies (e.g., Mach and Jackson 2006), provides a sufficient number of cases to properly identify these relationships.

Individuals who suffered any of the economic risk events are less supportive of *Immigration* and more supportive of *Unions*. These results also correspond with the extant literature. The cause of this shift may be self-interest, but such self-interest is likely infused by the anxiety caused by elite discourse, partisan influences, the perception of risk, sociotropic conditions and ethnocentric attitudes (e.g., Hainmueller and Hiscox 2010).

Consistent with the extant literature, the relationships between individual economic conditions and taxation attitudes are the most robust. Those who lost their job or were suffering from financial difficulties, including marital dissolution, and who may benefit from reduced taxation are more likely to oppose *Property Tax*. Opposition increases with the number of financial risk events experienced. With only one event, the difference is

significant (Table 2), but the more financial risk events suffered, the greater the difference, particularly for *Property Tax*, *Unions* and *Socialism* attitudes. The results support the claim that person-specific economic life events have a significant influence on attitudes. However, there are no more than 54 cases where individuals experienced three financial risk events in the last year, and only three of the seven relationships in this category are statistically significant.

The least explored relationships in the extant literature regarding life events and attitudes are *Foreign Aid* and *Federal Housing*. It is not surprising then that the relationships between these attitudes and the economic risk events are not significant, or small in magnitude. Support for *Federal Housing* increases when individuals experience any financial risk event, while support for *Foreign Aid* decreases with *Major Financial Problems*.

Nonparametric analyses affirm there are significantly different mean ranks between the populations. However, these estimates only serve as preliminary analyses to the central theme of the study. In a GxE exploration, the effects of life events on the population's attitudes are secondary to the effect life events have on the difference between co-twins' attitudes. Variance components models rely on co-twin covariance and GxE models focus on the possibility that cross-twin correlations differ as a function of environmental exposure. If, for example, MZ cotwins' attitudes become more similar in response to a life event, or DZ cotwins' attitudes more dissimilar, regardless of the population's overall reaction to the life event, the relative influence of genes and environments on attitudes will be significantly different in the affected population. In this case, genetic influence would increase. However, the opposite may also be true. For example, if the effect of a life event is overly large, it is possible that the effect will remove all differences in co-twin similarity regardless of zygosity type. In this case, the majority of variance will be due to environmental influences. Thus, the overall effect of life events on the population provides little information on the relative importance of genes and environments. It is to this question the paper now turns.

Testing for Gene-Environment Interaction (GxE)

Twin designs derive their explanatory power from the difference in the genetic similarity of MZ cotwins, who share almost identical chromosomal DNA sequences, and DZ cotwins, who share on average half of their DNA sequence. Comparison of trait concordance between MZ and DZ twin pairs reared together controls for the effects of familial environments, allowing for differences in co-twin correlations to be partitioned into broad estimates of heritability and environment. Phenotypic (trait of interest) variance (V_p) is most often decomposed into three latent variables ($V_p = A^2 + C^2 + E^2$): additive genetic variance (A), which is the sum of all genetic influence; shared environmental variance (C), and unique person-specific environmental variance, (E), which also includes error (see Medland and Hatemi 2009).

Univariate genetic and environmental variance decomposition estimates for each of the seven attitudes are presented in Web Appendix 4. Numerous univariate approaches have been applied to this sample, with slightly different results depending on the methodology (Eaves et al. 2011; Hatemi, Medland and Eaves 2009). Sources of individual differences on economic attitudes are a function of genetic and environmental sources of variance, but the

combined environmental sources account for the majority of variation. Because the findings and methods are explicitly detailed in the extant literature, I forgo the structural modeling specifics of the univariate design, and focus on the meaning of the estimates and deciphering the model in relation to gene-environment interaction.

First, variance component estimates represent what accounts for individual differences within the population (Hatemi, Byrne and McDermott 2012). Consider attitudes toward *Federal Housing* for example. The proportion of variance estimated for each of the A, C and E components, 0.40, 0.07 and 0.53 respectively, should not be interpreted to mean that 40% of one's attitudes is determined by genes (Hatemi, Alford, et al. 2009). Rather, 40% of the total variance (i.e., *individual differences*) on attitudes toward *Federal Housing within the population* can be attributed to genetic similarity, 7% to shared experiences and 53% to person-specific idiosyncratic experiences. In the classical twin design (CTD), each of the variance components remains independent of the others, and any interactions between genes and environments are confounded within the discrete A, C and E estimates. These estimates contain not only the direct effects of genes or environments, but also the effects of interactions between genes and environments (Boomsma and Martin 2002). The CTD provides umbrella estimates – they are the average genetic and environmental influences in a population, masking possible systematic transactions between genetic and specific environmental influences. That is, the effect of genetic variation may be particularly important for individuals within a specific environment, and less or nonexistent for those in another circumstance.

To investigate the possibility that genetic and environmental influences on economic attitudes are moderated by experiencing an economic life event, a model in which the variance components vary as a continuous function is needed. A modification to the twin design identified by Jinks and Fulker (1970) and elaborated further by Eaves and contemporaries (Eaves 1972; Eaves and Eysenck 1977; Eaves et al. 1977; Purcell 2002) provides this modification. Rather than modeling attitudes using the linear equation shown above, the variance associated with each of the three components are expressed as a linear interaction with the life events: $V_p = (A + \beta_a * Life\ Event)^2 + (C + \beta_c * Life\ Event)^2 + (E + \beta_e * Life\ Event)^2$.

Using this equation, a variance term for gene-environment interaction (GxE) is incorporated into the variance components model by partitioning genetic effects into a baseline or average impact of the variance component independent of the environmental indicator (analogous to an intercept in linear regression), and the marginal effect of the specific environmental event (analogous to the slope). In this equation, the β estimates allow the variance components to differ across exposure to the life events. This model is illustrated in Figure 1. Model specifics, algebra and simulations are specified in detail by Purcell (2002). A re-parameterization for ordinal data provided by Medland et al. (2009) is used in this study.

Entering the life event moderator in the means model removes genetic effects that are shared between the attitude and the life event from the covariance model. However, this approach may fail to detect GxE interactions where the moderated genetic component is common between the attitude and the life event (gene-environment covariance, or rGE as noted

above). Therefore, the GxE model is modified as a bivariate model of both trait and moderator in order to detect *GxE* in the presence of *rGE*.² A path diagram presented in Web Appendix 6 illustrates this approach (see Purcell 2002). The life event is entered as a dependent variable and as a moderator on each of the paths to the trait. The main effect in the means model is replaced with a path indicating shared genetic effects. Two sources of genetic influence are estimated for the attitude: that which is shared with the life event, and that which is not (common and unique environmental paths, a_C and a_U respectively). Each path can interact with the life event moderator, represented by the coefficients b_{XC} and b_{XU} . The *C* and *E* components follow the standard bivariate Cholesky parameterization but without moderation. Thus, in the absence of *GxE*, *rGE* is calculated as:

$a_m a_c / (a_m \sqrt{a_c^2 + a_u^2})$. In the presence of *GxE*, *rGE* must be calculated conditional on the life event (*M*) as it will also vary as a function of the life event: $\frac{a_m (a_c + \beta_{XC} M)}{a_m \sqrt{(a_c + \beta_{XC} M)^2 + (a_u + \beta_{XU} M)^2}}$

Maximum likelihood estimations in a structural equation model are fit to the raw data in the statistical package Mx (Neale et al. 2003). A series of interaction models are fitted to each of the significant political attitude and life event combinations. Exposure to the life event is included as a moderator on the variance paths A, C and E to the phenotype. In Figure 1, 'a' represents the effect of additive genetic variance independent of the life event; βa represents the effect of additive genetic variance dependent on the life event; the same goes for 'e' and βe . These betas were subsequently constrained to zero in the reduced (nested) models. Model fit for each of the reduced models was compared to the fit of the full model using the $-2LL$ likelihood statistic, which is distributed as χ^2 .

The p-values for the gene-environment interaction models are shown in Table 3. The raw $-2LL$ values for each interaction are too numerous to be displayed in the text and are available in Web Appendix 7. The full model includes the interaction of the life events on the A, C, and E estimates, and if the interaction effects are different for males and females (Sex). Table 3 presents the p-values for reduced models by comparing the change in model fit between the main effects model and the model with the interaction terms unconstrained; these nested models include removing sex differences, and the interactions from the A, C, and E parameters. A significant value ($p < .05$) represents a model in which the interaction cannot be removed without a significant reduction in model fit. It is customary to focus on the interaction between the measured environmental stimuli (the financial risk life events in this study) and all three sources of variation combined (ACE). However, the p-values for the interaction between the life events and each A, C, and E parameters are displayed individually for further specification. The parameters in the main-effects model are interpreted as in any other classical twin design (see Web Appendix 4 for the estimated values of ACE when life events are not modeled). Interaction terms are better understood graphically, by plotting the relative variance in the attitudes accounted for by A, C, and E under each of the life event conditions. The graphs for the combined ACE interactions are

²There are several approaches to addressing *rGE* in variance components analyses. One revolves around the choice of environmental influences to explore. Distal influences are candidates for self-selection and *rGE* confounds. However, random life events, as explored here, prove less susceptible to active *rGE* confounds. A second approach double-enters the moderator into the covariance structure. A third approach utilizes a co-twin control method prior to conducting gene-environment interaction (*GxE*) analyses (Middeldorp et al. 2008). The first two approaches are used here, and this last approach is presented in Web Appendix 5.

displayed when significant. Graphs for reduced models are only displayed when the combined ACE interaction is not significant, but some reduced combination of ACE is significant.

Experiencing a *Major Financial Loss* within the last year has a significant effect on attitudes, but no significant influence on sources of variance. That is, the process by which individuals differ in determining their attitudes remains the same across affected and non-affected populations, even if the event itself is influential in altering the expressed attitude. Losing one's job, however, significantly moderates the population estimate of genetic and environmental influence on *Unions*, *Federal Housing*, and *Property Tax* attitudes (Figures 2 and 3). For females, genetic variance declines to almost zero on *Union* attitudes for those who lost their job, while the shared environment increases substantially. For males, the reduction in genetic influence is similar to females, but instead of the common environmental variance increasing, it is the unique environment. Both males and females are more supportive of *Unions* if they lose their job, but differences in attitudes between females who experience the event are more a function of shared upbringing, while differences between male attitudes in reaction to the event are more of a function of personal experience. For *Federal Housing*, the loss of one's job reduces genetic variance and increases unique environmental variance, but has almost no influence on common environmental variance. The difference is significantly greater in males.

Perhaps the most intriguing finding is the impact job loss has on *Property Tax* attitudes. Support for *Property Tax* decreases for people who lost their job, but the process by which people differed in their opinion if they lost their job appears to be a function of genetic influence. Genetic variance increased by over 0.30 at the cost of environmental influence. That is, one's genetically informed psychological disposition appears to account for differences on *Property Tax* attitudes to a great degree (over 0.60 of the variance) among individuals who lost their job.

Experiencing a recent divorce or marital separation also significantly alters the sources of variance for *Immigration*, *Property Tax* and *Socialism* attitudes (Figure 4). For *Immigration* and *Property Tax*, genetic variance decreases, while unique environmental variance increases. The import of the common environment remains unchanged. The results for *Socialism*, while statistically significant, are muted. There is a significant decrease in common environmental variance, but only marginal increases in genetic and unique environmental variance.

So far, the analyses have focused on the effect of a single event. With only one event, it is not possible to identify whether the effect is linear or at which point financial risks no longer influence sources of variance on attitudes. This is addressed by creating a summed scale of risk events, ranging from zero to three, and modeling the interaction between the *Combined Risk Events* measure and each attitude. A significant GxE interaction exists for *Capitalism*, *Federal Housing*, *Property Tax* and *Socialism* (Figure 5). *Federal Housing* is significant but the change in the variance components is marginal, and thus the graphs are not displayed. The two measures of value systems, *Capitalism* and *Socialism*, are influenced in a similar manner by the *Combined Risk Events* measure. The import of the common environment

accounting for individual differences increases with each subsequent risk event, while unique environment decreases substantially after the first risk event. Genetic influences decrease in a linear fashion for *Capitalism*, but taper off after the second risk event for *Socialism*.

Recall that under the job loss condition, genetic variance on *Property Tax* increases. By including all risk events in one measure, however, genetic influences decrease, but the reduction is modest until after the second event. This makes sense given the increase in genetic influences under the job loss condition. Specifically, for females, genetic influences on *Property Tax* decrease, while common environment decreases after the first event, then returns to near its original magnitude after three events. For males, genetic influences marginally decrease from zero to two events, but take a radical drop at three events. For both males and females, unique environmental influence accounts for more of the individual differences within the population as the number of life events increases. The results are largely robust with the exception of the third event. The number of cases where an individual suffers three financial risk events in one year is small (54), and this is reflected by the wide confidence limits.

In summary, genetic influences on economic attitudes are quite sensitive to major person-specific financial contingencies, even if the phenotypic influence is modest. In more than 1/3 of the cases, there are significant changes in sources of variance. In almost all cases, genetic influences dissipate, with the one exception being the increase of genetic influence accounting for differences on *Property Tax* attitudes when individuals have recently lost their job.

Do the Effects of Life Events on Attitudes Persist Over Time?

The question remains as to whether attitude differences persist after the events have passed from recent memory. In time, do people revert to their former attitude position relative to the population? Do sources of individual differences on attitudes remain even if the mean changes on attitudes do not? Do people change not only their position, but also the way in which they differ from one another over the long run?

The panel structure of the study allows for such comparisons on a subset of the population. Table 4 compares the attitude scores between the populations who experienced a financial risk event and the unaffected population two years later. First, for all attitudes except *Capitalism*, the population of individuals who suffered *Major Financial Problems* maintains a different mean rank (calculated by Wilcoxon Z) in comparison to the unaffected population. However, attitudes are no more or less stable, measured by attitude correlations between waves, in the affected populations, with one exception. *Union* attitudes are less stable in the population who suffered *Major Financial Problems*.

The percentage of individuals in the second wave who lost their job is similar to the percent in the first wave, but in absolute terms, there are no more than 70. Nevertheless, statistically different *Property Tax*, *Unions*, *Socialism*, and *Immigration* attitudes remains between those who were laid off two years prior and those who were not. *Foreign Aid*, *Immigration* and

Union attitudes are more stable for those who lost their job two years prior, but *Socialism* attitudes are less stable.

Sample size is a concern regarding the *Divorce or Separated* event in the second wave. While the relative percent of divorce is consistent with the National Center for Health Statistics (Statistics 1991), less than 60 individuals from the first wave who were divorced or going through a separation were included in the second wave. Nevertheless, the mean rank differences between the affected population and non-affected population persist for all attitudes except *Foreign Aid* and *Immigration*. Attitudes are also less stable for *Federal Housing* and *Socialism* in the affected group.

In most instances, the influence of the risk events persists. That is, the differences in attitudes found for those who experience a life event in the first wave (Table 2), maintain the same direction and somewhat relative difference to the unaffected population in the second wave (Table 4). The next question is, do the sources of individual differences also persist? Analyses conducted using attitudes from the second wave resulted in no significant GxE interactions in any model for those affected by financial life events in the first wave. Since no models are significant, the model fitting results are placed in Web Appendix 7.

Limitations

The rate of adverse life events, while consistent with national averages, is low. However, this sample of more than 29,000 individuals provides ample cases to identify statistically meaningful relationships. The sample is not random and it is critical to explore different periods of time, cultures, and contexts prior to generalizing. Nevertheless, the attitude relationships are comparable to National Election Studies data (Smith et al. 2012). In addition, the three point attitude measures do not provide the same advantages as seven point scales, and may not reveal more subtle relationships between attitudes and life events. Yet, with regard to ACE variance components on attitudes, seven point likert-type scales provide comparable results to the same questions asked using three-point scales.

The life events measured are not exhaustive. While attitudes are assessed in the second wave, recent life events are not. Thus, analyses across both waves of data in the same structural GxE model are not possible. Additionally, the number of cases in wave two where individuals suffered a life event in wave one is low on an absolute scale and it is possible that no significant GxE interactions are identified in wave two due to sample limitations. For example, individuals unemployed at time one, may still be unemployed, or employed in between measures, then unemployed again by time two. This possibility might account for the persistence of attitude change or the lack of GxE effects in wave two. While this situation is unlikely for the divorce life event, future studies with additional measures are needed to address these possibilities.

Discussion

The relationship between economic events and policy positions has long presented a tantalizing puzzle. Recently researchers have begun to articulate the role of genes in this process, but the dynamics of how person-specific life events influence political attitudes

through both environmental and genetic pathways have remained unclear. The results presented here shed some light on these mechanisms.

First, this study provides further evidence that proximate life events have a significant influence on attitudes in the domain of those events. Individuals who lost their job or suffered from financial problems were more likely to hold positive attitudes toward organizations, policies or value systems which propose to alleviate those problems, such as *Unions*, *Federal Housing*, and *Socialism*, and more likely to oppose policies that have often been blamed as the cause for lack of jobs or economic woes (i.e., *Immigration* and *Capitalism*).

Next, this study investigated the extent to which proximate life events altered the sources of variance that account for individual differences on economic attitudes (GxE). Importantly, even though the effects of life events on attitudes can be modest, they can have a substantial influence on variance components estimates. Here, small attitude shifts resulted in large differences in co-twin covariance. In most instances, genetic variance on attitudes decreases for those who experience an economic life event. The one exception where genetic variance increases and accounts for a greater portion of individual differences is on *Property Tax* attitudes when individuals have lost their job in the last 12 months.

The marked increase on the genetic variance of *Property Tax* attitudes under a job loss condition might provide an ideal case to identify the specific neurobiological pathways subsumed within the heritability estimates on economic attitudes. Indeed, it remains unknown whether the genetic influence on economic attitudes operates through dopamine, serotonin, ketamine, or NMDA receptors and their extended hormonal pathways that have been implicated in cognition (Cropley et al. 2006), emotion (Canli and Lesch 2007; Dolan 2002), risk taking (McClure et al. 2004), delayed gratification (Hariri et al. 2006), anxiety (Hariri and Holmes 2006), rational action (Sanfey et al. 2003), and reward sensitivity (Farrer et al. 2009; Freire et al. 2006). Future work, focusing on these genetic variants and associated hormones under experimental conditions that measure economic risk, gain and loss, may begin to explicate the specific neurobiological pathways toward economic attitudes.

The malleability of genetic and environmental influences on political attitudes in the face of life events suggest that studies that partition the variance of attitudes into independent components attributable to genes and environments do not capture the interaction of genes and environments in real time as life events unfold. This alone should not be surprising. However, changes in sources of individual differences due to proximate influences do not persist over the long term. That is, the proportion of genetic influences that account for individual differences on attitudes is quite stable over the long run, and is only temporarily modulated by life experiences.

The findings generate a series of important questions. It appears that life events create a shock to the system, and alter how individual differences emerge in the population. Yet, it remains unknown whether genetic and environmental influences are simply moderated by life events or if the life events trigger different cognitive and emotive processes which are

then used to evaluate attitudes and manage one's preferences at the time. In this case, entirely different genetic and environmental mechanisms that inform those emotive and cognitive processes may be instigated. Future studies that identify specific genetic markers, and explore the expression of those markers under varying social and environmental conditions, are necessary to explore these possibilities.

Once the "crisis" passed, however, for the most part, attitudes did not appear to re-stabilize into their relative position within the population after two years. Do they at three years? A great deal of research has focused on attitude stability and preference formation (Achen 1975; Converse 1964; Jennings and Markus 1984). There is evidence of long-term change for certain attitudes based on life experiences, but attitudes may have some reversion as Alwin, Cohen and Newcomb (1991) presented in the Bennington study. Stressors often guide individuals to revert to default, established patterns. In other cases, stressors influence individuals to change their perception of experiences and subsequent behaviors. Time between events and attitude measures are important. Some life events pass away from memory enough that new life events exert their own independent effects in the river of experiences that wash us through life, while others remain salient for decades (Carstensen et al. 2000; Seidlitz and Diener 1993; Taylor 1983).

Indeed, after two years, the phenotypic influence of the financial risk events remained on most attitudes, but the change in the relative importance of genetic and environmental sources of individual differences did not. Thus, it appears it could very well be that genetic influences in part add stability, while environment cues change, and this process is mediated and moderated by new life events and other dispositional traits (ideology, personality, cognition, emotional regulation, etc.). Humans are supremely adaptive, and when times or circumstances change, people also change their position. Such a process would fit within an evolutionary framework that depends on particular environmental triggers to cue particular response sets: "no trigger, no variance" (e.g., Bouchard and Loehlin 2001; Hewstone, Rubin and Willis 2002). The evidence provided here offers support to further explore this possibility and conduct longitudinal and experimental studies to measure if genetic influence dissipates or increases in a wider array of environmental conditions. A third follow up on these respondents is in the field, and it remains to be seen if the attitude positions and genetic and environmental sources of influence in the affected groups remain stable relative to the unaffected population after 30 years.

Conclusion

To argue that differences in political attitudes or behaviors are not in some way influenced by one's genotype requires the assumption that while genes influence all other areas of biological and psychological functions (e.g., group affiliation, cooperation, conflict, etc.), all the mechanisms humans use to evaluate political choice are uniquely outside the sphere of genetic influence. Such a view is not tenable. However, the majority of research in this area has relied on univariate variance components. While these approaches are important and necessary, they represent only the first step in describing a population. They do not capture the influence of proximate events because such effects are often washed out by the greater population. Although there is much that remains to be understood, this study and others have

begun to converge on the understanding that within broad variance components estimates of genes and environments, a great deal of action and interaction exists on a daily basis. Dynamic and changing environments have a critical role on the import of genetic influences in the short term, but in the long term, the estimates of genetic and environmental influences appear stable. The results provide reason to begin a comprehensive exploration of the influence that proximate life events, including day-to-day and even hour-to-hour life experiences, have on a wider range of political attitudes in order to unpack variance components estimates into more meaningful and useful measures of genetic liability within specific environmental contexts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Path Diagram of Variance Components Analysis with GxE interaction

Notes: E is Unique Environment, A is Additive Genetic, and C is common Environment. T1 is twin 1 and T2 is twin 2. β_a represents the effect of additive genetic variance dependent of the life event; the same applies to c and e.

Figure 2. Changes in Source of Variance on Federal Housing and Unions When Fired or Laid Off

Notes: Full ACE model interactions shown. The shaded areas represent the 95% confidence intervals.

Figure 3. Changes in Source of Variance on Property Tax When Fired or Laid Off

Notes: Full ACE model interactions shown for males and females combined. The shaded areas represent the 95% confidence intervals.

Figure 4. Change in Source of Variance on Immigration, Property Tax and Socialism When Divorced or Separated in the Last Year

Notes: Full ACE model interactions shown for Immigration and Property Tax. C only interaction model shown for Socialism (see Table 3). The shaded areas represent the 95% confidence intervals.

Figure 5. Change in Source of Variance on Capitalism, Property Tax and Socialism When Exposed to One or More Financial Risk Events

Notes: A is additive Genetic, C is common environment; E is unique Environment. Full ACE model interactions shown. The shaded areas represent the 95% confidence intervals.

Table 1

Prevalence of Life Events and Distribution of Economic Attitudes

Life Events	Experienced	Did Not Experience			
Major Financial Problems	7.8	92.2			
Laid off/fired	3.7	96.3			
Divorce or Separated	2.8	97.2			
Economic Attitudes Under Each Life Event	Support	Don't know	Do Not Support		
Capitalism	54.3	29.2	16.5		
Major Financial Problems	46.5	34.4	19.1		
Laid off/fired	46.2	33.6	20.2		
Divorce or Separated	42.5	36.8	20.7		
Federal Housing	56.2	27.9	15.9		
Major Financial Problems	60.6	25.2	14.2		
Laid off/fired	59.0	26.1	14.9		
Divorce or Separated	60.0	26.6	13.4		
Foreign Aid	41.8	32.2	26.1		
Major Financial Problems	38.4	32.5	29.1		
Laid off/fired	40.0	32.7	27.3		
Divorce or Separated	40.4	34.4	25.3		
Immigration	45.6	32.0	22.4		
Major Financial Problems	44.9	29.9	25.2		
Laid off/fired	40.0	31.3	28.7		
Divorce or Separated	41.7	33.7	24.7		
Property Tax	64.8	16.1	19.1		
Major Financial Problems	48.6	21.0	30.4		
Laid off/fired	47.9	20.8	31.3		
Divorce or Separated	53.1	18.3	28.6		
Socialism	10.0	36.2	53.8		
Major Financial Problems	16.3	41.0	42.6		
Laid off/fired	16.3	43.1	40.6		
Divorce or Separated	15.6	42.3	42.2		
Unions	43.5	27.6	28.8		
Major Financial Problems	47.4	27.2	25.4		
Laid off/fired	50.8	26.2	23.0		
Divorce or Separated	50.1	26.3	23.6		

Notes: Percentages shown; sample sizes range from 29,030–29,674.

Table 2

Differences in Attitude Scores between the Unaffected Population and the Affected Populations

Attitude	Not Affected Population	Major Financial Problems	Laid off/fired	Divorce Marital Separation	1 Event	2 Events	3 Events
	M (SD)	M (SD/d) /Z	M (SD/d) /Z	M (SD/d) /Z	M (SD/d) /Z	M (SD/d) /Z	M (SD/d) /Z
Capitalism	1.63(.75)	1.73 (.76/.13) 6.38***	1.74(.77/.14) 4.75***	1.78(.77/.20) 5.99***	1.72(.76/.12) 7.46***	1.80(.78/.22) 5.47***	1.66(.73/.04) 0.52
Federal Housing	1.60(.75)	1.54 (.73/.08) -3.95***	1.56(.74/.05) -1.60	1.53(.72/.10) -2.23*	1.57(.74/.04) -1.71 [†]	1.48(.71/.16) -3.96***	1.43(.72/.23) -1.88 [†]
Foreign Aid	1.84(.81)	1.91 (.82/.09) 3.59***	1.87(.81/.04) 1.02	1.85(.80/.01) 0.13	1.88(.81/.05) 2.24*	1.92(.82/.10) 2.13*	1.83(.82/.01) -.09
Immigration	1.77(.79)	1.80 (.81/.04) 1.54	1.89(.82/.15) 4.61***	1.83(.80/.08) 2.12*	1.81(.81/.05) 2.48*	1.89(.83/.15) 3.35***	1.83(.84/.07) .53
Property Tax	1.55(.78)	1.82 (.87/.33) 15.33***	1.83(.88/.34) 10.82***	1.76(.87/.25) 6.46***	1.76(.86/.26) 14.28***	1.92(.89/.44) 10.70***	1.94(.91/.46) 3.55***
Socialism	2.43(.67)	2.26 (.72/.24) -11.03***	2.24(.72/.27) -8.57***	2.27(.71/.23) -6.49***	2.29(.71/.20) -10.84***	2.18(.73/.36) -8.64***	2.15(.79/.38) -2.84**
Unions	1.85(.84)	1.78 (.83/.08) -3.68***	1.72(.81/.16) -4.88***	1.74(.82/.13) -3.76**	1.79(.83/.07) -10.94***	1.69(.80/.20) -4.60***	1.63(.81/.27) -1.99*
N	26,737-26,834	2,222-2,291	1,045-1,076	805-837	2,848-2,945	534-548	52-54

Notes: Statistical significance is calculated by Wilcoxon Z (Z),

*** p .001,

** p .01,

* p .05,

[†] p .10; attitude scores range from 1 to 3 (1=yes, 2= don't know, 3 = no); M=mean, SD=standard deviation, d=Cohen's d.

GxE Model-Fitting Statistics for the Interaction between Life Events and Economic Attitudes

Table 3

Attitude	Major Financial Problems					Loss of Job					Divorce/Marital Separation					Combined Financial Risks				
	Sex	ACE	A	C	E	Sex	ACE	A	C	E	Sex	ACE	A	C	E	Sex	ACE	A	C	E
Capitalism	-		ns			-		ns			-		ns			0.001	0.01	-	0.01	-
Federal Housing	-		ns		0.05	0.05		-	-	0.01	-		ns			ns	-	-	-	0.04
Foreign Aid	-		ns		-	-		-			-		-			-			ns	
Immigration	-		-		-			ns			ns	0.05	0.02			-			ns	
Property Tax	-		ns		ns	0.001	0.01	-	0.001		ns	0.01	-	-	-	0.001	0.02	-	-	-
Socialism	-		ns		-			ns			ns	-	-	0.050	-	0.001	0.01	0.01	0.001	ns
Unions	-		ns		0.01	0.01	0.01	-	-	0.05	-		ns			-			ns	

Notes: Each cell contains the p-values for change in model fit of $-2LL$ likelihood ratio test. A dash (-) is present when the life event had no significant main effect on the attitude (Table 2) and therefore is not testable in a GxE model, or there was no significant GxE interaction and therefore no need to explore sex differences; "ns" is not significant. The "Sex" column notes if there is a significant sex difference. ACE is the model where all three variance components are significantly influenced by the life event, A is additive genetic only, C is common environment only and E is unique environment only. The $-2LL$ values for each nested model is presented in Web Appendix 7.

Table 4
Comparison of Attitudes between the Unaffected Population and the Affected Populations 2 Years Later

Attitudes 2 yrs. Later	Population at Time 2		Population at Time 2 for Those who Experience a Life Event at Time 1			
	M(SD)	Stability	Major Financial Problems		Laid off/fired	
			M(SD)	Stability	M(SD)	Stability
Capitalism	1.56 (.79)	0.70	1.59(.78)	0.63	1.58(.82)	0.75
Federal Housing	1.46 (.75)	0.56	1.37(.68) [†]	0.52	1.43(.75)	0.51
Foreign Aid	1.89 (.88)	0.61	2.02(.88) [*]	0.65	1.89(.91)	0.85 ^{***}
Immigration	1.58 (.79)	0.59	1.69(.88) [†]	0.63	1.52(.77) [†]	0.82 ^{***}
Property Tax	1.35 (.71)	0.58	1.54(.82) ^{***}	0.59	1.44(.78) [*]	0.61
Socialism	2.52 (.69)	0.57	2.39(.75) ^{**}	0.55	2.27(.78) ^{**}	0.34 ^{**}
Unions	1.77 (.87)	0.71	1.62(.81) [*]	0.62 [*]	1.47(.82) ^{**}	0.82 ^{***}
N	3,900–3,948	3,743–3,890	188–193	183–190	70–72	69–71
						54–59
						57–58

Notes: Statistical significance is calculated by Wilcoxon Z.

***
p .001,

**
p .01,

*
p .05,

[†] p .10; attitude scores range from 1 to 3 (1=yes, 2= don't know, 3 = no); M=mean, SD=standard deviation. Stability is measured by the correlation between attitudes at time 1 and time 2.