

Choosing sides. The genetics of why we go with the loudest.

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Abstract

Recent developments in spatial voting moved beyond finding the most appropriate utility function and started to assess individual differences in decision strategy. The question is not if a proximity or directional worldview performs better in general, rather under what conditions people pick one strategy over the other? We draw on psychological theories to develop a survey-based measure of individual decision strategy and take a behavior genetic route to explaining the individual differences. We argue that dispositional traits shape whether an individual develops a directional or proximity worldview of the political arena. Utilizing a classical twin design, we capitalize on the documented relationship between partisanship and a directionalist worldview. We find that, in the Minnesota Twin Political Survey both the strength of party identification and directional voting are moderately (~20%) but significantly ($p < 0.05$) heritable with no socialized component contributing to the variance. The covariation between the two traits is predominantly driven by common underlying genetic effects ($p < 0.01$). Implications for the rational voter models are discussed in light of the findings.

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“The thrust of the *dispositional* model is that it is the direction of a candidate's policy that is critical to developing his support base, not his absolute position”

In memory of George Rabinowitz (1943-2011)

Introduction

A dominant subset of voting behavior theories defines itself as a rational choice theory. Preferences are formed based on what utility individuals derive from the electoral win of a given candidate or political party. What utility means or how it is calculated is still debated by rational choice theorists. Two of the major rational voting behavior theories are the proximity (Downs, 1957; Enelow and Hinich, 1984) and the directional theory (Rabinowitz and Macdonald, 1989). Both define the electoral utility based on the relationship between an individual's position on various issues (or an ideological scale) and the positions of candidates or parties running for office. However, there is a major difference between these two theories. Proximity theory assumes that voters will prefer those candidates that have the closest policy positions to theirs, whereas the directional theory asserts that the most intense candidates on the same side of the issue will be the ones preferred by the voters. Over 20 years of theoretical and empirical research tried to compare which of these views better describes how real voters behave. However, these comparisons suffer from serious methodological issues and cannot yield conclusive evidence (for a review see Claassen, 2009; Lewis and King, 1999 and Tomz and Van Houweling, 2008).

Claassen (2009) rightfully asks whether this debate is purely an academic nuance or it has a long-lasting impact on how people view and sort the electoral competition. This is a valid question as in an overwhelming proportion of cases both theories predict the same preference (Tomz and Van Houweling, 2008: 305). Nevertheless, we strive to understand which theory better describes electoral behavior, because they reflect two different worldviews. The implications of a “proximilist” view are that voters have well defined policy positions, penalize extreme candidates, and prefer moderate ones. Conversely, in its original formulation, the directional theory of voting was introduced because individuals are hypothesized to regard issues in a dispositional manner, similar to partisanship (Rabinowitz, 1978). The “directionalist” view implies that voters only take sides (direction) and consequently do not have ordered policy preferences. Furthermore, if the voters have more

candidate options on the same side, they prefer those who care the most about the issue, supporting candidates with more extreme positions (Rabinowitz and Macdonald, 1989). En sum, “directional citizens react to emotional appeals as the intensity of their feelings about a political issue interact with the candidates’ appeals” (Claassen, 2009: 230).

The directional view means the abandonment of considering issues in a strictly positional manner, and implies the transformation of exact policy preference into the intensity with which a side – pro- or against – is held. The more emotional character of decision-making (Rabinowitz and Macdonald, 1989) is paired with responsiveness to more extreme attitudes. Given the importance of the differentiation, but keeping in mind the methodological difficulties of pronouncing a clear winner (Lewis and King, 1999), recent research focuses on gathering experimental data (Claassen 2009; Lacy and Paolino, 2010) or defining the composition of the electorate (Tomz and Van Houweling, 2008). Employing these approaches, the researchers accept that there is substantial heterogeneity in the electorate. Identifying individual differences in the rational voting strategies used open new realm of possible research questions. What are the underlying determinants of the heterogeneity? Why people experiencing the same political arena choose different ways to rank their electoral preferences? As suggested by the work of Tomz and Van Houweling (2008), individuals who have stronger attachment to a party or are politically less informed have a higher propensity to follow a directional logic of voting. But is it only a matter of socialization, environmental factors, or do individuals react differently to environmental stimuli because of genetic predispositions?

Responding to the same environmental stimuli – a candidate’s policy stances – in very different manner is rooted in the dispositional consideration of issues, thus individuals’ general predisposition towards everything political plays an important role in understanding these differences. Previous behavior genetics research found strong heritability in a multitude of political traits¹ including strength of party identification (Hatemi et al., 2009; Settle et al., 2009), a highly relevant covariate of rational decision strategy (Tomz and Van Houweling, 2008). We also take a behavior genetic path to understand the sources of individual heterogeneity. Since behavior genetic research is often misunderstood, it is important to highlight early that genetic factors have no direct influence on any behavioral traits (including all of political attitudes and behaviors). Rather the influence is channeled through a complex pathway that start with different genotypes (and their interactions with the environment or

other genotypes), continues through coding of proteins, amino-acids that serve as signals in our body influencing our physiological functioning, our nervous system and the operations of our brains². These genetically coded signals are subject to great variations even within genotypes, but, on average, do influence dispositional traits across the genotypes and, in turn, these could influence political attitudes and behaviors³.

In our operationalization, we focus on how the two theories differ in the assumed relationship between issue positions and issue salience. According to the directional theory, an individual's position on a given issue already reflects how much he or she cares about the issue. Strength of issue position should therefore overlap with the additional salience consideration. The proximity theory has no such assumption about issue positions and salience, and thus the two theories can be distinguished from each other based on this relationship. We argue that the overlap between the intensity and salience is a necessary condition of the directional worldview, thus it becomes possible to assess the determinants of the directional worldview emphasizing the dispositional view of issue politics. In line with previous experimental research, we find substantial individual heterogeneity on the measure of this overlap. Our results also confirm our expectations, showing that individual differences on decision strategies are heritable and genetically related to strength of partisanship.

In the next section we review the difficulties in comparing the proximity and directional theory. We then develop our argument on the overlap between the attitude strength dimensions as necessary condition of the directional theory. We continue with describing our data and the methods employed. After presenting our results on the heritability of rational decision strategy, we state the limitations and discuss the implications of our study.

Competing spatial theories

A well functioning democratic system relies on some type of congruence between what people prefer and what their representatives or governments stand for. Unfortunately, what this congruence between preferences and policies means and how it should be analyzed is not straightforward. Previously, most democratic theories operated with the assumption that people are best represented by those candidates or parties that are closest to them (Claassen, 2009: 230). This is the logic of the proximity theory (Downs, 1957; Enelow and Hinich, 1984). However, the directional theory of voting brought a perspective in which one's utility

is maximized by political actors most intense on the same side of the issue (Rabinowitz and Macdonald, 1989).

The novelty of this theory lies in a redefinition of how voters perceive the political arena. It questions the view that individuals actually think of their own political opinions as policy positions. The difference between specifications of the utility function reflects the divergent view of how people are expected to sort out their own opinions and the political competition, and how they translate them into electoral preferences. People prefer the most intense candidate on their side, because this candidate is most committed on the issue of interest (Tomz and Van Houweling, 2008). The same logic applies when there is no candidate on the side of the individual. In this case the voter wants the least committed, least intense candidate from the opposing side.

The reason for this stark contrast to the classic proximity theory of voting is that, according to Rabinowitz (1978), issues operate in a diffuse way and “the majority of the public [do] not see issues in the sharp positional fashion that the traditional theory assumes” (Rabinowitz and Macdonald, 1989: 94). Thus, alongside the separation between valence and position issues proposed by Stokes (1963), an additional category of issues is needed. These are the dispositional issues, a subset of position issues and are characterized as follows:

“[Dispositional issues], like party identification, imply a neutral rather than a committed center. In addition, since no absolute positions are involved, an electorate responding to issues in a dispositional manner would generally be confined to the options candidates offer. This would explain both the issue sensitivity and the electoral centrality of the space” (Rabinowitz, 1978: 811).

A more formal review of the preference rank ordering and decision-making under the two theories under scrutiny is offered through the analysis of the hypothetical situations displayed in Figure 1⁴.

-- Insert Figure 1 around here --

In the present scenario both voters (v1 and v2) are faced with four possible candidate choices (A, B, C, D)⁵. According to the proximity rule, voters will prefer the candidate that is closest to them on the issue scale: the closer the positions, the higher the utility associated with that choice. Both v1 and v2 will prefer C, as that is the closest position to them. In this

setting it is clear that the neutral (0) position has no specific meaning for the proximity theory, as only the absolute distance counts for the choice or preference. Under the proximity rule, the full preference ordering for v1 is CBDA and for v2 is CDBA. Although v1 and v2 have diverging opinions on the hypothetical issue, their first preference is identical. Furthermore, both of them are farthest away from A, although one may argue that v1 should have more sympathy towards A than v2, as they are basically on the same “side”. The directional theory reflects on this puzzling situation.

Following Rabinowitz and Macdonald (1989), under the directional rule v1’s first preference choice is A and v2 prefers first D. This is given by the two-step approach: if there are candidates on the same side of the neutral point with the voter, it is clear that one of those candidates will be preferred. If there are more candidates competing on the same side of the neutral point, voters will choose those that are more intense (or extreme) about the issue⁶. Consequently, for the scenario in Figure 1, A (for v1) and D (for v2) are clear winners under the directional rule. The full preference ordering for v1 is ABCD and for v2 is DCBA.

By looking at this more formal expression of the two spatial rules, we now understand what directional theorists mean by intensity based view and dispositional issues. The directional utility function reaches its maximum if both the voter and the candidate are on the same extreme. In the example from Figure 1, the issue scale ranges from -5 to 5, leading to a maximum utility of 25 (5×5 or -5×-5). The more extreme the positions of actors and voters, the higher the utility associated with the given choice.

This different view on the perceptions of individuals’ policy preferences and decision mechanisms has an important implication for candidate competition. If people see politics in terms of symbolic response and intensity (Rabinowitz and Macdonald, 1989), the median voter theorem (Black, 1948; Downs, 1957) has to be reconsidered. According to utility function employed by the directional theorists, candidates will gain less by taking a moderate position on an issue or policy. The real gains in electoral competition stem from more intense and extreme positions. Nevertheless, even in its initial proposition by Rabinowitz and Macdonald (1989), there are certain limits of directional theory. If candidates’ positions are too extreme, they will be outside the region of acceptability and penalized by the electorate.

Considering these implications of the directional theory it is not surprising that it was extensively scrutinized. The ongoing competition between proximity and directional theory still reappears in scholarly journals. This long-running discussion is also due to the crux of comparison; for both substantive and methodological reasons it is extremely difficult to offer a clear verdict on which of these mechanisms are at play when observing voters’ decisions

(Claassen, 2009; Lewis and King, 1999; Merrill and Grofman, 1999; Tomz and Van Houweling, 2008). This is especially true for two party systems such as the one in the United States.

The crux of comparison

Comparing these two theories is a rather difficult enterprise. First, we need to define the goals and limits of comparison. Do we want to assess which type of electoral behavior is more frequent among individuals? Do we want to see which specification of the utility function is a better predictor of candidate evaluation and implicitly yields better model fit? Furthermore, even if one theory performs better in a given aggregated context, can we be sure that there is no systematic difference between the applicability of these theories on the individual level? There could be individual differences suggesting that one theory performs better for some people and the other for others.

Previous research pursued different paths of comparison, but there is no clear verdict on which theory fairs better. Three major issues constantly reappear in the comparison of the two theories: (1) what candidate placements are used (Gilljam, 1997a; Gilljam, 1997b; Macdonald et al., 1997; Macdonald and Rabinowitz, 1997b; Macdonald et al., 1998; Merrill and Grofman, 1997; Pierce, 1997; Rabinowitz and Macdonald, 1989; Westholm, 1997; Westholm, 2001), (2) do we explain intra- or inter-individual differences on various issues (Westholm, 1997; Westholm, 2001), and the non-discernable predictions that proximity and directional theories produce. Not surprisingly, the first two aspects of this debate are not settled. If indeed all the comparisons depend on operationalization and model assumptions (Lewis and King, 1999), answering which theory better describes voter is still a daunting task.

Using a novel operationalization of decision strategy we construct a measure that explain both inter and intra individual differences. Our measure is not tainted by various operationalizations of candidate placement and it tackles non-discernable predictions directly by building on social psychological principles of how people think about political issues.

Non-discernable predictions emerge because in a real life setting directional and proximity theories often do not differ in predictions (Claassen, 2009; Lacy and Paolino, 2010; Lewis and King, 1999; Tomz and Van Houweling, 2008). Depending on the position of candidates and the voter we can only distinguish between decision strategies used in few permutations.

Thus, using survey data, the possibility to derive critical tests of these theories is extremely limited (Tomz and Van Houweling, 2008). These methodological difficulties drove researchers to reconsider the goals and methods of assessments of the competing spatial theories. A “mixed approach” (Merrill and Grofman, 1997; Morris and Rabinowitz, 1997) combined with the collection of experimental data produced a paradigm shift in thinking about these issues (Claassen, 2009; Lacy and Paolino, 2010; Tomz and Van Houweling, 2008). In their experiment, Lacy and Paolino (2010) manipulate fictional candidate descriptions, and compare, for example, how extreme voters rate moderate candidates with how moderate voters rate the same candidates. Testing three hypotheses (two directional and one proximity), they find an overwhelming support for the proximity theory (Lacy and Paolino, 2010).

The real question becomes, why some people view electoral competition in proximity terms and others in directional terms? After carrying out a controlled experiment using the issue of health care, Tomz and Van Houweling (2008) report that 57.7 percent of the respondents were proximity voters, only 14.7 percent were directional voters, the rest of 27.6 percent being discounted proximity voters⁷. Moreover, they also analyze how directionalists differ from proximilists. They find that “directionalists were almost absent among political independents, but comprised one-fourth of strong partisans”, and that “[d]irectional voting was about twice as common among the less educated respondents (18.6%) as among the more educated ones (8.5%)” (Tomz and Van Houweling, 2008: 313-314). Furthermore, as Claassen reports (2009), some issues favor the proximity behavior - like military spending, or even ideological positioning, but some stimulate a directional vote choice or evaluation - such as abortion.

A recent attempt to answer why some people use directional and others proximity voting comes from Collins (2011). He argues that individuals “transform” or reduce the perceived continuous policy space into categories, putting each candidate into one category. Then, they have proximity type preferences over categories (not necessarily candidates) and they choose the closest category to their ideal category (Collins, 2011). Thus, if the policy space is divided into many categories by the voters’ cognitive processes, it is more probable that these voters will be a proximilist. However, if a voter uses only two categories that closely resemble the two sides of the policy space (as measured in surveys for example), the voter will be a directionalist (Collins, 2011).

We subscribe to the logic that it is more accurate and important to identify and understand the individual differences in decision strategies. In the following section we

propose a survey based measure that lets us distinguish between people who are more inclined to follow a directional view of politics and those who see the political arena in terms of well defined policy positions.

Overlap of attitude strength dimensions: necessary condition of the directional theory

We turn to one aspect of the directional theory that gained relatively little attention to date. If individuals indeed regard the political arena in terms of intensity and not in terms of exact policy positions, we can capitalize on the relationship between issue position extremity and salience to better understand the variance in the prevalence of the two spatial theories in question. Those who are more susceptible to use a directional approach of voting must have overlapping extremity and salience considerations. When asked about an issue, people who are “dispositional” utility maximizers (Rabinowitz, 1978; Rabinowitz and Macdonald, 1989), express the intensity with which they feel about the issue.

The implications of the directional worldview on the relationship between issue positions, intensity, and salience are of key interest here. Extremity is defined as “the extent to which an individual’s attitude deviates from the midpoint of favorable-unfavorable dimension and it is typically operationalized by folding over attitude self-report rating scales” (Krosnick et al., 1993: 1132). Intensity is “the strength of the emotional reaction provoked by the attitude object in an individual” (Krosnick et al., 1993: 1132). Finally, salience, dubbed as importance in social psychology, is “the extent to which an individual cares deeply about and is personally invested in an attitude and is ordinarily operationalized by self-reports of importance, concern, or caring about the attitude object” (Krosnick et al., 1993: 1132). These three attitude strength dimensions are linked and they generally indicate the same outcome: extreme, intense, and salient attitudes are strong attitudes (Krosnick et al., 1993; Raden, 1985). In the social psychological literature it is recognized that these dimensions are linked, but they are still considered analytically different concepts (Boninger et al., 1995; Krosnick and Petty, 1995).

The directional theory of voting starts with the following simple claim: in an issue survey question with a Likert type scale we inherently observe intensity. Thus, there is equivalence between extremity and intensity in the case of this theory. Along these lines, when discussing the directional theory of voting, Westholm (1997:866) concludes:

“Thus, when voters are asked to indicate their issue stands on a continuous or semicontinuous scale, the differences between responses falling on either half of the scale will express variations in intensity rather than variations in policy positions. It follows that separate questions designed to measure issue salience are redundant, since the intensity component is already in hand.”⁸

Furthermore, when introducing the directional theory, Rabinowitz and Macdonald (1989) also relied on results provided by Niemi and Bartels’ (1984) research. Analyzing the 1979 Pilot ANES Study and the 1980 ANES data, Niemi and Bartels found that including the salience term from an explicit follow up question in proximity models has no real influence on how well the spatial model predicts candidate evaluations. Salience measures are redundant, because the “intensity component is already in hand” (Westholm, 1997: 866).

Thus, the formulation of the directional theory implies two explicit equivalencies. Because people see issues in a diffuse and dispositional manner, their issue position’s extremity is the reflection of the emotional reaction produced by it (intensity). Also, the intensity with which individuals feel about an issue is nothing else than the extent to which an individual cares deeply about the given issue (salience). However, from this we can derive that in order to have intensity based directional worldview extremity must be the same as salience. Consequently, according to the directional theory, we have one perfectly sufficient measure of intensity and that is the folded scale of the issue question.

We judge the prevalence of the directional theory by assessing whether the necessary equivalence is present for an individual. This is done by the analysis of the overlap between the observed attitude strength dimensions. Directional theory is at play when the extremity and salience overlaps. If and only if we observe overlap between extremity and salience can we assert that people see politics in terms of intensity, subscribing to the views propagated by directional theorists. If there is no overlap, the directional theorists misjudged how people see the political arena. We expect that there is individual heterogeneity: some people see politics in terms of intensity, but some do not. So, for the people where we have overlap, we know that the necessary condition of the directional theory is satisfied, and thus they are more susceptible to subscribe to the intensity based worldview of the directional theory (Rabinowitz, 1978; Rabinowitz et al., 1989). This argument is also in line with what Lacy and Paolino (2010: 461) posit on the relationship between attitude strength dimensions:

“Proximity theory, because it allows for issues to be ordered along a continuum, allows candidates to be intense moderates as well as intense extremists, but the level of commitment is generally not evaluated as a central part of the empirical tests of proximity voting. Directional theory, by contrast, allows for moderations only in terms of one’s commitment to an issue position.”

En sum, we argue that issue question positions reflect intensity if and only if extremity of the position overlaps with the salience attributed to the issue. If extremity and salience do not overlap, we can be sure that these individuals do not follow the worldview suggested by the directional theory. Thus, overlap between intensity and salience is a necessary, but not sufficient condition of the directional theory.

We must be careful in formulating the implications of the missing overlap for the prevalence of other rational choice theories. No overlap between extremity and salience means that respondents do not use the directional rationale in choosing their preferred candidates. Also, in cases where the directional and proximity theory would suggest the same preferences, individuals with overlap are more susceptible to follow a directional rule, not proximity one. This advantage of considering overlap rests on a theoretical argument. As the choice sets are identical, there is no possibility to empirically distinguish the two theories. But as overlap is a reflection of a directional worldview, where we find overlap, we can affirm that even if the choice sets are identical, the mechanism followed is directional.

This is reflected in our operationalization of overlap as well. We do have overlap measure for each of the three issues available in our data, from which we produce an additive measure. We use this measure for two main reasons: (1) it takes into account the multi-issue aspect of electoral competition, and (2) it also grasps the issue dependent variance in overlap, suggested by the works cited from the social psychological literature. As we previously argued, we are analyzing directional worldview, not simple issue specific attitudes. The detailed operationalization and coding of overlap is discussed in the next section.

Using the overlap as a measure that discriminates between the applicability of the directional vs. other spatial models, our contribution has two more substantive advantages. We argue that through this measure we can identify the individual differences that make the directional theory applicable for only a subset of people. Secondly, even if our measure is just a proxy, it is applicable to survey data. Experimental data would be preferred to compare these theories, but by using the overlap we can still identify survey respondents who are more susceptible to follow a directional electoral logic.

Data

To better understand individual differences in voting strategy, we turn to the Minnesota Twins Political Survey (MTPS) collected in 2008-2009, administered to a sample of twins selected from the Minnesota Twin Family Registry (National Science Foundation grant #SES-0721378; John R. Hibbing, PI). The Minnesota Twin Family Registry comprises of about 8,000 twin pairs born in the state of Minnesota between 1936 and 1955. The registry was compiled between approximately 1983 and 1990 (see Kruger and Johnson, 2002; and Lykken et al., 1990 for additional information on the Minnesota Twin Family Registry). This survey is the first twin study specifically devoted to political phenotypes. The mode of data collection was mainly a web survey but self-administered paper and pencil versions were also used. The survey fielded between July and December of 2008 with a supplementary collection effort between July and October of 2009. Given the characteristics of the Minnesota Twin Family Registry the sample is restricted in its age coverage. All respondents were between the age of 53 and 61 at the time of the interview. Only same sex twin pairs were selected in the sampling phase. n=1349 interviewed individuals yielded n=596 matched twin pairs (MZ Males=143 pairs, MZ Females=213 pairs, DZ Males=86 pairs, DZ Females=154 pairs). In terms of families, we have n=428 families with MZ twins and n=316 families with DZ twins. Item missing data levels were under 1% for overlap and 11.4% for party ID⁹. With the possibility of the co-twin missing and incidental item missing data covariance coverage was always above 67.8% for MZ and 58.2% for DZ twins. Missing data was corrected for with full information approaches.

The MTPS included three issue questions where two sides of an issue were placed on the two extremes of a 7-point scale. The respondents were asked: “[w]here would you place yourself on this scale?” All three issue questions were followed up enquiring about “[h]ow important is this issue to [the respondent] personally?” The issue questions were:

Some people feel the government in Washington should see to it that everyone has a job and a good standard of living (position 1). | Others think the government should just let each person get ahead on their own (position 7).

Some people think it is important to protect the environment even if it costs some jobs or otherwise reduces our standard of living (position 1). | Other people think that

protecting the environment is not as important as maintaining jobs and our standard of living (position 7).

Some people believe that the United States should solve international problems by using diplomacy and other forms of international pressure and use military force only if absolutely necessary (position 1). | Others believe diplomacy and pressure often fail and the U.S. must be ready to use military force (position 7).

We thus have role of government, environment and international affairs issues providing sufficient issue content variation. The salience question asked right after the issue position item had five possible answers: “1. Extremely important”, “2. Very important”, “3. Somewhat important”, “4. Not important”, “5. Not at all important”.

As a first step, we folded over the 7-point issue questions: we subtracted the middle point (4) from the issue positions and took the absolute value of it. This is the extremity measure: 0 - neutral (4 originally), 1 – weak (3 and 5 originally), 2- considerable (2 and 6 originally), and 3 - extreme (1 and 7 originally). We also recoded the salience measure to range from 0 - Not at all important to 4 - Extremely important. The correlations between extremity and salience are as follows: 0.31 ($p < 0.001$) for state implication, 0.44 ($p < 0.001$) for environment and 0.46 ($p < 0.001$) for the international relations issue.

To construct our overlap measure, first we create a dichotomous variable for each issue. If extremity is equal to salience, the variable takes the value of 1, otherwise 0. As extremity has 4 values and salience has 5, we collapse the “extremely important” category with the “very important” category as both represent strong attitudes. Consequently, we have overlap in case of an issue if somebody is extreme on it (3) and the issue is highly important for her (3 or 4 on the recoded salience scale), or a considerable position (2) is matched by somewhat important (2) category on salience, or a weak position (1) with no importance (1). Finally, if somebody is neutral about the issue (0), we find overlap if she considers that issue not at all important (0). Figure 3 displays the sample percentages of overlap for each issue. As expected, there is variation in our overlap measure across issues (Claassen 2009). Compared to the other two issues, more people think about the international relations issue in directional terms.

-- Insert Figure 2 around here --

In our analysis we will focus on an additive overlap measure. We do this for several reasons. First and foremost, we are interested in identifying and analyzing a more general directional worldview. If we focus on the issue specific overlap, we would not be able to isolate the effect of the issue content. As previously stated, overlap between extremity and salience is a measure that taps into the susceptibility of an individual to follow a directional logic. This should be thought of as a degree of directionalist worldview. Given that we have 3 issues in the dataset, the additive overlap measure ranges from 0 - no overlap on any of the issues, to 3 - overlapping extremity and salience for every issue. Figure 4 presents the distribution of the additive overlap measure. In our analysis we treat this variable as ordinal. An advantage of the overlap measure is that it does not suffer from any bias stemming from what candidate positions are used to specify the utility functions. Additionally, constructing an additive measure also means that we account for both intra- and inter-individual differences. These two properties of our measure tackle the previous challenges in comparing the directional and proximity theory.

-- Insert Figure 3 around here --

Tomz and Van Houweling (2008, 314) find that directionlists are much more frequent among those who are strong partisans, and for this reason we also focus on the relationship between our overlap measure and the strength of party identification (PID). We recode the party ID item from our dataset into strength of PID (or partisanship) variable. The initial formulation of the question was:

Generally speaking, which of the following best describes your partisan affiliation?

The possible categories were Strong Democrat (1), Democrat (2), Independent (3), Republican (4), Strong Republican (5). Two additional categories were specified as answers: "I support a third party" and "None of these". As we do not know anything about the strength of the latter two positions, these categories were considered missing values. We folded over the 5-point partisanship variable, and the resulting strength of PID variable is 0 if Independent, 1 if either Democrat or Republican, and 2 if either Strong Democrat or Strong Republican. Figure 5 displays the distribution of the final partisanship variable.

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Model

Behavior genetic models received increased attention within political science since Alford et al. (2005) seminal piece that highlighted the possibility of genetic inheritance of political traits. To assess individual differences we also use a twin design and twin sample employing a similar, but more refined behavior genetic technique: the structural equation ACE model. Detailed description of the model is available elsewhere (Medland and Hatemi, 2009) but an intuitive introduction follows here.

The main goal of the ACE model is to decompose the variance in the trait of interest (or phenotype as geneticists call it) into three components: additive genetic (or A), environment common to twins (C) and environment unique to each individual (E). The main result of the model is the proportions of the variance explained by these components (with corresponding hypothesis tests to see if these proportions of variance explained differ significantly from 0). The ACE model leverages the fact that identical (monozygotic or MZ) twins share 100% of their genome while fraternal (dizygotic or DZ) twins, on average, share 50%. For this reason, if additive genetic effects (A) are present MZ twins should be more similar to each other on the trait studied than DZ twins. On the other hand, if the twins' common (C) or shared environment that drives similarity of co-twins, the co-twin correlation should be more or less the same for both zygosity groups. Finally, if it is the environment (E) unique to each co-twin drives the individual differences, co-twins should exhibit no similarity, a negligible co-twin correlation on the trait.¹⁰

We use a multivariate extension of the ACE model that utilizes the covariance matrix to estimate the cited effects for the variance of two variables of interest (strength of party ID and overlap). It also decomposes the correlation between the two variables into additive genetic, common and unique environmental effects. When using this model the main property of interest is the correlation between the two traits we are interested in and what proportion of this correlation is explained by additive genetic (A), common environmental (C) and unique environmental (E) effects. In essence, we are not only interested in what drives the variation in our traits of interest but also which of these components drive the correlation. This model is the bivariate Cholesky decomposition (and, once again, for more details see Medland and Hatemi 2009). Once all three components of the model are estimated it is customary to present results from reduced models where either the A, or C (or both) components are assumed to drive no variation (or covariation) in the related traits of interest.

But we present no model reductions as Medland and Hatemi (2009) correctly points out, the lack of power with small samples could largely distort some estimates when a non-zero (though insignificant) effect is fixed at 0. This is especially appropriate as all components show significant (or borderline significant) effects on either one of the two variances or the co-variance.¹¹

Since our partisanship measure is 3-point ordinal and our overlap measure is 4-point ordinal, we use the version of the ACE model designed for ordinal data. This uses a probit link function in the estimation of the covariance matrix. Though the age variation of our sample is limited, probit thresholds are still corrected for age; additionally we correct for race (white vs. nonwhite), sex, and the year and mode of data collection. None of these control variables reach significance when their effects are corrected for jointly. The data was analyzed using Mplus 6.1 (Muthen and Muthen, 1998-2010). The estimator used was the mean corrected weighted least squares. A, C and E estimates were Bollen-Stine bootstrapped (Bollen and Stine, 1992) to acquire accurate confidence intervals.

Results

Table 1 presents the unrestricted covariance matrix of partisanship and overlap measure separately for MZ and DZ twins. Table 2 presents the proportions of contribution for additive genetic (A), common (C) and unique environmental (E) effects to the variance of partisanship and overlap. In the last part of Table 2 we present the proportions of A, C and E's contribution to the correlation between partisanship and overlap.

-- Insert Table 1 around here --

-- Insert Table 2 around here --

Starting with partisanship, we managed to replicate Settle et al. (2009) and Hatemi et al. (2009) results that strength of partisanship significantly heritable. On the other hand the magnitude of heritability is much lower in our sample (20% vs. 46% and 50%).

Secondly, it appears that additive genetic effect also significantly contributes to the individual differences on rational voter decision strategies. Our overlap measure shows a modest, but despite the small sample significant, 18% heritability. We find little evidence of

common environmental effect suggesting that decision strategies are not impacted by childhood political socialization. If such an effect exists it is negligible.

Finally, much like Tomz and Van Houweling (2008), we also find a significant correlation ($r=0.21$, $p<0.001$) between partisanship and rational decision strategy. It seems that higher overlap, and hence an increased likelihood of a directional strategy, is positively correlated with partisanship. Our analysis also shows that this correlation is predominantly driven by additive genetic effects. We only find a borderline significant unique environmental correlation where the lower 90% confidence interval is 0 once rounded to two decimal¹². Interestingly, the common environmental component of the covariation appears to go in the opposite direction. This means that early socialization forces reverse the positive correlation between partisanship and overlap. Before we engage in speculation as to why this could be, we should note that neither partisanship nor overlap appears to be significantly influenced by C at $p<0.05$. Also the cross-trait/cross-twin correlations in Table 1 that influence these estimates the most are insignificant. So this C component of the covariation needs to be taken with a grain of salt. Replication on a larger sample could derive interesting findings.

Limitations

The greatest limitation of the data is that it only included three issue questions. While these three questions are enough to derive the individual differences in the tendencies of rational decision strategy using our overlap measure, a broader set of questions would have been desirable for a more throughout assessment. Needless to say, an experimental measure of decision strategy, similar to the one produced by Tomz and Van Houweling would provide a better measure than our overlap proxy (2008). Until such data becomes available, we consider our measure to provide the best proxy with the available data.

Additionally, the analysis presented is limited by the peculiarities of the data at hand. The Minnesota Twins Political Survey is one of the first sources to provide detailed political data collected on a twin sample. Unfortunately, this sample is heavily restricted by age and geography and we have little information as to how these results would generalize to other age groups and people from different areas of the country. Additionally, in their study of ideology Hatemi et al (2009) found that the impact of family socialized (shared) environment has completely eroded by the time people reached their 50's. It is entirely possible that a more substantial socialized effect would be present if we were studying a younger cohort.

Data collection effort used both Internet and paper and pencil survey modes opening the door to mode effects. Also, the sample is relatively small, though this did not lead to insignificant co-twin correlations, only a few insignificant cross-twin/cross-trait correlations (as presented in Table 1). Males in the sample are underrepresented, though this is not uncommon for twin samples (Lykken et al., 1978). The supplementary data collection in 2009 was mainly aimed toward overcoming this problem and boosting the male sample. Unfortunately, this, and also the dual mode survey, hurts the uniformity of data collection mode and time period opening the doors to mode and period effects that are not uniformly represented in all twin groups. In the analysis at hand, this is an important consideration as some members of the sample were collected before and some after the 2008 presidential election and could bias policy preferences and salience measures. In our model we attempted to control for these problems and are reassured by the fact that none of these effects appeared significant in the estimation of the partial correlation matrix.

Twin models to estimate heritability come with its own set of assumptions that, much like the model itself, are extensively discussed in Medland and Hatemi (2009). After presenting our results and the cautionary remarks on the general limitations, we discuss the implications of our findings the final section.

Discussion and conclusions

Rational choice theory has dominated vote choice research for over a half century (Downs, 1957; Enelow and Hinich, 1984; Merrill and Grofman, 1999). For decades the debate about the appropriate specification of the individual utility function dominated the discourse of spatial voting (for a review see Lewis and King, 1999; Macdonald et al., 1998; Westholm, 1997). Recent realizations that the different utility specifications can differ across individuals brought the debate closer to the methods utilized in behavioral research (Adams and Merrill, 1999; Merrill and Grofman, 1997; Tomz and Van Houweling, 2008). Inquiries of individual differences are deep seeded in political psychology and also behavior genetics if we are willing to look past long standing political science traditions.

Understanding the sources of individual differences across various decisions strategies taken by voters synthesizes the wealth of knowledge acquired by rational choice scholars with other political research traditions. Such synthesis, especially visible in the past couple years, is almost surprising given the length of time various political research traditions managed to

either ignore or fight each other to no end. The newly emerged conversation will, no doubt, produce fruitful findings for years to come.

It was our goal to build on the work of Tomz and Van Houweling (2008) and better understand the sources of individual differences in decision strategies used by various voters. To best complement this special issue of the *Journal of Theoretical Politics* we approached the question from the perspective of behavior genetics. This task was not easy as we only had survey based issue position data available on a genetically informative sample. Experiments of Tomz and Van Houweling (2008) have not yet been done on such a sample of individuals. To overcome this difficulty we drew on social and cognitive psychology to derive a survey based measure of decision strategy. This measure is not perfect but at face value we argued for its validity. We also believe it is the best proxy we can acquire from a survey to assess the extent to which a voter sees the structure of electoral competition in directional terms.

Behavior genetic analysis yielded modest but significant additive genetic component of individual differences on the magnitude of directional worldview. Our results suggest that the disposition to be responsive to a more intense or extreme political stimuli is, though only modestly, affected by biological factors. Yet again, this does not imply that any particular gene determines whether an individual will follow a directional voting logic. It merely reflects that various psychological traits making extreme stimuli more appealing are more likely to be shaped by biological factors than early socialization. One possible explanation for this is that, viewing politics in a dichotomous “pro or against” fashion is closely affected by individual dispositional traits. However, our analysis reveals that the most important factor in the formation and application of a directional worldview is given by unique environmental factors (presented as E in our analysis). This comes as no major surprise if we consider the role of the political environment in which individual decisions are made. Intense competition and high contestation of political issues as quintessential environmental factors do impact the electoral decision strategies. High levels of policy differentiation and a polarized information environment is likely to induce more directional voting than quiescent, stable information environment (Lachat, 2008, 2011; Pardos-Prado and Dinas, 2010).

Tomz and Van Houweling (2008) established partisanship as an important covariate of directional worldview, and Settle et al. (2009) and Hatemi et al. (2009) showed that partisanship is heritable. We manage to replicate both of these findings on the Minnesota Twin Political Survey although the proportion of our genetic component was somewhat smaller. Finally, we show that most, but not all of the correlation between the magnitude of

directionalist worldview and partisanship is driven by a common underlying additive genetic effect.

Unfortunately, with the design used in this study we cannot decipher the actual mechanism of how genetic transmission influences the two genetically correlated political traits. Dawes and Fowler (2009) show that the D2 Dopamine receptor gene (DRD2) has a significant impact on partisanship. Needless to say this one gene only explains a fraction of the genetic variation in partisanship. Nonetheless, DRD2 and other genes regulating the dopamine system become good candidates to test their influence on the magnitude of a directionalist worldview.

To explore the question further we can only speculate, but it is clear that the physiological pathway going from allelic variation in a specific gene to an actual behavior or worldview is quite distant with many intervening factors. Direction of causation in the relationship between decision strategy and partisanship is not entirely clear either. In fact, it is inevitable to assume that on the physiological level the relationship must be spurious. Directional decision strategy in picking the candidate to vote for has always been considered the more “emotional” rational choice (Claassen, 2009: 230). We suspect emotional attachment to various groups (such as political parties) and the strength of emotional response to threats to the group (such as an election where someone from the opposing group/party could prevail) could influence both partisan attachment and directionalist worldview. The physiology of political emotions already received some attention in the literature (Marcus, 2002; Marcus et al., 2000). Oxley et al. (2008) explored how the physiological differences in response to threat differ across individuals with different ideologies. Unfortunately this study only included people with strong political convictions.

We admit that this study is far from being conclusive. It was born out of numerous constraints posed by data collection in a rare population and it employs an imperfect proxy measure. We hope to see additional research corroborating our findings. First and foremost, our survey measure should be validated directly though the comparison with an experimental measure. While we argued for its face validity and its correlation with partisanship not only follows past findings (Tomz and Van Houweling, 2008), the genetic analysis points to the same underlying sources of covariation. But direct validation was not possible with the data used in this study, or any other data available to us at this time. Second, we hope experimental data will one day be collected on a genetically informative sample such as twins. It would be ideal if this sample was more representative of the US population. Replications in other countries would also be highly desirable. Finally, we hope to see studies exploring the

contribution of specific genes to variation in voters' decision strategies. Building on Dawes and Fowler (2009) we already presented the genes of the Dopamine regulation system, especially DRD2, as good candidates for such a study. In the mean time, consider our study as a pilot, a contribution to rational choice theory of voting, behavior genetics and, hopefully, a foundation to build on.

Notes

1. For a review see introductory chapter in this special issue.
2. For a slightly more detailed explanation of the oversimplification of this mechanism presented in this paragraph, please see the introductory chapter to this special issue (to editor: update will be needed on Hatemi et. al. 2012).
3. For example Mondak et al (2010) proposed that one such dispositional trait that is known to be highly heritable is personality. These authors suggested a direct effect from genes to personality (which is obviously also an oversimplification in light of the process described here) but no direct effect of genes to political traits. Such theoretical contributions are welcomed and heavily needed in political science but this specific one does not stand up to empirical testing (to editor – citation of the piece I (Levente Littvay) reviewed in this special issue would be appropriate here).
4. For simplicity of the example we assume that all candidates are within the region of acceptability (Rabinowitz and Macdonald, 1989). This concept is discussed in greater detail below.
5. In a multiparty system, previous research focuses on the preference ordering of voters; we employ the same rationale and use the same notation as Westholm (1997).
6. Westholm (1997, 866) dubbed this as the two-step rationale of the directional theory: (1) side rule and (2) party intensity rule.
7. As we are not concerned about the discounting theory (Grofman, 1985), we will focus on the findings related to the proximity and directional voters.
8. Emphasis added.
9. This is somewhat higher as third party and no party support were also considered missing.
10. This effect is also inflated by random measurement error.
11. Readers unfamiliar with the univariate or multivariate forms of the ACE structural equation model who wish to understand how it works (not just what it does) should consult

Medland and Hatemi (2009) since the detailed description of these models is beyond the scope of this article.

12. Confidence intervals tend to be unreliable very close to the boundary value. While the lower bound is significant it is so close to 0 that we are not comfortable claiming significance at $p < 0.1$. This result is clearly not significant at $p < 0.05$.

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Tables and Figures

Table 1: Correlation Matrices for the Cholesky Decomposition

MZ Twins	PID Strength Twin 1	Overlap Twin 1	PID Strength Twin 2
Overlap Twin 1	0.205***		
PID Strength Twin 2	0.302***	0.041	
Overlap Twin 2	0.190***	0.244***	0.169*
DZ Twins	PID Strength Twin 1	Overlap Twin 1	PID Strength Twin 2
Overlap Twin 1	0.201**		
PID Strength Twin 2	0.201*	-0.029	
Overlap Twin 2	-0.051	0.133+	0.259**

nMZ=428 (minimum 67.8% fully observed), nDZ=316 (min. 58.2%)

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Bolded: Co-twin correlation for a given phenotype.

Table 2: Parameter Estimates for Correlated Factors Model

PID Strength	Estimate	CI 95%	CI 90%
A	0.2*	(0.01, 0.38)	(0.03, 0.36)
C	0.11	(0, 0.33)	(0.01, 0.3)
E	0.69***	(0.57, 0.84)	(0.59, 0.82)
Overlap	Estimate	CI 95%	CI 90%
A	0.18*	(0.03, 0.34)	(0.05, 0.32)
C	0.06	(0, 0.21)	(0, 0.19)
E	0.76***	(0.64, 0.88)	(0.65, 0.86)
Correlation	Estimate	CI 95%	CI 90%
A	0.19**	(0.11, 0.30)	(0.13, 0.30)
C	-0.08+	(-0.17, -0.04)	(-0.15, -0.05)
E	0.1+	(-0.01, 0.19)	(0, 0.17)

Total Correlation 0.21***

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Figure 1: Hypothetical scenario of issue positions of 2 voters and 4 candidates

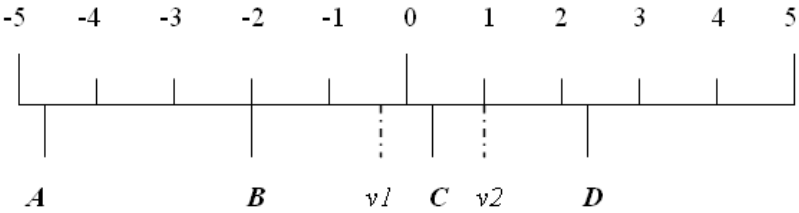


Figure 2: Overlap across issues

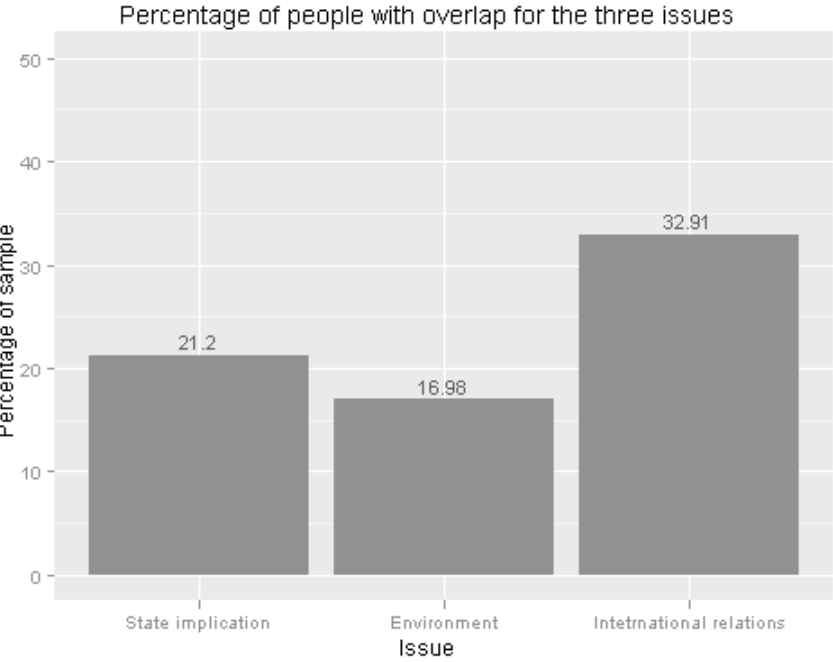


Figure 3: Distribution of the additive overlap measure

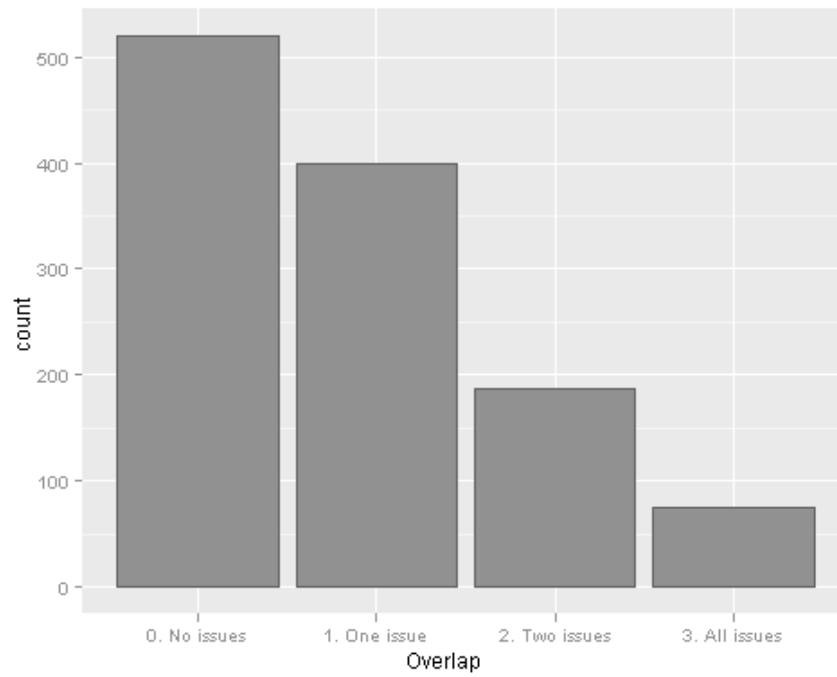


Figure 4: Distribution of PID strength

