

# Identifying long-term party switchers\*

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## Abstract

When party positions change to create sharper contrasts on social issues, and/or less sharp differences on economic issues, then voters with socially-conservative, but economically-liberal preferences are likely to switch their support from Democrats to Republicans, and vice versa. We develop a method that identifies these switch voters, and apply it to data from the National Election Survey, to analyze the demographic characteristics and policy preferences of these two groups of “switch voters.”

*Keywords:* Polarization, policy divergence, ideology, voter migration.

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# 1 Introduction

After an election, political commentators often debate how the winning candidate managed to form a sufficiently large coalition of supporters. Which demographic groups that favored his opponent in the last election was the winner able to bring into the fold? Was there an ideological realignment of the electorate, and if so, what were the political issues that precipitated it?

These questions are even more interesting in a long run perspective than for any particular election. For example, a central argument of Thomas Frank's bestseller "What's the matter with Kansas?" is that a large number of white working class voters have turned away from the Democrats and towards the Republicans because Democrats became more similar to Republicans on economic issues, and because their preferences on cultural issues such as abortion or gay marriage are often more closely aligned with Republicans:

"The Democratic Leadership Council has long been pushing the party to forget blue-collar workers and concentrate instead on recruiting affluent white-collar professionals, who are liberal on social issues. [...] They] stand rock solid on, say, the pro-choice position while making endless concessions on economic issues, on welfare, NAFTA, social security, labor law, privatization, deregulation and the rest of it" (p. 243). "By dropping the class language that once distinguished them sharply from Republicans they have left themselves vulnerable to cultural wedge issues like guns and abortion and the rest whose hallucinatory appeal would ordinarily be far overshadowed by material concerns." (p.245)

Of course, this analysis is far from uncontroversial; see our literature review below. The fundamental reason for this controversy is that it is not straightforward to analyze long-run voter migration. At most, opinion polls ask voters who they voted for in the last election, but almost never do opinion polls ask respondents which party they voted for more than 4 years ago (let alone, several decades earlier), and which issues, if any, made them change their mind – and even if those opinion polls existed, we would probably distrust the respondents' recollection. So, if we are interested in a long-term realignment of the electorate, directly asking voters is not an option.

Most of the literature therefore takes a different route and identifies a specific (usually demographic) group of voters and analyzes how their collective voting behavior changes over time. Obviously, this approach has some disadvantages: First, it neglects all other groups of voters. Second, it remains unclear to which extent the specific group analyzed is representative for all voters who switched. Third, it does not provide us any insights into which individual characteristics or policy issues induced specific voters to switch.

In this article, we develop a method that can identify “long-term switch voters,” that is, voters who are likely to have voted for Democrats in a previous election and for Republicans now, or vice versa. Because we consider a fixed set of voters (i.e., holding constant their ideological preferences), the fundamental force that drives long term voter migration among them is an ideological realignment of the two major parties on economic, moral, and other policy issues.

Our method can be applied to any sequence of cross-sectional data sets that have information on voters’ candidate preferences and issue preferences on fundamental policy issues, and/or demographic characteristics. We determine the most likely “switch voters” between a base year in the past and a current year as follows. First, we calculate, for each voter type, the probability of voting Republican in either election. We then take the voter type distribution of the current year, and calculate, for each voter, the probability of supporting Democrats in the base year *and* Republicans in the present year, rank voters with respect to this switching probability, and then categorize the 20 percent of individuals for whom this probability is highest as “New Republicans.” “New Democrats” are defined analogously.

Applying our method requires a core of fundamental questions that appear in both the base year and the present year, from which voting probabilities can be estimated for both elections. In our application in Section 5, we can use about 10 questions from the NES on fundamental policy convictions, such as the extent to which the state should be involved in the market, or the question whether abortion should be legal. After we have identified those voters who are “New Republicans” or “New Democrats,” we can analyze their demographic characteristics or positions on any question in the sample.

It is crucial that our model allows for voters’ policy preferences to be multidimensional. In a

model that constrains preferences to be one-dimensional – in particular the one underlying most political reporting that divides voters and candidates into “liberals”, “moderates” and “conservatives” –, the most likely switch voters for both parties are necessarily the most moderate voters, and “New Democrats” are very similar to “New Republicans.”

For example, some analysts argue that Donald Trump was a moderate in the 2016 Republican Presidential primary because he does not have “consistently conservative” positions.<sup>1</sup> But rather than having moderate positions on all issues, Trump appears to combine relatively moderate or even liberal positions on some economic issues with very right-wing positions on immigration and nationalism, and thus is attractive to voters with these policy preferences, while being less popular with “country-club Republicans” (i.e., social moderates or even liberals who mostly care about lower taxes).

Considering these two voter groups, as well as those who are moderate on all issues, as one “moderate” group would obfuscate their fundamentally different policy preferences. Our multi-dimensional method, instead, allows us to clearly distinguish different groups that are between the parties for different reasons.

We demonstrate our method by applying it to National Election Survey data for elections between 1976 and 2012. We find that, demographically, switch voters look very much like the average supporters of the party they left, but they have cultural preferences that are often similar or even more extreme than those of the average supporter of their new party. Specifically, New Republicans are heavily blue-collar, lower middle class voters who are economic moderates, but are very socially conservative and religious. New Democrats, instead, are quite wealthy, and very secular and socially liberal. They are the most well-educated among all groups.

Our paper proceeds as follows. After the literature review, we provide an intuitive explanation of our structural model in Section 3. Section 4 provides a formal description of the model (technical details can be found in the Appendix). In Section 5, we apply our method to Presidential Elections

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<sup>1</sup>See, e.g., <https://www.washingtonpost.com/news/monkey-cage/wp/2015/12/16/donald-trump-is-a-textbook-example-of-an-ideological-moderate/>. Note also that the factor that determines voter behavior is not so much the “true” positions that a candidate will take if elected, but rather what the voters believe that these positions will be.

between 1976 and 2012, using data from the National Election Survey. We first consider voter migration for the entire period, and then focus on changes over shorter time periods. A key insight of this paper is that identifying switch voters requires a multi-dimensional policy space. To show this, we demonstrate in Section 6 that exogenously imposing a one-dimensional framework for voter preferences would miss the main interesting results. We conclude in Section 7.

## 2 Literature Review

Ever since the publication of “The American Voter” (Campbell et al., 1960), a central focus of scholars in American political behavior is to understand how characteristics and ideological positions influence voters’ choices in elections. In particular, the Michigan school emphasized the role of party identification, perceived as determined less by political preferences and more by the voter’s childhood socialization. While the stability of party identification is certainly high between most consecutive elections for most voters, there are some voters that do change their party allegiance, and if there is a systemic and permanent cause of this shift, then, over longer time horizons, a substantial proportion of voter types may eventually identify with a different party.

Moreover, while change in many elections is gradual and small, the literature on electoral realignments has pointed out “critical elections” in the past “in which the decisive results of the voting reveal a sharp alteration of the pre-existing cleavage within the electorate” (Key Jr (1955); see also Schattschneider (1960), Burnham (1965) and Sundquist (2011)).

This concept of electoral realignment based on a change of cleavages is at the heart of our model, as will be explained intuitively in Section 3. The change of what positions the two parties stand for between two different elections changes the probability of voting Republican in a non-uniform way for different voter types. We can calculate this probability change, and thus identify those voter types who are most likely to move from Democrats to Republicans, and vice versa. Our method does not require that the two elections are necessarily back-to-back, and is thus also applicable if there is not just one earthquake-like “critical election” after which the new cleavage lines coagulate, but rather what Key Jr (1959) calls “secular realignment,” that is, more gradual

change in voter coalitions. This is important because the last “critical election” that is uncontested in the realignment literature took place in 1932, though most observers would certainly agree that the parties’ voter coalitions have kept changing since then.

The core insight from economic models of political competition is that candidates compete for the support of swing voters in order to win elections, and put much more emphasis on the preferences of swing voters than on those of other voters (Downs (1957); Lindbeck and Weibull (1987, 1993); Calvert (1985)). Understanding the political preferences of this group is therefore of crucial for our understanding of the politico-economic equilibrium.

As Krasa and Polborn (2014b) point out, swing voters in a multidimensional world are a continuum of often non-moderate preference types – from social liberals who are economically conservative to social conservatives who are economically liberal. Any policy that is attractive to some swing voters will also disgruntle other swing voters. This model therefore provides a theoretical framework in which an ideological realignment of the parties leads to long-term voter migration of different groups from Democrats to Republicans, and others in the opposite direction.

Our approach is based on an intuition first formulated in chapter 9 of Fiorina et al. (2006), and first rigorously developed into a structural model in Krasa and Polborn (2014a), who show how to analytically disentangle the contributions of elite polarization and mass radicalization, and how changes in the voting behavior of different voter preference types allow inferences about politicians’ positions. The present paper generalizes the methods developed there to estimate the voting probabilities of different voter preference types for different elections.

The application of our method to NES data contributes to a large literature on voter dynamics in the United States. For example, Hunter (1992); Shogan (2002); Frank (2005); Greenberg (2005) argue that a “culture war” on issues such as abortion or gay marriage moved white working class voters to the Republican party, starting with Ronald Reagan’s election in 1980 and the subsequent realignment of evangelicals. Layman (2001) documents how different religious and secular groups changed their support for Democrats and Republicans. Hetherington and Weiler (2009) argue that “authoritarianism” (measured by respondents’ views over whether it is more important for children to be “obedient” or “independent” and “curious”) plays an important role in explaining who votes

for Democrats and Republicans today.

However, there are many articles that challenge the culture war thesis, and emphasize the primary importance of economic issues in explaining voter preferences for candidates (e.g., Bartels (2006a); McCarty et al. (2006); Gelman et al. (2008); Bartels (2010)). Ansolabehere, Rodden, and Snyder (2006) provide some mixed evidence, and show a substantially increased importance of moral issues for vote choices in the 1990s relative to the 1970s and 80s, but also find that economic factors are still more important for voters than purely moral ones.

Much of the existing literature focuses on a particular demographic group of voters (say, working class whites or evangelicals) and then analyzes how their voting behavior has changed over time. Our main contribution is that our method allows for complementary insights, by reversing the sequence: We first identify those voters who are most likely to have shifted from Democrats to Republicans or vice versa, and characterizes their demographic characteristics, and their economic and cultural preferences on many different issues. Also, much of the existing literature has focused on groups that moved to the Republican side of the political spectrum while there is less work on which groups move from Republicans to Democrats. Our method can identify the latter group as well.

### **3 Identifying switch voters**

Voters may move their support between parties for two different reasons. First, they may change their positions on political issues over time so that the party that best represents their interests changes. For example, if voters' economic positions change for better or worse, this will generally affect their preferences toward redistribution and taxation, and may move them from supporting the low tax party to the high tax party, or vice versa. The quote declaring that "If you're not a liberal when you're 25, you have no heart. If you're not a conservative by the time you're 35, you have no brain." illustrates this effect.<sup>2</sup>

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<sup>2</sup>This and similar quotes have been ascribed, possibly incorrectly, to Benjamin Disraeli, George Clemenceau Winston Churchill, and many others.

Second, voters with constant preferences on political issues may change their party allegiance over time if parties change what they stand for. As a consequence, voters may lose their previous ideological home and gain a new one in a different party. An example for this effect is the declaration used, among many others, by Ronald Reagan, Ben Bernanke, George Will that "I did not leave the (Democratic or Republican) party, the party left me."

We will analyze the second type of switch voters in a multidimensional spatial policy model. It is useful to spend some time to understand why this framework is more appropriate for this analysis than the standard one-dimensional model of party competition pioneered by Downs (1957), in which all policy questions are just manifestations of some one-dimensional "liberal-to-conservative" policy preference spectrum.

In the one-dimensional model, elections are decided by one particular voter type, the "median voter." Moreover, in two-party plurality systems, to the extent that the parties take non-identical positions, one of them appeals more to the liberal side and the other one to the conservative side of the voter spectrum.<sup>3</sup> If parties (or their candidates) are affected by different valence or voter-idiosyncratic shocks, then some voters may switch parties. However, these switch voters are always the same types, and in the long run, they switch back and forth between parties, depending on which party is "more moderate" or "better" in each particular election.

Specifically, consider a probabilistic voting model with one policy dimension in which candidates take different positions and voters, in addition to their policy payoffs, receive idiosyncratic payoffs from the different candidates in each election. Formally, let a voter's ideological position be denoted by  $\theta \in \mathbb{R}$ . Voter  $\theta$ 's utility from candidate  $P$  in position  $x$  is given by  $u_\theta(x) = -(x - \theta)^2 + \xi_P$ , where  $\xi_P$  is a normally distributed idiosyncratic preference shock.

In this framework, consider two elections that both end in a 50/50 split of the electorate because the set of voters who changes from Democrats to Republicans (because of their idiosyncratic

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<sup>3</sup>We do not explain here why candidates do not converge to the same position because the reason for policy divergence is immaterial for the present article. There is a large theoretical literature on the factors (e.g., candidate with policy motivation (Wittman (1983); Calvert (1985); Londregan and Romer (1993); Martinelli (2001); Gul and Pesendorfer (2009); entry deterrence (Palfrey (1984); Callander (2005)); incomplete information among voters or candidates (Castanheira (2003); Callander (2008); and differential candidate valence (Aragones and Palfrey (2002); Groseclose (2001); Soubeyran (2009); Krasa and Polborn (2010, 2012); Bierbrauer and Boyer (2013)).



shocks) is just as big as the group that travels in the opposite direction. The voters who switch their party allegiance are predominantly ideological “moderates” who only switch because they happen to have a slight non-policy preference for the Democrat in the first election and for the Republican in the second one, or vice versa.

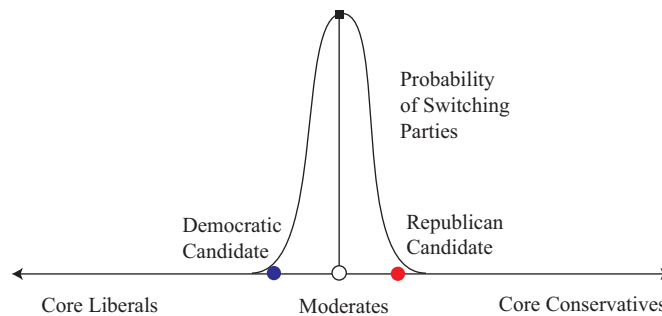


Figure 1: Voter Migration in One Dimension

A voter whose ideal position is far to the left of the median is very likely to support the Democrat in both elections; to switch his allegiance to the Republican would require a very large (and thus very unlikely) idiosyncratic preference shock. Analogously, very conservative voters are highly likely to vote for the Republican candidate in both elections. In contrast, a moderate voter who is indifferent between the two candidates’ policy positions, has a probability of  $1/2$  of idiosyncratically favoring either candidate, and therefore, when considering two elections, has relatively high probabilities (of  $1/4$  each) of switching from Democrats to Republicans, or vice versa. So, the set of switch voters will predominantly consist of these moderates (see Figure 1).

Moreover, given two 50/50 elections, for each voter type  $\theta$  – not just for the median – the probability of switching from Democrat to Republican equals the probability of switching from Republican to Democrat. Because switching is driven only by personal preference shocks, the ideologically preferred positions of voters who switch from Democrats to Republicans and those who switch from Republicans to Democrats should be very similar.

What the one-dimensional model of party competition effectively rules out by construction is a change of the parties’ policy positions in a way that generates a *systematic realignment* in the sense that particular voter types are likely to change from Democrats to Republicans, and in the opposite direction for other types.

In a model with many policy dimensions, this equivalence breaks down: Relatively extreme voter types may well be switch voters. To see this, consider a setting with two policy dimensions. A voter's type is now given by  $\theta = (\theta_1, \theta_2)$ , where  $\theta_1$  is his overall position on cultural issues (such as abortion or gay marriage), while  $\theta_2$  is his overall position on economic issues. Preferences are now given by  $u_\theta(x_{1,P}, x_{2,P}) = -\lambda_1(x_{1,P} - \theta_1)^2 - \lambda_2(x_{2,P} - \theta_2)^2 + \xi_P$ , where  $(x_{1,P}, x_{2,P})$  is the policy position of candidate  $P \in \{D, R\}$  on the two issues, and  $\lambda_i$  are issue weights.

Figure 2 illustrates a situation where both issues are equally important. The horizontal axis measures cultural positions, from socially-liberal on the left to socially-conservative on the right, while the vertical axis measures economic positions. When the Republican candidate takes more conservative positions than the Democratic candidate in both dimensions, core liberals such as D (i.e., voters who are both economically and socially liberals) will likely support the Democrat, and core conservatives such as E likely support the Republican.

In contrast, the set of voters who are policy-wise almost indifferent between the candidates – and are therefore the most likely switch voters – contains individuals with very different policy preferences: There are some, such as A, who are socially-liberal and economically conservative; others, such as B, who are social *and* economic moderates; and still others, such as C, who are socially-conservative and economically-liberal. Among these close-to-indifferent voters, only B should be called a moderate, while both A and C hold extreme, albeit offsetting, issue positions.

Consider again two close elections, and assume that in the second election, candidates take more divergent positions on social issues, as indicated in Figure 3. In this case, the line that divides voters who are more likely to support the Democratic candidate from those who are more likely to support the Republican candidate rotates in a clockwise direction.

True moderates, such as B, may still go in either direction, but socially-liberal and economically-conservative voters such as A become more likely to support the Democratic candidate, and socially-conservative and economically-liberal voters such as C become more likely to support the Republican candidate.

Unlike in the one-dimensional case, the policy preferences of these *New Democrats* and *New Republicans* differ dramatically if they are mostly composed of voter types like A and C, respec-

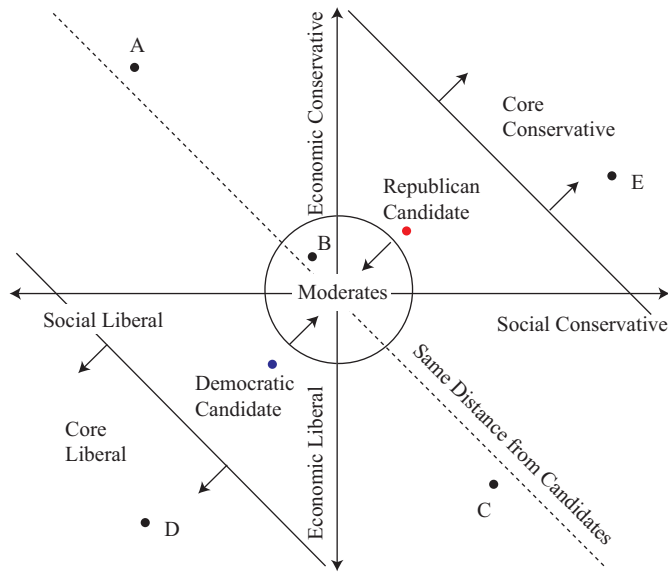


Figure 2: Moderates and Core Supporters in Two Dimensions

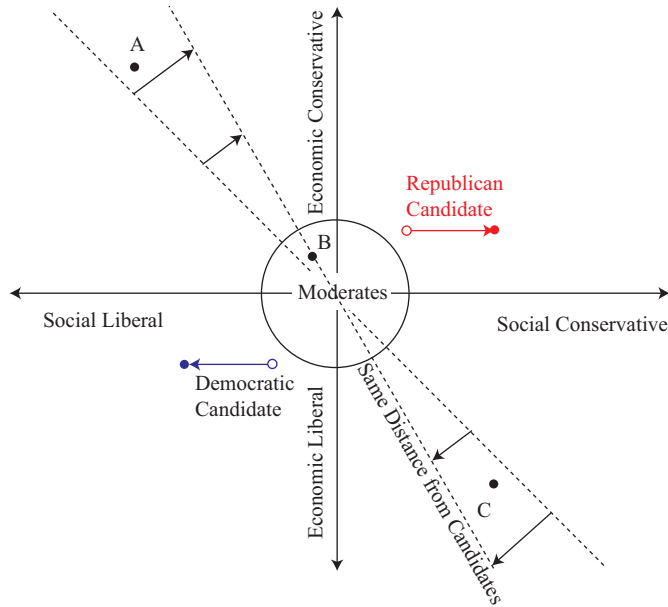


Figure 3: Voter Migration in Two Dimensions

tively. In contrast, if most switch voters look like *B* instead of *A* and *C* then the average New Democrat and average New Republican would again be ideologically moderate on both dimensions (i.e., close to the average of all voters), and relatively similar to each other. Whether the typical swing voter is a moderate on both dimensions, such as *B*, or an “offsetting extremist,” such

as  $A$  or  $C$ , is a crucial empirical question, especially because candidates may select positions to appeal to these swing voters.

## 4 Model

Consider a policy space in which voters have ideal positions in  $K$  different dimensions. The candidates in the election at time  $t$  have position  $x_t^D \in \mathbb{R}^k$  and  $x_t^R \in \mathbb{R}^k$ , respectively. A voter with ideal positions  $\theta \in \mathbb{R}^k$  prefers the Republican candidate over the Democrat in election  $t$  if and only if

$$-\sum_{k=1}^K \lambda_{k,t} (\theta_k - x_{k,t}^R)^2 \geq -\sum_{k=1}^K \lambda_{k,t} (\theta_k - x_{k,t}^D)^2 + \xi_{\theta,t}, \quad (1)$$

where  $\xi_{\theta,t}$  is voter  $\theta$ 's net non-policy utility shock in favor of the Democratic candidate (i.e., the difference between the voter's non-policy utility from the Democrat and from the Republican) and  $\lambda_{k,t}$  is a weight factor measuring the importance of issue dimension  $k$  at time  $t$ , where we allow the relative weight of issues to change over time. In particular, a person's preferences on issue  $k$  can be a better predictor of his voting behavior because of two different effects: First, the individual may care more about the issue, e.g., environmental issues because they may matter more now than in the past, i.e.,  $\lambda_{k,t}$  increases. Second, the issue has become a wedge issue between parties, because the difference in the parties' policy positions has increased. Our model allows us to remain agnostic as to which of these effects matters more.

We can think of  $\xi_{\theta,t}$  as capturing the voter's idiosyncratic like or dislike of the candidates, which is orthogonal to his policy preferences, and has the effect that some voters vote for the candidate who is farther away from them policy-wise, though the extent to which this happens is, of course, decreasing in the difference of policy utility that the voter gets from the two candidates.

Simplifying (1), we obtain that the Republican candidate is preferred if and only if

$$\xi_{\theta,t} \leq \sum_{k=1}^K \lambda_{k,t} \left( (x_{k,t}^D)^2 - (x_{k,t}^R)^2 + 2\theta_k (x_{k,t}^R - x_{k,t}^D) \right). \quad (2)$$

Note that the right-hand side of (2) defines a  $K - 1$ -dimensional hyperplane, with any two voters on the same hyperplane having the same probability of voting Republican. In particular, if the right-hand side of (2) equals zero — in two dimensions, this corresponds to the dashed lines in Figures 2 and 3 — then the voter types on this hyperplane are equally likely to vote for each party.

Note that the probability of voting Republican depends on the candidate positions that are unobservable for us. Also, we do not observe a voter's  $\theta_k$  directly. However, we have voters' responses to survey questions, and assume that each  $\theta_k$  is linearly related to responses to a particular set of  $n_k$  survey questions, i.e.,  $\theta_k = \sum_{i=1}^{n_k} \mu_i y_i + b_k + \varepsilon_k$ , where  $y_i$  denotes the answer to question  $i$  and  $\mu_i$  is a weight factor for question  $i$  that we estimate,<sup>4</sup>  $b_k \in \mathbb{R}$  and  $\varepsilon_k$  is a noise term. The weights  $\mu_i$  and  $b_k$  do not depend on time. For example, suppose that we use answers to three different questions to determine a voter's position on economic issues. Then the relative weights of these three questions for the determination of a voter's economic position remain constant over time. However, the relative importance a voter's economic positions compared to other issues may vary between different elections. We use maximum-likelihood estimation to determine all model parameters.

In order to identify the voters who switch parties, we follow the approach suggested in the discussion of Figure 3 above. Specifically, using (2), we can, for each voter, determine the probabilities of voting Republican  $p_{R,t_0}, p_{R,t_1}$  for two different election years  $t_0$  and  $t_1$ . The probability that a particular voter switches from Republican in  $t_0$  to Democrat in  $t_1$  is  $p_{R,t_0}(1 - p_{R,t_1})$ . Similarly, the probability of switching from Democrat to Republican is given by  $(1 - p_{R,t_0})p_{R,t_1}$ . We then rank voters according to these probabilities and select the top 20% of them as the respective switch voter groups.

A formal description of our estimation approach can be found in the Appendix.

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<sup>4</sup>In practice, we normalize the answers to be in  $[0, 1]$  and order answers such that higher answers correspond to more conservative positions. Then, the weight  $\mu^j$  can be interpreted as the resulting increase in  $\theta$  if a respondent's answer on question  $j$  were to change from the most liberal answer to the most conservative one.

## 5 Application: Switch voters in the NES

### 5.1 Data

We demonstrate our method of classifying switch voters using data from the American National Election Survey (henceforth NES) for elections between 1976 and 2012. This is the longest time frame for which the questions that we use to characterize voter preferences are available. Specifically, we use respondents' answers to different policy issue questions, as well as some demographic information, which we map into a vector of five different positions,  $\theta_i$ ,  $i = 1, \dots, 5$ . This mapping takes into account all issue questions (or questions that plausibly proxy for a voter's preferred issue positions) that were asked in all years.

The first component is the respondent's economic position, and is based on the answers on questions about attitudes towards business and unions, as well as the government's role in the economy. The second component measures the respondent's position on social-cultural issues, based on a question about abortion, as well as on church attendance. While church attendance is not a policy issue per se, all we need is that answers are correlated with a person's view on moral issues in politics, for example gay marriage, which are actual policy issues, but have not been asked about sufficiently often to enable us to include them in the computation of  $\theta_i$ . The third component captures a voter's attitude on racial issues and is based on a question about affirmative action in hiring, as well as the respondent's thermometer score for blacks. The fourth component proxies for a position on the pacifism-militarism spectrum and uses the respondent's thermometer score for the U.S. military. The fifth and final component is a function of the respondent's demographic characteristics such as education, gender, and race.

### 5.2 Predictions of 2012 political behavior

We start by considering 1976 and 2012 as the previous and current election year, respectively. Note that the longer the time frame, the larger is the potential to observe switch voter groups that differ significantly from each other because the fault lines between the parties are more likely to change

substantially over long time periods than from one election to the next. We will look at shorter time frames between elections in Section 5.4.

While the main objective of this section is to analyze the demographic characteristics and political preferences of the two switch voter groups (New Republicans and New Democrats), we first show that our method allows for a very precise categorization of voters, making hardly any mistakes when predicting the votes of ideological core supporters.

We define a party's core supporters as the 20% of voters with the highest probability of voting for it. In Figure 2, the set of core conservatives are given by those types  $\theta = (\theta_1, \dots, \theta_k)$  that are to the right of the right solid line, and analogously for core liberals.

Table 1 looks at the politics of these groups in the 2012 U.S. Presidential election. In addition to the core and switch voter groups defined above, the tables also provide information about average Democrats/Republicans (i.e., averaging over all voters who voted for Obama/Romney in the 2012 Presidential election).

The data allow for a very precise prediction of the core supporters' voting behavior in the presidential election. Of the voters that we identify as core liberals, more than 98 percent voted for Barack Obama, and less than 2 percent voted for Romney. Similarly, 97 percent of core conservatives voted for Romney. Even the predictions for the groups of New Democrats and New Republicans are quite sharp, with more than three-quarters voting for their "new" party's candidate, even though these are voters types who, by construction, would have had a relatively high chance of voting for the other party in the 1976 election. Core liberals and conservatives are also very likely to vote for their respective party's House candidate.

In contrast to our approach, many studies in the literature identify "extreme" voters by classifying voters according to their self-identification on the liberal-to-conservative scale. However, this method is problematic for two reasons: First, as discussed in Section 3, switch voters are always misidentified as moderates in a one-dimensional policy setting. Second, many voters do not understand the abstract concept of "liberal" and "conservative." For example, 13.7 percent of respondents thought that Obama was strictly more conservative than Romney, and another 7.2 percent thought that Obama and Romney had the same ideological position. Similarly, 12.4 per-

Table 1: Politics

| Question                               | (1) Core Liberal | (2) Av. Obama voter | (3) New Democrat | (4) New Republican | (5) Av. Romney voter | (6) Core Conservative |
|--|------------------|---------------------|------------------|--------------------|----------------------|-----------------------|
| Presidential Vote Republican           | 1.6***           | (0.0)               | 22.9***          | 74.7***            | (100)                | 97.0                  |
| Vote for Republican Congressman        | 4.8***           | 10.9***             | 24.9***          | 78.8***            | 92.2                 | 93.7                  |
| Placement Liberal-Conservative (Dummy) | 9.8**            | 13.1***             | 17.8***          | 59.8***            | 74.9***              | 87.4                  |
| Placement Liberal-Conservative         | 33.6***          | 38.5**              | 42.2***          | 64.7***            | 72.1***              | 79.1                  |

Stars in column  $n$  indicate the significance level for the difference between the values in column  $n$  and  $n + 1$  (1, 2 and 3 stars for the 10, 5 and 1 percent level, respectively).

All questions scaled so that answers lie between 0 and 100.

cent believe that the Democratic party is strictly more conservative than the Republican party, and another 10.1 percent believe that they have the same ideological position.

The ignorance of a significant fraction of voters about the liberal-conservative scale is also reflected in voter behavior. Of the voters who think that they are extremely conservative or conservative – 24 percent of the ANES electorate –, 9.3 percent vote for Obama, and of the voters who think that they are (any type of) liberal – another 24 percent of the ANES electorate –, 6.7 percent vote for Romney. This is an error rate that is about 4 times higher than with our classification of core liberals and conservatives. Our measure has the advantage that it is based on relatively concrete questions that are easier to understand for respondents who rarely think in terms of the spatial model of the ideological spectrum.

Another, conceptual, problem with the interpretation of results from the self-classification approach arises if the percentage of ignorant voters changes over time. For example, if we observe that, over a long period of time, fewer self-professed liberals vote for Republicans and fewer self-professed conservatives vote for Democrats, this could be due (at least in part) to more people understanding what “liberal” and “conservative” mean, rather than an actual change in the behav-



ior of particular preference types.

### **5.3 Switch voter political preferences and demographics**

We now analyze New Democrats' and New Republicans' political preferences and demographic characteristics, in comparison to the corresponding values for all voters who voted for the Democratic and Republican Presidential candidate in the 2012 election, respectively.

Political preferences on some key issues are summarized in Table 2. We normalize answers to general policy questions such that the “most liberal” answer translates into 0 and the most conservative answer to 100, irrespective of how the answers are coded in the NES; however, spending questions are coded in the same way as in the NES, i.e., higher numbers indicate a desire for higher spending.

The first block of Table 2 contains different economic issues that deal with variations of the fundamental state versus free market trade-off. The groups' ordering is as expected, with New Democrats and New Republicans taking more moderate positions than the average Obama and Romney voters, respectively.

The second block deals with race relations. The first of these questions asks whether the government should help blacks and other minority groups, or they should help themselves. The second one asks specifically about affirmative action in hiring. The pattern of responses is very similar to that on economic issues.

The third block contains some of the moral “hot-button issues” of abortion and gays where the New Democrats and Republicans appear anything but moderates, but rather often look more extreme than their respective party's average supporters.

For example, the NES question on abortion policy allows for four answers, ranging from “should be always legal” (which we normalize to 0) to “should be always illegal” (100), with the intermediate positions favoring different degrees of restrictions. An overwhelming majority of New Democrats believe that “by law, a woman should always be able to obtain an abortion as a matter of personal choice,” while the average of New Republicans is very close to the second-

Table 2: Key cultural and economic policy preferences

| Question                             | (1) Av. Obama voter | (2) New Democrat | (3) New Republican | (4) Av. Romney voter |
|--------------------------------------|---------------------|------------------|--------------------|----------------------|
| Less Gov. Better                     | 31.9***             | 45.9***          | 71.5***            | 85.7                 |
| Against Gov. Health Insurance        | 35.4***             | 42.5***          | 64.2***            | 75.0                 |
| Against Gov. Job Guarantee           | 44.7***             | 52.8**           | 61.0***            | 73.4                 |
| Spending Scale                       | 59.1***             | 52.9***          | 38.1***            | 27.7                 |
| Spending Social Security             | 75.3***             | 71.2             | 68.3***            | 62.3                 |
| Against Gov. Aid to Blacks           | 52.3                | 54.3***          | 79.4               | 81.2                 |
| Against Affirmative Action in Hiring | 69.6***             | 85.3*            | 90.9***            | 95.3                 |
| Abortion Scale                       | 20.8***             | 7.1***           | 64.2**             | 47.7                 |
| Against Gays in Military             | 8.1**               | 2.4***           | 24                 | 21.6                 |
| Against Gay Adoption                 | 23.0***             | 12.0***          | 53.8               | 53.9                 |

Stars indicate the significance level for the difference between the voter group in the given column and those in the next column (1, 2 and 3 stars for the 10, 5 and 1 percent level, respectively).

All questions scaled so that answers lie between 0 and 100.

most restrictive position, “The law should permit abortion only in case of rape, incest, or when the woman’s life is in danger.” These positions of the two switch voter groups are significantly more extreme than the positions of the average party voters, respectively.

A similar picture emerges for the questions whether gays should be allowed to serve in the military and to adopt children, where New Democrats are substantially more liberal than average Democrats, and New Republicans are very close to the average Republican. While a one-dimensional model would have difficulty explaining these patterns, the multidimensional model suggests that party polarization on cultural issues is crucial for why New Democrats and New Republicans have switched their party allegiance.

Table 3: Fundamental beliefs and values

| Question                 | (1) Av. Obama voter | (2) New Democrat | (3) New Republican | (4) Av. Romney voter |
|--------------------------|---------------------|------------------|--------------------|----------------------|
| Church Attendance        | 27.8***             | 15.3***          | 55.7*              | 45.1                 |
| Evangelicals thermometer | 39.5                | 36.5***          | 57.8               | 60.4                 |
| Bible Literal            | 22.9***             | 8.8***           | 40.9*              | 34.9                 |
| Agnostic                 | 27.5                | 28.2***          | 11.6               | 13.7                 |
| Is Religion Important    | 59.2**              | 50.9***          | 82.7               | 78.7                 |

Stars in column  $n$  indicate the significance level for the difference between the values in column  $n$  and  $n + 1$  (1, 2 and 3 stars for the 10, 5 and 1 percent level, respectively).

Table 3 contains more information about fundamental beliefs and values of the different voter groups. New Democrats are very secular, and only few of them attend church almost every week or think that the Bible is the “actual Word of God, to be taken literally, word for word.” New Democrats here are “more extreme” than the average Democrat. Similarly, New Republicans are significantly “more extreme” than the average Republican with respect to church attendance and the Bible literality question, while they are similar to average Republicans on the other three questions.

Table 4 explores the composition of the different groups in terms of their demographic characteristics. New Democrats are substantially more likely to be college educated (43 percent versus an average around 36 percent for both Democrats and Republicans), and New Republicans are substantially less likely to be college educated (25 percent).

The “Wordsum” Test is a small verbal intelligence test administered as part of the NES that asks 10 multiple choice synonym questions of varying difficulty. Other testing has found that the correlation between the wordsum score and a full-fledged general intelligence test is about 0.75. The overall average score of Democratic and Republican voters in this test is fairly similar (71% Democrats, versus 73.4% for Republicans). However, within each party, there are large differences: New Democrats perform significantly better than the average Democrat, both in terms

Table 4: Demographics

| Question              | (1) Av.<br>Obama voter | (2) New<br>Democrat | (3) New<br>Republican | (4) Av.<br>Romney voter |
|-----------------------|------------------------|---------------------|-----------------------|-------------------------|
| College               | 36.3**                 | 43.1***             | 25.0***               | 35.2                    |
| Wordsum Test          | 71.0***                | 76.6***             | 68.7***               | 73.4                    |
| Wordsum<br>Test=100%  | 19.6*                  | 24.7***             | 11.9*                 | 15.3                    |
| Wordsum<br>Test<= 40% | 8.0***                 | 4.2                 | 7.3***                | 3.5                     |
| Working Class         | 38.3**                 | 32.1**              | 40.6***               | 34.1                    |
| Union Member          | 11.5                   | 9.9                 | 12.6**                | 9.2                     |
| Union thermometer     | 63.2***                | 57.0*               | 49.1***               | 34.0                    |
| White                 | 59.6***                | 87.1                | 82.9**                | 89.9                    |
| Black                 | 23.4***                | 0.2                 | 1.6                   | 1.0                     |

Stars in column  $n$  indicate the significance level for the difference between the values in column  $n$  and  $n + 1$  (1, 2 and 3 stars for the 10, 5 and 1 percent level, respectively).

of the average score, and in terms of reaching extremely high or low values. Similarly, New Republicans perform significantly worse than the average Republican with respect to all three measures.

New Democrats are considerably less likely to identify as “working class” than Democrats at large, and New Republicans are considerably more likely to do so than the average Republican. New Republicans are also more likely to be union members than the average Republican.

In terms of their racial make-up, both switch voter groups have a much higher proportion of whites (and a correspondingly lower percentage of blacks and other minorities) than their respective parties. This is likely due to the fact that African Americans and other minorities form a large part of the Democratic base and therefore their estimated probability of voting Republican in either election is small, reducing their estimated switch probability.

## 5.4 Switch voters over shorter periods

While the main advantage of our approach is that we can use it to determine switch voters with respect to elections that are very far apart, it is also interesting to consider switch voters over shorter periods. First, since we know about shorter-term voter migration from historical sources, this provides a check that our method is, in fact, capable of recovering these trends. Second, it will provide us with an understanding which particular elections led to a major realignment of the electorate, and which ones did not.

Table 5 contains some results with 1976 as the earlier election and 1984 as the later election. That is, this table measures the effect of the “Reagan revolution” on voters.

Table 5: Switch voters, 1976–1984

| Question                        | (1) Av. Mondale voter | (2) New Democrat | (3) New Republican | (4) Av. Reagan voter |
|---------------------------------|-----------------------|------------------|--------------------|----------------------|
| Presidential Vote Republican    | 0                     | 36.0***          | 69.6***            | 100                  |
| Vote for Republican Congressman | 14.4***               | 28.3**           | 48.4***            | 64.6                 |
| South                           | 24.5**                | 13.1**           | 27.6               | 24.6                 |
| Working Class                   | 41.0**                | 29.9             | 39.8**             | 27.9                 |
| Against Gov Guaranteed Jobs     | 43.1**                | 49.5             | 56.8**             | 64.7                 |
| Women Equal Role Scale          | 22.3                  | 18.0***          | 38.1*              | 31.1                 |
| Aid to Blacks                   | 42.3                  | 34.1**           | 71.3               | 59.6                 |
| Abortion Scale                  | 30.2                  | 19.2             | 44.6               | 37.8                 |

Stars in column  $n$  indicate the significance level for the difference between the values in column  $n$  and  $n + 1$  (1, 2 and 3 stars for the 10, 5 and 1 percent level, respectively).

Even though the distance between the elections is now short, there is still a substantial voter migration, reflected in the fact that only 36 percent of New Democrats, but almost 70 percent of New Republicans voted for Reagan (remember that, if there was no realignment of candidates be-

tween elections, these two numbers would be the same). In terms of their Congressional vote, New Republicans still mostly vote for Democratic candidates, so there is a large personality component in the vote for Reagan.

While much has been written about “Reagan Democrats,” the voters who moved from Republicans to Democrats have received much less coverage in the literature. They were a lot less likely to live in the political South than the electorate at large, and they were much less likely to be working class than either average Democrats or New Republicans (who, in turn, were much more likely to be working class than average Republicans).

In terms of economic policy preferences, both switch voter groups are more moderate than the average party supporter, while on various social questions, their answers are as or more extreme than those of the average voter of their new party. For example, on the women role question – a scale ranging from “Women and men should have an equal role” (normalized to 0) to “Women’s place is in the home” (100), New Democrats favored gender-equality more than the average Democrat (though not statistically significant), and New Republicans were more conservative than even the average Republican.

Table 6 contains select results for 2000 (Gore v. Bush) as the earlier election and 2008 (Obama v. McCain) as the later election. First, note that the difference between the voting behavior of the two switch voter groups is minimal here: New Democrats are only 4 percentage points more likely to vote for Obama than New Republicans, and about 7 percentage points more likely to vote for a Democratic Congressman. This small difference is a consequence of only minimal movement of the general fault lines between the parties between the 2000 and the 2008 election, so that both switch voter groups consist mostly of very moderate (i.e., difficult to predict) voters.

As in the longer time period, New Republicans are more likely to be from the working class, and on economic issues, they have relatively liberal opinions, compared to the average Republican, while New Democrats are relatively business-friendly and critical of government involvement in the market. Just as in the longer time frame, New Democrats are, on social and cultural issues, about as liberal as the average Democrat, while New Republicans (relative to the 2000 election) are interestingly less socially conservative than the average Republican.

Table 6: Switch voters, 2000-2008

| Question                         | (1) Av.<br>Obama voter | (2) New<br>Democrat | (3) New<br>Republican | (4) Av.<br>McCain voter |
|----------------------------------|------------------------|---------------------|-----------------------|-------------------------|
| Presidential Vote<br>Republican  | 0.0***                 | 44.6                | 48.6***               | 100                     |
| Vote for<br>Congressman          | 14.8***                | 43.3                | 50.6***               | 82                      |
| Working Class                    | 42.5                   | 39.3                | 51.9*                 | 34.3                    |
| Gov vs Free Market               | 14.4**                 | 26                  | 23.8***               | 54.5                    |
| Less Government<br>Better        | 24.8***                | 50.7                | 35.0***               | 69.8                    |
| Big Business                     | 52.8**                 | 59.6**              | 47.9***               | 57.7                    |
| Union Thermometer                | 66.1***                | 50.5                | 63.1***               | 45                      |
| Against Gov. Health<br>Insurance | 30.4***                | 45.1                | 45.4***               | 63.1                    |
| Bible Literal                    | 29.1                   | 26.4                | 30.1**                | 46.6                    |
| Church Attendance                | 27.9                   | 28.6                | 30.0**                | 46                      |
| Abortion                         | 26                     | 28.3                | 27.2*                 | 51.6                    |
| Gays Allowed to<br>Adopt         | 35.8                   | 36.1                | 39.4***               | 65.3                    |

Stars in column  $n$  indicate the significance level for the difference between the values in column  $n$  and  $n + 1$  (1, 2 and 3 stars for the 10, 5 and 1 percent level, respectively).

## 5.5 Interpretation

The analysis of the determining factors of voter support for parties is, of course, one of the central questions in the study of American political behavior. Yet, our approach is fundamentally new in that it first identifies swing voters and then analyzes their demographic make-up and issue preferences. This way, we can say, for example, that among New Republicans, there are disproportionately many white working class voters with socially conservative preferences.

In contrast, the existing literature generally focuses on a pre-specified demographic group and analyzes how the behavior of this group changed over time. See, e.g., Layman (2001) for religious voters, Bartels (2006b) for the white working class, or McCarty et al. (2006) and Gelman et al.

(2008) for an analysis of different income groups.

For example, Bartels's (2006b) – shows that many white working class voters still support the Democrats. This result is entirely consistent with ours “in the other direction” that a large percentage of *New Republicans* is composed of white working class voters. Similarly, he also shows that evangelicals do not “put larger weight” than other voters on moral issues such as abortion. Again, this is absolutely consistent with our finding that New Republicans are significantly more religious than even average Republicans. In fact, the reason why many New Republicans are working class evangelicals is not that they have a different structure of preferences (with higher or increased weights on religiously salient policy questions), but rather that the change in economic and cultural party positions has alienated socially-conservative and economically liberal voters from the Democrats and brought them closer to the Republicans, and the group of socially-conservative and economically liberal voters is substantially over-represented among white working class evangelicals.

## 6 Comparison: A one-dimensional analysis

Our analysis builds on the notion that policy is multidimensional. It is interesting to see, however, what results we would obtain if we (incorrectly) assumed that there is only one policy dimension that captures all, or at least practically all, policy disagreement.<sup>5</sup> In other words, the estimation in this section is based on the same set of issue questions, but we now impose that a voter's answers to all questions determine a *one-dimensional* position only.

Table 7 summarizes some results for this case. The comparison of the first two questions with the corresponding ones from Table 1 indicate that there is some loss in prediction accuracy relative to the multidimensional model. For example, the probability of a New Democrat voting for Romney is 22.9 percent, while here, it is 27.3 percent. A similar comparison applies to voting behavior for Congress. Thus, allowing for additional dimensions does help somewhat with the

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<sup>5</sup>Note that, if the “true model” had only one dimension of political conflict, while the estimation allowed for several additional dimensions, then we would simply find that these other dimensions do not contribute to explaining voter behavior, and identifying switch voter.



Table 7: For Comparison: Results with one-dimensional policy space

| Question                         | (1) Av.<br>Obama voter | (2) New<br>Democrat | (3) New<br>Republican | (4) Av.<br>Romney voter |
|----------------------------------|------------------------|---------------------|-----------------------|-------------------------|
| Presidential Vote<br>Republican  | (0.0)                  | 27.3***             | 69.1***               | (100)                   |
| Vote for<br>Congressman          | 10.9***                | 31.7***             | 70.4***               | 92.2                    |
| Less Government<br>Better        | 31.9***                | 47.2***             | 70.6***               | 85.7                    |
| Spending Social<br>Security      | 75.3                   | 72.4**              | 66.9***               | 62.3                    |
| Against Aid to<br>Blacks         | 52.3***                | 63.3***             | 74.6***               | 81.2                    |
| Abortion                         | 21.6***                | 27.7***             | 40.4***               | 55.3                    |
| Abortion Scale                   | 20.8***                | 26.1***             | 37.1***               | 47.7                    |
| Against Gays in the<br>Military  | 8.1                    | 9.2**               | 17.6*                 | 21.6                    |
| Against Gays<br>Allowed to Adopt | 23                     | 24.0***             | 41.1***               | 53.9                    |
| Church Attendance                | 27.8                   | 28.2**              | 35.5***               | 45.1                    |
| Bible Literal                    | 22.9                   | 21.0**              | 28.6**                | 34.9                    |
| College                          | 36.3                   | 35                  | 35.2                  | 35.2                    |
| Wordsum Test                     | 71                     | 71.7                | 73.3                  | 73.4                    |
| Working Class                    | 38.3                   | 38                  | 36.7                  | 34.1                    |
| Union thermometer                | 63.2***                | 59.2***             | 45.8***               | 34.0                    |

Stars in column  $n$  indicate the significance level for the difference between the values in column  $n$  and  $n + 1$  (1, 2 and 3 stars for the 10, 5 and 1 percent level, respectively).

prediction of voter behavior, though this is not the main point.

More importantly, forcing issue positions to enter in a one-dimensional way has the effect that switch voters here look “moderate” on all issue questions, including social and cultural issues. Likewise, there is no significant difference between the percentage of working class voters among New Democrats and New Republicans, or their college status. Thus, the most interesting results derived in sections 5.3 and 5.4 are based on the multidimensional nature of the issue space in our model, which allows for migration of socially-conservative, economically (relatively) liberal voters from Democrats to Republicans, and of socially-liberal, economically relatively moderate voters from Republicans to Democrats. In other words, if we consider only one policy dimension, then we effectively assume that switch voters have moderate positions on all issues.

## 7 Discussion

In this paper, we develop a simple structural model of elections in which voter behavior reflects the extent and direction of party platform divergence, and use it to analyze which voter types are the most likely to have switched from Democrats to Republicans, and vice versa.

In one-dimensional models, party switchers in both directions are moderates and should be *very similar* to each other (on all issues). The fact that they switch is driven by idiosyncratic preferences for candidates in different elections, rather than by a systematic relationship between a voter’s policy preferences and a change in the two parties’ platforms.

In contrast, in a multidimensional setting, there is a systematic relationship between a voter’s policy preferences and the probability of moving over time from Democrats to Republicans, or vice versa. If the policy difference between Democrats and Republicans has increased on social and cultural issues, while decreasing or remaining constant on economic issues, this affects different voter types differentially: Voters who are socially conservative and economically liberal are likely to move from the Democrats to the Republicans, and the reverse is true for voters who are socially liberal but economically conservative.

Our approach allows us to reverse the approach in the literature that looks at specific demographic groups and analyzes whether their voting behavior changed over time. Instead, we identify those voters who switched, by calculating the probability that each type would vote for Democrats in the first election and for Republicans in the second one, or vice versa. After identifying the switch voters, we can then analyze their political preferences and demographic characteristics.

We demonstrate an application of our method using NES data, where we find that the demographics and policy preferences of these voters conform to some of the informal descriptions in the qualitative literature, for example, Thomas Frank's bestseller "What's the matter with Kansas." New Republicans, the voters who are most likely to have switched from Democrats to Republicans are economically more liberal than the average Republican, but have staunchly conservative social policy preferences that are, in many cases, more extreme than those of core conservatives. Conversely, New Democrats are also more right-wing than the average Democrat on most economic issues, but they are actually more liberal than even core liberals on some social-cultural issues.

Interestingly, demographically, New Democrats look very much like Republicans, and New Republicans look very much like Democrats: New Democrats are overwhelmingly white, and disproportionately well-educated and upper-middle-class, while New Republicans disproportionately belong to the (white) working class and have low education levels. In contrast, in terms of their economic preferences, these groups are in fact quite moderate. New Democrats are more liberal than New Republicans, which is somewhat surprising since New Democrats are, on average, from higher economic classes than New Republicans.

Of course, it would be interesting to apply our method to different datasets domestically and internationally. In general, what is needed is a common subset of questions that is available for both elections and allows for calculating a probability of voting for each party.

## 8 Appendix A: Solving and Estimating the Model

### 8.1 Determining Voter Types

The remaining problem is determining voters' positions  $\theta$ . To do so, we generalize the method developed in Krasa and Polborn (2014a) to an arbitrary number of policy dimensions;<sup>6</sup>

We cannot directly observe a voter's ideal position on issue  $k$ , but we assume that it is correlated with responses to a set of survey question  $Y_{i,k}$ ,  $i = 1, \dots, n_k$  that we observe. In particular, we assume that  $\theta_k = \sum_{i=1}^{n_k} \mu_{i,k} Y_{i,k} + b_k + \varepsilon_k$ , where  $b_k \in \mathbb{R}$  and  $\varepsilon_k$  is a noise term which is normally distributed with mean zero. We assume that the mapping of questions into positions is constant over time so that (2) implies

$$\xi_{\theta,t} - 2 \sum_{k=1}^K \lambda_{k,t} \varepsilon_k \leq \sum_{k=1}^K \lambda_{k,t} \left( (x_{k,t}^D)^2 - (x_{k,t}^R)^2 + 2(x_{k,t}^R - x_{k,t}^D) b_k + 2(x_{k,t}^R - x_{k,t}^D) \sum_{i=1}^{n_k} \mu_{i,k} Y_{i,k} \right). \quad (3)$$

Multiply both sides of (3) by a common factor  $s_t$  such that the variance of  $s_t(\xi_{\theta,t} - 2 \sum_{k=1}^K \lambda_{k,t} \varepsilon_k)$  equals 1 in every period  $t$ . Let

$$a_t = \sum_{k=1}^K s_t \lambda_{k,t} \left( (x_{k,t}^D)^2 - (x_{k,t}^R)^2 + 2(x_{k,t}^R - x_{k,t}^D) n_k \right).$$

Let  $\rho_{k,t} = 2s_t \lambda_{k,t} (x_{k,t}^R - x_{k,t}^D)$ . Further, define  $D_t$  to be a time dummy, i.e.,  $D_t = 1$  for an observation at time  $t$ , and is zero otherwise. Then the probability of voting Republican is given by

$$\Phi \left( \sum_{t=1}^T D_t \left( \sum_{k=1}^K \rho_{k,t} \sum_{i=1}^{n_k} \mu_{i,k} Y_{i,k} + a_t \right) \right), \quad (4)$$

where  $\Phi$  is the cdf of a standard normal distribution with mean 0 and variance 1. Suppose there are  $L$  observations. Let  $v_\ell$ ,  $\ell = 1, \dots, L$  denote the person's vote, and denote by  $d_{t,\ell}$  and  $y_{i,k,\ell}$  realization  $\ell$  of random variables  $D_t$  and  $Y_{i,k}$ , respectively. Then maximum likelihood estimation identifies parameters  $\mu_{i,k}$ ,  $\rho_{k,t}$ , and  $a_t$  by solving

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<sup>6</sup>In Krasa and Polborn (2014a), there are only two policy dimensions.

### Problem 1

$$\begin{aligned} \max_{\mu_{i,k}, \rho_{k,t}, a_t} \sum_{\ell=1}^L v_\ell \ln \left( \Phi \left( \sum_{t=1}^T d_{t,\ell} \left( \sum_{k=1}^K \rho_{k,t} \sum_{i=1}^{n_k} \mu_{i,k} y_{i,k,\ell} + a_t \right) \right) \right) \\ + (1 - v_\ell) \ln \left( 1 - \Phi \left( \sum_{t=1}^T d_{t,\ell} \left( \sum_{k=1}^K \rho_{k,t} \sum_{i=1}^{n_k} \mu_{i,k} y_{i,k,\ell} + a_t \right) \right) \right) \end{aligned} \quad (5)$$

subject to

$$\sum_{i=1}^{n_k} \mu_{i,k} = 1, \text{ for } k = 1, \dots, K. \quad (6)$$

Rather than solving this constrained optimization problem, we solve the following unconstrained problem:

### Problem 2

$$\begin{aligned} \max_{\tilde{\mu}_{i,k}, \tilde{\rho}_{k,t}, a_t} \sum_{\ell=1}^L v_\ell \ln \left( \Phi \left( \sum_{t=2}^T (1 + d_{t,\ell}) \sum_{k=1}^K \sum_{i=1}^{n_k} \tilde{\rho}_{k,t} \tilde{\mu}_{i,k} y_{i,k,\ell} + \sum_{t=1}^T d_t a_t \right) \right) \\ + (1 - v_\ell) \ln \left( 1 - \Phi \left( \sum_{t=2}^T (1 + d_{t,\ell}) \sum_{k=1}^K \sum_{i=1}^{n_k} \tilde{\rho}_{k,t} \tilde{\mu}_{i,k} y_{i,k,\ell} + \sum_{t=1}^T d_t a_t \right) \right) \end{aligned} \quad (7)$$

It is easy to see that the solutions of the two problem coincide if we set

$$\mu_{i,k} = \frac{\tilde{\mu}_{i,k}}{\sum_{k=1}^{n_k} \tilde{\mu}_{i,k}}, \quad \rho_{k,1} = \frac{1}{\sum_{k=1}^{n_k} \tilde{\mu}_{i,k}}, \quad \text{and} \quad \rho_{k,t} = \frac{1 + \tilde{\rho}_{k,1}}{\sum_{k=1}^{n_k} \tilde{\mu}_{i,k}}, \quad \text{for } t > 1. \quad (8)$$

Absent any normalization of the survey responses, the resulting set of estimated position is some arbitrary interval of  $\mathbb{R}$ . By normalizing all  $Y_{i,k}$  such that the lowest answers are 0, and the highest answers are 1, and by ordering the responses in such a way that “higher” answers correspond to a more conservative position, we can ensure that all  $\theta_k \in [0, 1]$ . In particular, given that  $\sum_{i=1}^{n_k} \mu_{i,k} = 1$ , a response of zero to all question would result in  $\theta_k = 0$ , while a response of 1 to all question would yield  $\theta_k = 1$ .

The coefficient  $\mu_{i,k}$  indicates whether  $Y_{i,k}$  is ordered correctly, In particular, if  $\mu_{i,k} < 0$  the higher answers correspond to a more liberal positions, and the ordering is incorrect. In this case,

the question should be coded as  $1 - Y_{i,k}$ . Since

$$-\tilde{\mu}_{i,k}(1 - Y_{i,k}) = \tilde{\mu}_{i,k}Y_{i,k} - \tilde{\mu}_{i,k} \quad (9)$$

the new solution to the optimization problem 2 would replace the negative coefficient  $\tilde{\mu}_{i,k}$  by the positive coefficient  $-\tilde{\mu}_{i,k}$ , and the intercept terms  $a_1$  would change by  $-\tilde{\mu}_{i,k}$  and  $a_t$  by  $-\rho_{k,t}\tilde{\mu}_{i,k}$ . Thus, (8) and (9) imply

$$\theta_k = \frac{\sum_{i=1}^{n_k} \tilde{\mu}_{i,k}Y_{i,k} - \min\{\tilde{\mu}_{i,k}, 0\}}{\sum_{i=1}^{n_k} |\mu_{i,k}|}. \quad (10)$$

## 8.2 Determining Switch Voters and Core Supporters

We can now translate question responses into types and then estimate the hyperplane connecting the set of all types that are equidistant from the two candidates by a simple probit estimation. In particular, (2) indicates that the hyperplane at time  $t$  is of the form

$$\sum_{k=1}^K \beta_k \theta_k + a = 0, \quad (11)$$

where  $\beta_k, k = 1, \dots, K$  and  $a$  solve

### Problem 3

$$\max_{\beta_k, a} \sum_{\ell=1}^L v_\ell \ln \left( \Phi \left( \sum_{k=1}^K \beta_k \theta_{k,\ell} + a \right) \right) + (1 - v_\ell) \ln \left( 1 - \Phi \left( \sum_{k=1}^K \beta_k \theta_{k,\ell} + a \right) \right), \quad (12)$$

where  $v_\ell$  is person  $\ell$ 's vote at  $t$ , and  $\theta_{k,\ell}$  the person's ideal point on issue  $k$ .

Note that the location of the hyperplane in (11) does not depend on  $\varepsilon_k$ , the error in measuring  $\theta_{k,\ell}$ . However, when we compute the probability  $p_R$  that a type  $\theta = (\theta_1, \dots, \theta_K)$  votes Republican, then this probability is affected by measurement error through  $\varepsilon_k$  as (3) indicates. In particular, if we knew the correct values of  $\theta$  then only term  $\xi_{\theta,t}$  would be present on the left-hand side of equation (3) and the type  $\theta$  would be a better predictor of voting behavior. In other words, if the survey questions were poorly correlated with the policy issues then we would get a large

estimation errors for  $\theta$ . As a consequence, if we use the model to identify the top 20% of most likely Democratic and Republican voter's respectively, a large number of them would in practice vote for the other party. As we show below, this is not the case, as less than 5% of the voters identified as being in these core groups vote for the wrong party. Since this "error" is the sum of the idiosyncratic shock  $\xi_{\theta,t}$  as well as the measurement error of  $\theta$ , this tell us that this latter error is very small.

### 8.3 Computing Solutions for Problem 2

Problem 2 is a non-linear probit model, which poses some numerical challenges. In particular, there are many saddle points, at which the standard Newton method can get stuck. In addition, if one does not start sufficiently close to the true optimum, the Newton method may diverge, resulting in an underflow problem, i.e.,  $\Phi(\cdot)$  becomes zero, resulting in a division by zero when computing the first and second derivatives of problem 2.

In order to get a good enough starting point for the Newton method, we first apply a subspace search method. In particular, we alternate by optimizing only over  $\tilde{\mu}_{i,k}$  and  $a_t$ , and then only over  $\tilde{\rho}_{k,t}$  and  $a_t$ . The argument of  $\Phi$  in this restricted optimization problems are linear, and therefore well behaved (like standard probit models). We proceed with the subspace search until the gradient of Problem 2 is sufficiently small. Then we employ the Newton method, allowing all arguments to vary.

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