


ORIGINAL ARTICLE

# Estimating the locations of voters, politicians, policy outcomes, and status quos on a common scale

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## Abstract

How well are voters represented and what explains how well voters are represented? Answering these questions requires unpacking the mechanisms by which voters choose elected officials and elected officials implement policies. Though spatial theories of voting and legislative bargaining provide a broad framework for understanding these mechanisms, testing these theories involves a measurement problem where multiple political actors and outcomes must be located. We develop a technique for estimating policy outcomes, status quo locations, the ideology of elite political actors, and the ideology of voters, on a common scale. Using our new estimates, we demonstrate a similar level of incongruence for tax policies and spending policies. The incongruence arises for different reasons however—tax policies are over-responsive to the position of the median voter. Contrarily, spending policies are under-responsive and barely correlated with the position of the median voter. In examining the underlying mechanisms for policy change, we find that while the positions of elected officials over-respond to the median voter, the changing composition of state government has little immediate impact on policy. Instead, policy outcomes respond to long-term trends in the composition of government.

**Keywords:** Ideal point estimation

## 1. Introduction

How well are voters represented and what explains how well voters are represented? Understanding the strength of representation requires unpacking the mechanisms by which voters choose elected officials and elected officials implement policies. Spatial theories of voting and legislative bargaining provide a broad framework for understanding these mechanisms. These include various theories of electoral competition (Groseclose, 2001; Adams and Merrill, 2003) and theories of legislative outcomes (Romer and Rosenthal, 1978; Krehbiel, 1998). Both sets of theories posit that the positions of voters, various political actors, status quos, and policy outcomes reside in a continuous policy space. Testing these theories and fully understanding the mechanisms underlying representation thus entails a measurement problem.

We introduce a technique for estimating policy outcomes, status quo locations, the ideology of elite political actors, and the ideology of voters, on a common scale. We apply our results to the US States, where policy outcomes are largely determined by a governor and a state legislature, who are elected by voters. Our measurement strategy builds on recent advances—we leverage Wright's (2004) collection of state legislative roll call data, Shor and McCarty's (2011) insightful approach for bridging state legislatures, Bafumi and Herron (2010), Shor (2011), and Shor and Rogowski's (2018) approaches for bridging voters and legislators, and Richman's (2011) approach for estimating policy outcomes and status quo locations. While many of the elements of the

measurement approach have been developed elsewhere, they have never previously been combined in the way we propose. Our technique allows us to directly assess congruence between voter ideology and current policy.

We offer two applications of our estimation technique. First, we examine policy congruence between states' median voters and policy outcomes across several taxation and spending issues. We demonstrate a similar level of incongruence for tax policies and spending policies. The incongruence arises for different reasons however—tax policies are over-responsive to the position of the median voter—when the median voter moves one-unit to the right, tax policies move more than one unit to the right on the common ideological scale. Contrarily, spending policies are under-responsive and barely correlated with the position of the median voter. Second, we examine the mechanisms underpinning variation in congruence. We find that the positions of elected officials over-respond to the median voter. This pattern holds for the state House median, the state Senate median, and the governor, though the governor's position is the most over-responsive to the position of the median voter. The composition of state government has little immediate impact on policy, whether measured using an index of party control or an index of state government ideology. Instead, policy outcomes in non-southern states respond to long-term trends in the composition of government. A number of southern states have resisted this pattern with conservative policy outcomes despite many years of Democratic control of state government.

## 2. Measuring representation

Spatial measurement of the preferences of voters, the preferences of elite politics actors, and policy outcomes are useful broadly for two tasks. The first involves understanding how policy outcomes are formed. The second involves the normative question of measuring if voters are represented as they *should* be. These dual goals go back at least as far as the work of Miller and Stokes (1963), who measured the preferences of the mass public and the preferences of candidates for office using surveys targeted at each population. Miller and Stokes constructed scales from the items in each survey and measured representation by correlating these scales. Though their article was path-breaking, future work on measuring representation has grappled with two limitations. A high correlation does not imply that the preferences of voters and candidates are highly congruent. Beyond this, Miller and Stokes stop short of measuring substantive representation by not measuring the ultimate outputs of the policy process—actual policy outcomes.

Achen's (1977) critique of Miller and Stokes (1963) points out that their measures depart from common understandings of good representation. Specifically, constituent and candidate preferences can correlate strongly when candidates position themselves far from voters and they can correlate weakly when the candidates position themselves near the voters. He goes on to develop a number of measures which better capture good representation and reports results using Miller and Stokes's data. In doing so, he was forced to treat the constituent and candidate scales constructed by Miller and Stokes as if they were comparable. A fix for this problem remained elusive for quite a while, due to the need for bridge items (common items that could be posed to elites and the mass public) and methods for building scales off of such data.

A major breakthrough in the study of electoral representation came with the work of Bafumi and Herron (2010), who built bridge items by asking survey respondents from the mass public to take positions on roll call votes. Combined with breakthroughs in ideal point estimation (Poole and Rosenthal, 1991, 1997; Jackman, 2001), they generated comparable preference estimates of voters and members of Congress, finding that members of Congress were as a group more extreme than voters. Although this approach is now widely used, it has attracted a number of critiques due to the complex context of roll call votes and the relative ignorance of voters (Lewis and Tausanovitch, 2015; Jessee, 2016; Hill and Huber, 2019). To take one such example, the 2012 Cooperative Congressional Election Study asked survey respondents to take a position on the Simpson-Bowles budget, described to respondents as making "15 percent cuts across

the board in Social Security, Medicare, Medicaid, and Defense, as well as other programs, ... [e]liminat[ing] many tax breaks for individuals and corporations, [and] ... reduc[ing] debt by 21 percent by 2020.” Jessee’s work and Hill and Huber’s work demonstrate a sensitivity in the relative extremity of voters and members of Congress. Jessee finds a sensitivity to the relative size of the mass and elite samples and Hill and Huber find a sensitivity to providing respondents with information with how the two parties in Congress voted. In both cases, they continue to find that members of Congress are more extreme than voters. An alternative approach which we build on was developed in Shor (2011) and Shor and Rogowski (2018), where common survey items were posed to the mass public and candidates for office. This approach has the advantage that respondents in the mass public need not be asked to take positions on complex packages of issues (as in the case of the Simpson-Bowles Budget).

A second area of progress has been in measuring policy (*substantive*) representation. An early breakthrough was the work of Erikson *et al.* (1993), who measured policy outcomes in the states. They built a scale measuring the liberalism of state policy in each state in a moment of time. Due to the fact that state policy was measured on a separate scale from voter ideology, their work admittedly remained subject to Achen’s (1977) critique, as was Caughey and Warshaw’s (2018) and Grumbach’s (2018) extension of their methodology to dynamic measures: they could not measure congruence, only correlation. Lax and Phillips (2011) were able to sidestep Achen’s critique by forgoing continuous scales and generating binary measures of policy outcomes, which can be matched to public opinion on those same binary issues.

Our measurement approach can most directly contribute to research on policy representation in the US states, exemplified by the work of Erikson *et al.* (1993), Lax and Phillips (2011), and Caughey and Warshaw (2018). Lax and Phillips compare the presence of certain binary policies (e.g. a ban on partial birth abortion) across the states to state opinion on those policies. Erikson *et al.* develop a continuous policy outcome index and compare it to a one-dimensional measure of state opinion. Caughey and Warshaw develop a similar policy outcome index, but do so separately for economic and social policies over a long period of time. They compare the economic and social policy indices to economic and social liberalism in each state. These foundational works generate many important insights, but none come as close to assembling the data required to comprehensively test the predictions of spatial models of electoral and legislative politics as the approach developed here.

We believe our new measures can advance this literature in a number of ways by making it possible to study electoral, legislative, and substantive policy representation in a unified spatial framework for the first time. Lax and Phillips (2011) successfully measure policy representation and correlate policy representation to a number of state institutions. Because their measures of policy outcomes and public opinion are binary rather than continuous, it is difficult to directly engage the spatial theories of representation popular in the literature. Because our measures are continuous, our measures will allow for direct tests of these theories while still allowing for the measurement of policy representation (though admittedly our measures of opinion are not as fine grained as Lax and Phillips’s measures).

Erikson *et al.* (1993) generate continuous measures, but they measure state opinion, elite ideology, and policy outcomes on different scales, they lack measures of the status quo, and their measures are aggregated rather than issue-specific. Because of the different scales, they can study the correlation between policy and state opinion, but they cannot study the congruence between policy and state opinion and they cannot study whether policy is over or under-responsive to state opinion. The absence of measures of policy outcome locations and the status quo in a common space with legislators also means they cannot directly engage theories of lawmaking. By using aggregate scales rather than individual policy scales, they may also miss some detail that we can capture. Caughey and Warshaw (2018) similarly generate measures of policy outcomes and state opinion on different scales, and their work shares some of the limitations of Erikson *et al.*’s work.

In contrast, our measures are continuous estimates of ideal points, status quo locations, and outcomes in a common space. Estimating continuous measures allows for direct assessments of spatial theories of elections. Estimating status quo locations and outcomes allows the direct assessment of spatial theories of lawmaking. Estimating a common ideological space allows for the direct assessment of congruence between state policy and the median voter's preference and for measuring whether policy is over or under-responsive to the median voter's preference.

### 3. Methodology

This section explains how we extend and combine previously published techniques in order to produce estimates of voters, pivotal actors in state politics, policy outcomes, and status quos, on a common scale. We first describe our procedure for creating a common space with voters and the pivotal actors in state politics. We then describe how we compute the policy outcome and status quo locations.

#### 3.1 Estimating the common space

Our technique gives us estimates for legislators, governors, and a sample of voters in a common space. Though our goal was to study the state legislatures, we also found it helpful to have common estimates for members of Congress. Our approach for generating the common space leverages state legislative roll call data collected by Wright (2004) and survey data on candidates for office collected as part of Project Vote Smart's National Political Awareness Test.<sup>1</sup> Our method builds on Shor and McCarty's (2011) approach for bridging the state legislatures using the NPAT, Battista *et al.*'s (2013) work bridging the state legislatures using a big-matrix approach, and Shor and Rogowski's (2018) approach for bridging candidates for office and voters using common items found in the NPAT and National Annenberg Election Study (NAES).

To bridge across the various NPATs, we only used items with identical meanings as bridges. Project Vote Smart fields separate surveys for each state legislative election, for each gubernatorial election, and for each congressional election. Though these surveys were not identical, they contained many identical or near identical items which allowed us to merge these surveys into a common data set. We exclude from bridging items with identical wording, but not identical meaning. For example, respondents were asked whether they supported increasing the minimum wage in their state. While the wording would be near identical across states and years, the meaning would not be—raising the minimum wage in Oregon, where the minimum wage was \$6 in 2000 meant something different than raising the minimum wage in Alabama, where the minimum wage was \$5.15 that year. An individual with the same ideology could plausibly respond yes in Alabama and no in Oregon. Items with non-identical meanings across surveys had separate item parameters estimated.

Of course, not all state legislators responded to the NPAT surveys and constructing variables such as the chamber median required the ideal points of all members of the chamber. Therefore we merged in the roll call data from 99 state legislatures, the US House, and the US Senate. Here, the legislators who responded to the NPAT served as bridging observations for connecting the scale between the 101 chambers as in Shor and McCarty (2011) and Battista *et al.* (2013).

We next extended Shor and Rogowski's (2018) approach and identified common items between the NPAT and NAES. We leveraged both items common to the state legislative NPATs and the NAES and items common between the congressional NPAT and the NAES, which indirectly link voters and state legislators through congressional candidates. As before,

<sup>1</sup>Wright's roll call data for each chamber is for a session that overlaps with the 1999–2000 time period, with the exception of the Arkansas House and Senate, where the 2001 session was collected. The NPAT data generally come from 1998 and 2000, with exceptions noted in Appendix A.2.

we merged the NAES respondents into our data set which already included over a hundred state-level NPAT survey datasets and roll call data from 101 chambers.

The resulting data set was a matrix with 74,741 rows (corresponding to state legislative candidates, gubernatorial candidates, congressional candidates, and NAES respondents) and 57,541 columns (corresponding to items from the NPAT, items from the NAES, and roll call votes from the 101 chambers, not double counting identical items from the NAES and NPAT that appeared in multiple surveys). The top part of Figure 4 in Appendix A.3 summarizes the data that we used.

The size of the data matrix—about 4.3 billion entries—illustrates the difficulty of applying existing ideal point estimation techniques, such as Poole and Rosenthal's *W-Nominate* or Simon Jackman's *ideal*, to this problem. Faced with a similar problem, Shor and McCarty (2011) developed a linear mapping approach. They estimated ideal points based on pooled NPAT responses alone and based on roll call data from each of the 101 chambers individually, and then mapped the roll call ideal points onto a common scale using linear maps estimated based on legislators who voted in the state legislature and responded to the NPAT.

Our approach was to deal with the very large data matrix directly by taking advantage of its sparsity. Most of the data are missing—legislators in Montana do not vote on roll calls in Hawaii. Once we take into account the fact that many of our data entries are missing values, the problem becomes considerably more tractable—instead of 4.3 billion entries, we have 8.2 million non-missing entries. The key to our strategy was then developing software that skips the missing entries in the data matrix. In this sense, our approach is similar in spirit to Poole and Rosenthal's *DW-Nominate* software which must also deal with a very large data matrix (due to the fact that they are pooling more than 200 years worth of congressional roll call votes) and does so by “skipping” the missing entries present because, for example, Harry Reid did not cast any votes in the 13th congress. We estimate a conventional item response theory model considered in Clinton *et al.* (2004) via penalized maximum likelihood (Peress and Spirling, 2010). The model we estimate is still computationally difficult due to the size of the data set and the number of parameters being estimated, but our technique of skipping the missing entries (which do not contribute to the likelihood) makes the estimation feasible.

As with other ideal point estimators, the ideal points are only identified up to a linear transformation, so we normalized the ideal points such that the median Democrat in the US House is located at  $-1$  and the median Republican in the US House is located at  $1$ . We chose this normalization because readers are more likely to have a sense of the differences between the parties in the US House than they are to have a sense of the differences between the parties in the state legislatures.

We used our estimates of the ideal points of NAES respondents to compute the median voter in each state. Each NAES respondent was classified as a likely voter if they reported voting (if they were interviewed after the election) or if they reported being likely to vote (if they were interviewed before the election). The median voter in each state was computed as the median likely voter among the respondents in the state. Some measurement error is introduced due to computing the median voter on a sample and this measurement error is larger in smaller states. The reliability of this measure was 86.3 percent, indicating a relatively reliable measure. Throughout the paper, we report results that correct for this (and other forms) of measurement error.

The initial data set had a few missing values. Although we could compute the locations of chamber medians, party medians, etc., for all 101 chambers, a handful of governors did not respond to the NPAT and the median voter in Alaska and Hawaii was also missing because the NAES did not sample in those states. We imputed the ideal points of the missing actors using linear mapping. The missing ideal points of governors were imputed based on ideal point estimates that Bonica (2013) computed from campaign finance records. The missing ideal points of the median voters in Alaska and Hawaii were imputed based on Erikson *et al.*'s

measure of state liberalism in 2000.<sup>2</sup> This imputation introduces measurement error (due to the fact that these quantities cannot be perfectly predicted by campaign finance ideal points or state liberalism) so the reported analyses correct for this measurement error.

**3.2 Estimating policy outcomes and status quo locations**

Our approach for estimating policy outcomes and status quo locations builds on Richman’s (2011) work. Richman combines traditionally estimated ideal points with survey information on spending and tax preferences across an array of issue areas. The key insight is that locating the status quo is relatively easy if we know the preferences of the legislators and we know the direction of change, if any, favored by each legislator. Armed with these data, we can ask how liberal or conservative the legislators who favor increasing spending are, how liberal or conservative the legislators who favor no change are, and how liberal or conservative the legislators who favor reducing spending in that area are. The basic logic of the spatial model dictates that the legislators who favor no change are closest to the current policy location.

To apply Richman’s (2011) technique, we relied on the NPAT data—this time specifically employing a number of items that required candidates for office to indicate their preferences on taxes and spending. The items required that respondents indicate on an ordered scale whether they preferred a large increase, small increase, maintaining the current level, a small decrease, a large decrease, or complete elimination—of spending and taxes across various categories.<sup>3</sup> The list of issues included in the analysis is given in Table 1.

Figure 1 provides an illustration of the technique we employ. It displays the ideal points of NPAT respondents and their preferences on spending on health care, for state legislative candidates in Hawaii and Mississippi. The ideal points are estimated in a common unidimensional space. Comparing the preferences of state legislative candidates in Hawaii and Mississippi for any fixed ideal point, state legislative candidates in Mississippi are more likely to support increasing spending and less likely to support decreasing spending than state legislative candidates in Hawaii. Despite the fact that state legislative candidates in Hawaii are more liberal than state legislative candidates in Mississippi, more candidates in Mississippi overall support increasing health care spending and fewer support decreasing it. Together, this is indicative that the status quo health care spending in Mississippi is to the right of the status quo in Hawaii. Indeed, state health care spending per capita was two and a half times larger in Hawaii.

We identify status quo locations using an ordered probit model predicting the ordinal survey response based on the respondent’s common space ideal point. After estimating the model, we measure the current status quo as equal to the ideal point which maximized the probability of observing a “maintaining the current level” response. This probability could be characterized as:<sup>4</sup>

$$\Pr(\text{MaintainSQ}) = \Phi(c_3 - \beta\alpha_n) - \Phi(c_2 - \beta\alpha_n) \tag{1}$$

Differentiating with respect to  $\alpha_n$  and setting the derivative equal to zero, we have our estimate for the status quo based on the ideal point which maximizes  $\Pr(\text{MaintainSQ})$ ,

$$\widehat{SQ} = \frac{\hat{c}_2 + \hat{c}_3}{2\hat{\beta}} \tag{2}$$

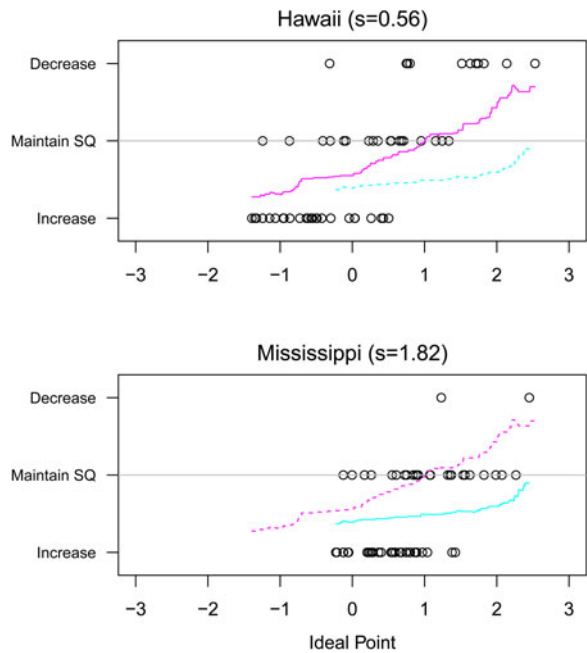
<sup>2</sup>We thank Gerald Wright for providing updated state liberalism scores for these states.

<sup>3</sup>The items used to estimate policy locations were not used to bridge between chambers or surveys as they did not meet the criteria to be considered identical outlined above.

<sup>4</sup>Here,  $\Phi$  denotes the normal cumulative distribution function,  $\beta$  denotes the slope of ideology in the probit model,  $c_2$  and  $c_3$  denote the cutoff parameters above and below “Maintain SQ”, and  $\hat{\beta}$ ,  $\hat{c}_2$ , and  $\hat{c}_3$  denote the estimates of the ordered probit parameters.

**Table 1.** List of spending policies and tax policies in the state legislative NPATs

Spending	Taxes
Environment	Alcohol
Healthcare	Capital gains
Higher education	Cigarette
K-12 Education	Corporate
Law enforcement	Gasoline
Transportation	Income greater than \$75,000
Welfare	Income less than \$75,000
	Property taxes
	Sale taxes



**Fig. 1.** Illustration of the status quo estimation technique—each dot denotes a response to the health care spending preference item in Hawaii or Mississippi. The magenta line is a smoothing plot based on responses in Hawaii and the cyan line is a smoothing plot based on responses in Mississippi.

A respondent would be most likely to give such an answer if the current policy was equal to his ideal point. We used the delta method to estimate the standard error of the status quo estimate.

We applied this process to the NPAT surveys conducted before and after the legislative session we studied in each state. The status quo estimated before the legislative session was our estimate of the status quo and the status quo estimated after the legislative session was our estimate of the policy outcome from the legislative session. As in Richman (2011), estimates of the status quo and policy outcome are reported for a number of different spending and tax issues (as indicated in Table 1). Richman reports a number of validation tests that indicate that this approach is effective in recovering the estimates of status quo locations even in difficult circumstances including missing data and highly biased response rates. We use simulations below to assess the accuracy of these policy and status quo location estimates when there are few survey responses.

This process has limits that circumscribe the set of recoverable status quo locations. Some issues, particularly in some states, were not ideological enough for the ordered probit model to be estimated with much confidence. Law enforcement and transportation policies tend not to sharply divide on the left-right common space. When the relevant preference dimension for a policy is not closely linked to the common space, status quo locations estimated on the common

space are unlikely to be informative. We excluded from our analysis issues for which the  $\chi^2$  test for the ordered probit model was not statistically significant (Richman, 2011). In other instances, extreme status quos could not be estimated with any precision. If almost all candidates in a state want to increase spending on K-12 education, the status quo could be just outside their preferences or far outside their preferences. These points typically had very large standard errors, introducing measurement error into our estimates. When the measurement error appeared in the dependent variable of a linear regression, we employed weighting to improve the efficiency of the estimation. When the measurement error appeared in a variable that was being correlated, we corrected the correlation for measurement error.

In Appendix A.1, we demonstrate that our approach accurately recovers the relevant quantities in a series of Monte Carlo experiments. The simulations are designed to address three potential challenges—limited numbers of bridge voters, limited numbers of bridge votes, and limited numbers of status quo location survey responses. These analyses show that in each case, the estimation performs effectively for realistic numbers of observations.

#### 4. Estimates of the common space

This section reports results of our common space estimation. To check the validity of our estimates, we correlated our estimates of the ideology of the median respondent and median voter with other measures of state ideology. The right-wing vote share in the 2000 Presidential race had a correlation of 0.83 with the median voter's position. Erikson *et al.*'s (1993) measure of state ideology<sup>5</sup> had a correlation of 0.74 with the median respondent's position. Both our measure and Erikson *et al.*'s measure are subject to measurement error—the correlation when measurement error is corrected for is 0.95. Peress (2013) estimated the position of each state using a principal components decomposition of the 2000 NAES data. The correlation between Peress's estimates and the median respondent 0.92.

In Figure 2, we report the distribution of estimates for voters and state legislative candidates by party. We find that the distribution for state legislators is more spread out than the distribution for voters, indicating that the state legislators are somewhat more extreme than the electorate. We see that both voters and state legislative candidates are sorted by party, but there is less overlap between the parties among the state legislative candidates than the voters. The general patterns reported here are largely consistent with other results on public and elite ideology in the literature (Bafumi and Herron, 2010).

The most polarized lower houses were Alaska, California, and Michigan. The least polarized houses were Mississippi, Tennessee, and West Virginia. The results are largely consistent with other estimates of the state legislatures (Shor and McCarty, 2011; Battista *et al.*, 2013). The correlations between our estimates and those reported by Battista *et al.* (2013) are 0.96 and 0.97, for the lower and upper chambers, respectively. The correlations between our estimates and those computed by Shor and McCarty (2011) are 0.85 and 0.84, for the lower and upper chambers, respectively.<sup>6</sup>

Though consistent with previous work involving voters at end of the 20th century, our finding that voters were less polarized than legislators may be surprising to some. Hence we pause to demonstrate that these findings are driven by underlying patterns in the data rather than being an artifact of our approach for constructing the common space. There are 15 bridge votes for which we observe responses from (mass public) respondents to the NAES and (congressional candidate) respondents to the NPAT. We can consider these responses individually and we can also construct an index by coding each response as liberal and

<sup>5</sup>Erikson *et al.* have continued to update their index and our comparison relies on the index computed for 2000.

<sup>6</sup>Shor and McCarty estimates pool data over about a 20-year period, and assume that individual legislators do not change their positions over time.



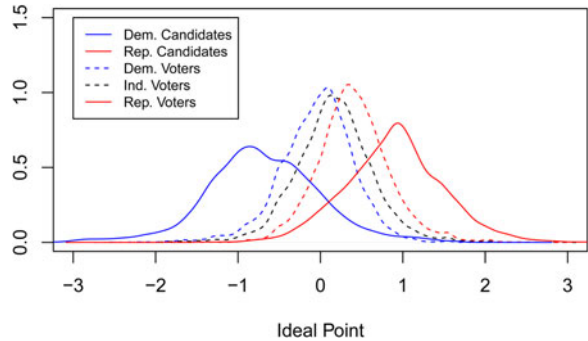


Fig. 2. Density of ideal point estimates for state legislative candidates and voters by party

conservative and computing the percentage of times each respondent indicated a conservative opinion. The average Democratic identifier took the conservative position on 27 percent of the issues while the average Republican identifier took the conservative position on 39 percent of the issues. The average Democratic candidate took the conservative position on 20 percent of the issues while the average Republican candidate took the conservative position on 58 percent of the issues. The average NAES respondent took the conservative position on 32 percent of the issues. In Figure 3, for each of the 15 items, we report the percent support among all voters, Democratic identifiers, Republican identifiers, Democratic congressional candidates, and Republican congressional candidates. On all but one of these votes, identifiers from each party were less polarized than candidates from each party. Overall, these results demonstrate the patterns of elite versus mass public polarization we found in the common space parallel patterns observed in the raw data.

## 5. Characterizing policy representation on spending and taxation

We used our estimates of policy outcomes and the positions of the median voter in each state to study policy representation at the state level. In Table 2, we report congruence which captures how close policy outcomes are to the median voter. Congruence is measured using the square root of the average squared distance between the policy outcome and the median voter's position. The measure we report is corrected for measurement error.

Incongruent policies can be decomposed into different sources (Erikson *et al.*, 1993). Policy may exhibit liberal bias, conservative bias, over-responsiveness, or under-responsiveness. We capture these using the parameters of a linear regression.<sup>7</sup> We regressed the policy outcome for a particular issue (e.g. gasoline taxes, K-12 education spending) in each state on the position of the median voter in that state. We weighted the regression by one divided by the variance of the measurement error for the dependent variable, to increase efficiency. We report the slope of this regression, where values greater than 1 indicate over-responsiveness and values less than 1 indicate under-responsiveness. We calculated the bias of policy at the national median voter's position (which is equal to 0.19 in our common space). We did not report the regression results when there were fewer than 30 data points. The estimates are reported as *slope* and *bias* in the table.

The policy process may be “noisy”, which involves spread around the same linear regression line. The amount of noise can be captured by the correlation between the median voter's position and the policy outcome. We report such a correlation (again, correcting for measurement error) in the table. We note that the correlation is unit free and could be reported even if we did not have comparable measures of the median voter and policy outcomes. Computing the remaining

<sup>7</sup>Because of the common space all parameters of the regression are meaningful.

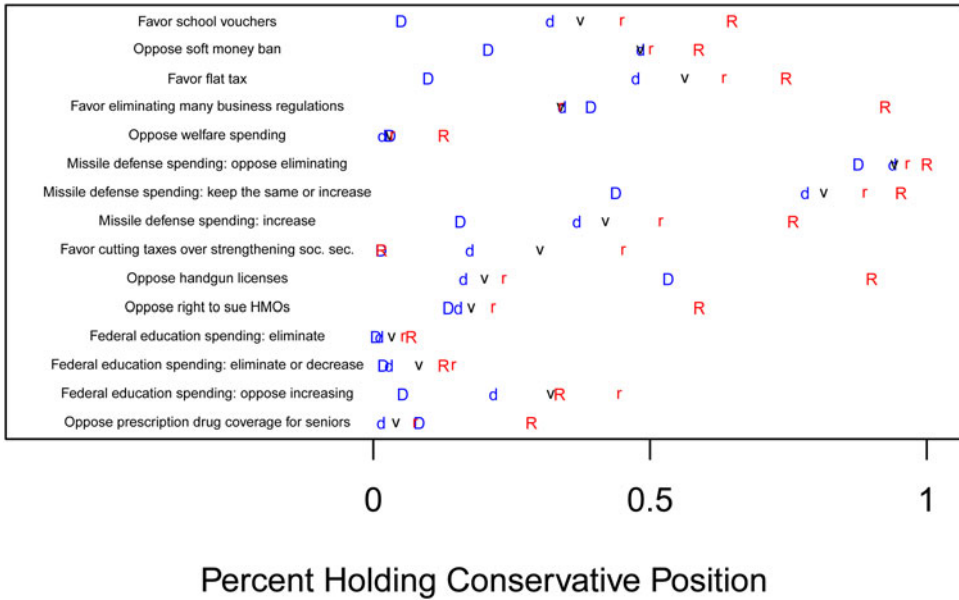


Fig. 3. Bridge voters—each black v, blue d, red r, blue D, and red R represents the percentage of conservative response to the issue for the mass public overall, Democratic identifiers, Republican identifiers, Democratic congressional candidates, and Republican congressional candidates.

measures—congruence, bias, and slope—require comparable measures of the median voter and policy outcomes. These could thus not be reported by Miller and Stokes (1963), Erikson *et al.* (1993), and Caughey and Warshaw (2018), whose measures capture the noise of the policy process, but not the systemic departures for congruence.

There is quite a bit of variability in the strength of the relationship between policy outcomes and voter preferences across issues. The correlation between corporate taxes and the median voter’s position is 0.62 and the correlation between K-12 education spending and the median voter’s position is 0.50. Contrarily, there is almost no correlation between gasoline taxes and the median voter’s position. Similarly, there is almost no correlation between welfare spending and the position of the median voter. In one case—spending on the environment—there is a negative correlation between spending and the median voter’s position, though the correlation is not statistically distinguishable from zero.

There is similarly a large degree of variation in the slope of the regression line across states. Over-responsiveness—policy shifting more rapidly than the position of the median voter—is more common than under-responsiveness. Policies such as cigarette taxes, corporate taxes, and K-12 education spending are over-responsive to the median voter’s position. Policies such as capital gains taxes and welfare spending are under-responsive to the median voter’s position. Only the slopes on capital gains taxes, corporate taxes, health care spending, and welfare spending are individually statistically distinguishable from 1. There is a tendency for taxes to be biased to the left—meaning that in a state whose median voter is close to the national median, we expect to see higher taxes than the median voter would prefer. The exception to this is that sin taxes (alcohol and cigarette) are biased to the right. Spending outcomes appear to be biased to the right—meaning that spending levels are generally lower than the median voter would prefer. The exception to this is welfare spending, which is biased to the left.

There is a good deal of variance in congruence, ranging from 0.373 for corporate taxes to 0.977 for education spending. The former is roughly equal to the ideological distance between Steny

**Table 2.** Representation in elections—congruence, responsiveness, and bias of policy outcomes to voter preferences

	Congruence	Correlation	Slope	Bias	<i>N</i>
Taxes:					
Alcohol	0.516	0.324	1.319 (0.930)	0.405*** (0.081)	37
Capital gains	0.861	0.471	0.167 (0.448)	-0.863*** (0.040)	37
Cigarette	0.568	0.547	1.578+ (0.828)	0.483*** (0.073)	40
Corporate	0.373	0.619	2.167*** (0.557)	-0.273*** (0.053)	46
Gasoline	0.664	0.004	1.183 (1.234)	-0.480*** (0.085)	40
Income, < 75k	n/a	0.370	n/a	n/a	17
Income, > 75k	0.484	0.290	1.082 (0.743)	-0.362*** (0.066)	40
Property	n/a	0.199	n/a	n/a	16
Sales	n/a	0.725	n/a	n/a	18
Spending:					
Environment	0.417	-0.343	-0.746 (0.486)	0.366*** (0.038)	48
Health care	0.695	0.228	-0.050 (0.448)	0.684*** (0.047)	45
Higher education	0.798	0.404	0.379 (0.560)	0.764*** (0.058)	38
K-12 Education	0.977	0.502	1.340*** (0.378)	0.965*** (0.030)	35
Law enforcement	n/a	0.528	n/a	n/a	23
Transportation and infrastructure	n/a	0.144	n/a	n/a	20
Welfare	0.448	0.083	0.131 (0.448)	-0.386*** (0.039)	47
Policy index:	0.289	0.378	1.436*** (0.384)	0.159*** (0.046)	50
Tax index:	0.404	0.348	1.966*** (0.575)	-0.223*** (0.054)	50
Spending index:	0.438	0.172	0.569 (0.358)	0.461*** (0.032)	49

One star indicates statistical significance at the 5% level. Two star indicates statistical significance at the 1% level. Three stars indicate statistical significance at the 0.1% level. A plus sign indicates statistical significance at the 10% level.

Hoyer and Joe Biden, while the latter is roughly equal to the ideological distance between Susan Collins and Mitch McConnell. Corporate taxes exhibit a relatively high correlation with the median voter and exhibit little bias, but are over-responsive to the position of the median voter. A large degree of bias leads to education spending that is on average quite far from the position of the median voter.

We next developed three indices of policy—one for tax items, one for spending items, and one for both sets of policies. In constructing these indices, we weighted items by the inverse of their measurement error variance for efficiency. The resulting indices have less measurement error than the individual items, but they also represent a different relationship—they represent the relationship between the average policy outcome in the state and the median voter's position. We find a 38 percent correlation between the policy index and the median voter's position and a correlation of 35 percent between the tax index and the median voter's position. The correlation between the spending index and the median voter's position is lower at 17 percent.

We find that the overall policy index as well as the tax index are over-responsive while the spending index is under-responsive. The slope of the spending index is not statistically

distinguishable from 1. We find that tax policy is biased to the left and spending policy is biased to the right. The results also suggest that overall, policy is biased slightly to the right (by about 8 percent of the distance between the median Republican and median Democrat in the House).

The overall policy index is more congruent than any of the individual policies—the average policy outcome in each state is about 15 percent of the distance between the parties in the US House from the median voter, or the ideological distance between Dianne Feinstein and Steny Hoyer. The tax and spending policy indices indicate less congruence than the overall policy index. The divergence between tax and spending policies and the median voter is obtained for different reasons however. The average tax policy diverges from the median voter due to over-responsiveness. Spending policies diverge from the median voter because spending policies are biased in the conservative direction and because they are barely correlated with the position of the median voter. In the next section, we will study why these differences occur.

We next compare our results to a few results that exist in the literature. Our emphasis will be on correlations since most prior results could not report congruence due to a lack of common space estimates. Two important sets of prior results point in seemingly different directions. Lax and Phillips (2011) suggest that there is a “democratic deficit” in the states—frequently, policy outcomes differ from what voters want. Contrarily, Erikson *et al.* (1993) suggest a very strong relationship between average policy outcomes and state opinion. Our results allow us to reflect on this seeming incongruence. Like our results, Lax and Phillips (2011) emphasize a great deal of heterogeneity across issues—they find, for example, that in 86 percent of the states, presence or absence of a lottery coincides with majority support or lack of support for a lottery. At the other end of the spectrum, presence or absence of bilingual education only corresponds with majority support in 6 percent of the states. For almost 10 percent of the policies they studied, they found a negative relationship between majority opinion and presence of the policy. They only found a statistically significant relationship between majority support and presence of the policy for about half the policies they studied. They found significant evidence of left and right bias for various policies—for example, while parental notification for minor seeking abortions was correlated with state opinion on this policy, states where 30 percent of the public supported this policy had a 50 percent chance of having the policy.

Erikson *et al.* (1993) suggest an 82 percent correlation between a policy index (based on data from 1962 through 1984) and state opinion (based on data from 1976 through 1988). Their policy index is itself constructed based on eight sub-indices, and the correlation between the sub-indices and state opinion ranges between 44 and 76 percent. Caughey and Warshaw (2018) produce similar measures of policy and opinion for 1936 through 2014, and find that for 2000, the correlation between a social policy index and social opinion is 78 percent and the correlation between an economic policy index and economic opinion is 59 percent. The closest match is between our policy index and Caughey and Warshaw’s economic policy index. The correlation they find is somewhat higher than what we find, which could be due to a number of factors.

First, Caughey and Warshaw (2018) smooth both the policy index and the opinion measure over time. Smoothing policy and opinion are likely to result in a higher correlation if the results of elections take time to lead to policy change. Second, the policy indices Erikson *et al.* (1993) and Caughey and Warshaw compute include a broader array of policies. Using broader indices is likely to result in a higher correlations if policy is highly responsive in some areas, but is seemingly randomly determined in other areas, as our work and Lax and Phillips’s (2011) work suggests. Third, beyond the fact that Erikson *et al.* and Caughey and Warshaw consider a broader array of policies than we do, they focus on different policies which may be more highly correlated with opinion than taxes and spending. Erikson *et al.* find a correlation of 47 percent between tax progressivity and state opinion, which is similar to the correlation we find between the tax index and public opinion. Grumbach (2018) developed a measure of state tax policy over a longer period of time. When we correlated his index for 2000 state tax policy with the median voter’s position, we found a correlation with a magnitude of 45 percent.

Overall, the correlations we find are similar to the most closely comparable measures found in the literature. One added benefit of our approach is that beyond the correlation, we can measure congruence, bias, and over/under-responsiveness. A second benefit is that beyond broad indices, we can study individual policies. One common interpretation in the literature is the high correlation between state policy indices and public opinion is reflective of good representation. Our results point against this interpretation—while there is variation across issues in representation, policy indices tend to be more highly correlated with the median voter than individual policies. Beyond this, even when high correlations are found on individual issues, they are typically not reflective of high congruence. Instead, we find considerable evidence for bias and over-responsiveness on many policies. Finally, despite variation across issues, some consistent patterns do emerge. Tax policies tend to be over-responsive and biased in the liberal direction while spending policies tend to be under-responsive and biased in the conservative direction.

## 6. Mechanisms for policy representation

If policies are (somewhat) responsive to the position of the median voter, what explains the presence and strength of this responsiveness? One plausible explanation is that elections lead to elected officials who are in-step with the voters, and that these elected officials push for policy changes that are congruent with their own positions. Two theoretical perspectives are, however, in tension with this mechanism. First, there is considerable evidence that voters are relatively uninformed (Delli Carpini and Keeter, 1991) making it questionable whether voters have the requisite knowledge of the positions of state legislative candidates necessary to hold them accountable. Though cue-taking may help to a degree (e.g. Lupia, 1994), there are limits to the degree of responsiveness we can reasonably expect to find (Rogers, 2017). Contrarily, gubernatorial elections may pose less of a challenge for policy voting due to voters' greater exposure to the candidates. Second, even if voters are able to move politicians, the policy process may exhibit considerable inertia (Baumgartner and Jones, 1993), particularly for spending (Davis *et al.*, 1966). Our second application investigates this mechanism.

Table 3 sheds light on the first part of the mechanism. We report models where the dependent variable is the position of a pivotal actor and the independent variable is the position of the median voter in the state. For the Senate median and the governor, the position of the median voter has a statistically significant effect on position. Moreover, in all three cases, the position is over-responsive to the position of the median voter. A one-unit change in the position of the median voter leads to a nearly three-unit change in the position of the governor. Consistent with expectations, we observe smaller correlations for the state legislative actors. Beyond the finding for responsiveness, we observe little bias for the three political actors—a state whose median voter is located near the national median voter has (on average) a state House median, a state Senate median, and a governor close to his position.

We next consider whether the positions of these pivotal actors impact policy. We generate an index of the ideology of state governments by taking the average of the state House median, the state Senate median, and the governor. These results are given in the first column of Table 4. There is no statistically significant relationship between the (current) state government ideology and policy outcomes—in fact, the correlation between the index and state policy is approximately zero. We next considered an alternative measure of state government based on party control. The index was set equal to 1 if the Republican party controlled both houses of state government and the governorship, or held a veto-proof supermajority in both houses of state government. The index was set equal to  $-1$  if the Democratic party effectively controlled state government and was set equal to 0 if there was divided control. We again found no statistically significant relationship.

While these results are surprising according to some theoretical perspectives, a further dive into the data largely explains this result. When we correlated the policy outcome and the status

**Table 3.** Representation in elections—the dependent variables are the ideal points of the pivotal actors in each state and the independent variable is the ideal point of the state’s median voter

DV	(1) House median	(2) Senate median	(3) Governor
Constant	−0.165 (0.242)	−0.334 (0.271)	−0.467** (0.164)
Median voter	1.223 (0.962)	2.141* (1.062)	2.921*** (0.731)
<i>N</i>	47	47	47
<i>R</i> <sup>2</sup>	0.027	0.051	0.218
Correlation	0.164	0.226	0.467
Bias at U.S. median	−0.122 (0.099)	−0.117 (0.121)	−0.101 (0.070)

**Table 4.** State government composition and policy outcomes—the dependent variables are policy indices

Policies	(1) All	(2) All	(3) All	(4) All	(5) Tax	(6) Spending
Constant	0.330*** (0.045)	0.328*** (0.044)	0.335*** (0.043)	0.270*** (0.057)	−0.053 (0.064)	0.571*** (0.048)
State ideology index	−0.019 (0.059)					
Party control (current)		0.004 (0.049)				
Party control (20-year average)			0.045 (0.062)	0.210* (0.083)	0.441** (0.140)	0.005 (0.089)
South excluded				X	X	X
<i>N</i>	47	47	47	32	32	31
<i>R</i> <sup>2</sup>	0.001	0.000	0.007	0.101	0.259	0.000
Correlation	0.032	0.000	0.084	0.318	0.509	0.000

quo, we found that the correlation was 84 percent. Given that both the policy outcome and the status quo are subject to measurement error, this correlation is likely substantially attenuated. Policy outcomes exhibit very little change in the short term, as Baumgartner and Jones (1993) have argued. Moreover, there is a great degree of turnover in the control of state government—between 1998 and 2000, we found that patterns of control switched in 15 states. Given frequent changes in partisan control and very slowly changing policy outcomes, a robust relationship between *current* control of state government and policy outcomes would be unlikely.

Alternatively, policy outcomes may be related to long-term control of state government. To investigate this, we constructed an alternative index based on the average of the same control variable over a 20-year period, with the particular time window motivated by the work of Caughey and Warshaw (2018).<sup>8</sup> The results are given in the third column of Table 4. We continue to find an insignificant relationship.

Even a 20-year average of partisan control provides a poor proxy for long-term government ideology in the Southern states during our period of study—a number of Southern states saw consistent Democratic control in the 80s and 90s coupled with very conservative policy outcomes. Using Rugeley’s (2007) data on presidential vote by state legislative district, we found that 42 percent of southern lower chamber districts held by Democrats cast a majority of their presidential votes for Republican or other conservative candidates in 2000, compared to 23 percent of non-

<sup>8</sup>In their dynamic models of economic policy, they find that approximately 80 percent of the effect of the dependent variables occurs over a 20-year window.

southern Democratic districts. Even though every southern lower chamber except Florida and South Carolina had a Democratic majority, 66 percent of southern districts cast a majority of their presidential votes for Bush or another conservative candidate. One interpretation is that while control of state government is usually a good proxy of the ideology of state political actors, it was a particularly poor proxy in this period of time for those states, as the slow realignment of southern states had not yet completed. When we restricted our analysis to non-Southern states, we found a strong and statistically significant relationship between long-term control of state government and policy outcomes.<sup>9</sup> The final two columns examine the effect of long-term control on tax and spending policies. The effect for tax policies is larger in magnitude while the effect for spending policies is smaller and statistically insignificant. A long-term change from Democratic control to Republican control would lead tax policy to move by almost 50 percent of the distance between the national parties. Interestingly, the attenuated effect of long-term partisan control on spending policies provides a potential explanation for why spending policies are incongruent with a states median voter.

## 7. Conclusions

In this paper, we developed a methodology for estimating the locations of voters, elite political actors, policy outcomes, and status quo locations in a common space. We applied our estimates to evaluate the congruence between voter preferences and policy outcomes and to evaluate elections as the mechanism explaining the observed degree of congruence. We found that while the average policy is fairly close to the median voter—the distance is about 15 percent of the distance between the two national political parties—individual policies are more divergent, ranging from 20 to 50 percent of the distance between the parties. Spending policy and tax policies are approximately equally congruent, but diverge from the median voter for different reasons. While tax policies are relatively unbiased and over-responsive to the position of the median voter, spending policies are biased and unresponsive to the position of the median voter. The patterns we observe for tax policies can be explained using elections as a mechanism, though tax policies are weakly effected by elected officials in the short term. Instead, long-term partisan control of state government is associated with the direction of tax policy. Contrarily, spending policies are little effected by the makeup of state government, even in the long term.

Measures of the preferences of voters, elite political actors, policy outcomes, status quos make possible the study of elections and legislating in a unified framework. Measuring these quantities on a common scale addresses Achen's (1977) critique of Miller and Stokes (1963). Our estimates and our methodology will facilitate future work studying policy representation, decomposing policy representation into electoral and legislative components, and directly testing spatial theories of voting and spatial theories of lawmaking. Does the modest level of representation reflect elections in which voters choose imperfect representatives (as in Rogers, 2017)? Does it reflect the workings of state institutions that generate gridlock (as in Clinton and Richardson, 2019)? Does it reflect general inertia in the policymaking process (as in Baumgartner and Jones, 1993)? What explains differences across issues in the responsiveness of policy outcomes to voter preferences (as found by Lax and Phillips, 2011)? By placing voters, candidates, policy outcomes, and status quos in a common space, the methods developed in this paper provide an opportunity to further study these and related questions.

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<sup>9</sup>We continued to find weak and statistically insignificant relationships when the models in the first and second columns of Table 4 were altered to exclude Southern states, indicating that even outside the South, policy outcomes are related to long-term rather than current control of state government.

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