Policy Representation in the State Legislatures*

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Abstract

How do electoral and legislative institutions translate public opinion into policy outcomes? Voters first choose representatives and these representatives then agree on policy changes. Understanding representation therefore entails the study of both voting behavior and legislative institutions. 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. We apply our results to the state legislatures. We find that the positions of pivotal actors are over-responsive to the positions of the median voter. In addition, policy outcomes in the state legislatures can be best described by a model which incorporates the veto, the filibuster, supermajority requirements, and negative agenda setting by the majority party. Together, our results document how imperfect policy representation can be attributed to elections that select extreme candidates and partisan and supermajoritarian institutions in the state legislatures which contribute to rather than temper over-responsiveness.

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1 Introduction

How do electoral and legislative institutions translate public opinion into policy outcomes? Representative democracy entails a two-step process in which voters first choose representatives and these representatives then choose policy. Understanding representation therefore entails the study of both voting behavior and legislative institutions. The study of each has often been strictly compartmentalized because each topic presents its own methodological challenges. Much has been learned recently from the separate study of representation in elections and the lawmaking process, but a deep understanding of *substantive* representation requires building on progress in both areas to track the representation process across all steps.

Our goal is to study the correspondence between public opinion and policy outcomes. Building on recent advances in the study of representation in elections (Wright, 2004; Bafumi and Herron, 2010; Shor and Rogowski, 2010; Stone and Simas, 2010; Shor and McCarty, 2011; Shor, 2011; Battista, Peress and Richman, 2013) and in testing theories of lawmaking (Clinton and Meirowitz, 2001; Woon, 2008; Jeong, Miller and Sened, 2009; Richman, 2011; Peress, 2013*b*), 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. To go beyond simply measuring representation and to begin to understand institutional factors that moderate representation, we study the state legislatures, where electoral institutions (such as public financing) and legislative institutions (such as gatekeeping committees) vary.

We uncover evidence of imperfect policy representation. In particular, our findings indicate that policy outcomes are over-responsive to the position of the median voter[1]—a unit change in the position of the median voter leads to on average a two unit change in the expected policy outcome. This in turn leads to policy outcomes that are extreme relative to the median voter.

Our methodology allows us to attribute imperfect representation to elections and legislative institutions. We find that the positions of pivotal actors—such as the median legislators, governors, and the majority party medians, are over-responsive to the position of the median voter. Moreover, the positions of some of these actors—especially the majority party medians—are weakly correlated with the median voter's position. These patterns are relatively stable across states, but are moderated by the primary system. Specifically, the pivotal actors are more responsive to the position of the median voter in states that have more open primary systems.

Turning to the legislatures, we find that policy outcomes can be best described by a model which incorporates the veto, the presence of a filibuster, supermajority requirements for some

[1] Throughout this paper, we use the term median voter to refer to the median voter *in the electorate* and use the term median legislator for the chamber medians in the upper and lower houses of the state legislatures. We also use the terms House and Senate to refer to the upper and lower houses of each state legislature, even in states where the lower chamber has been named the State Assembly. We prefer to use the terms House and Senate in place of lower and upper chamber because there will be less confusion with the terms lower pivot and upper pivot. This terminology avoids such confusing phrases as the "the lower chamber's upper pivot".

legislation, and negative agenda setting by the majority party in each chamber. We refer to this model, a hybrid of Krehbiel's Pivotal Politics model and Cox and McCubbins's Party Cartel model, as the Cartel and Pivots model. Our results are consistent with existing findings for the U.S. Congress. The best fitting Cartel and Pivots model explains a good degree of variation in the policy outcomes at the state level. Moreover, we find that super-majority requirements (where present) and party organizations matter in broadly similar ways across state legislatures—the superior fit of the Cartel and Pivots model relative to competing models holds consistently across the states. However, certain legislative institutions influence the absolute fit of the Cartel and Pivots model. In particular, we find that states with more powerful committees produce outcomes that more consistently follow the Cartel and Pivots model. Together, our results document how imperfect policy representation results from elections that select extreme candidates and partisan and supermajoritarian institutions in the state legislatures which contribute to rather than temper over-responsiveness.

1.1 Representation in Elections

The study of representation in elections has largely followed the path-breaking work of Miller and Stokes (1963), who realized many years ago that advances in the measurement of public opinion and elite opinion would allow for the empirical study of a topic that had animated political philosophers for many decades. While Miller and Stokes believed that they could measure the preferences of voters and candidates for office using a series of policy questions, they worried that they could not design a common set of questions for measuring both public and elite opinion, and instead generated measures of public and elite opinion on different scales. Miller and Stokes presented evidence that public and elite opinion were correlated while acknowledging that their findings were limited by the fact that they were not able to measure public and elite opinion on a common scale—Achen (1978) later termed this the "perils of the correlation coefficient". While Miller and Stokes's study demonstrated that congressional and public ideology were correlated, it remained possible that representation was poor if congressmen were systematically more extreme, more moderate, or biased in a particular direction relative to their constituents.

Recent work has made significant progress in measuring the preferences of voters and candidates for office on a common scale and this research has validated the concerns of Miller and Stokes and Achen. Stone and Simas (2010) developed common measures of voter and candidate ideology by combining surveys of voters and expert placements of candidates for office on a liberal-conservative scale. Rather than rely on expert placements of candidates, Bafumi and Herron (2010) estimated the preferences of legislators using roll call votes and obtained comparable measures of voter opinion through a survey that asked respondents their opinions on a select set of roll call votes. Shor (2011) estimated the preferences of candidates for office using Project Vote Smart's National Political Awareness Test (NPAT) and obtained comparable measures of voter opinion through a survey that

asked respondents their opinions on a select set of NPAT items. Shor and Rogowski (2010) used common items from the NPAT and the National Annenberg Election Study (NAES) to generate comparable measures of voter and candidate ideology. The recent work in this area tells a story of over-responsiveness—members of Congress vote in ways that are correlated with their constituents' preferences, but members of Congress tend to be more extreme than their district's median voter.

1.2 Theories of Lawmaking

Assessments of representation based purely on preference congruence are arguably incomplete without a coupled account of the lawmaking process because policy outcomes are affected by the institutional features of legislatures. Scholars of the U.S. Congress have built competing models of the lawmaking process, including Krehbiel's (1998) Pivotal Politics model and Cox and McCubbins's (2005) Party Cartel model. These abstracted models attempt to explain when change from the status quo is infeasible and what change is likely to occur when change can take place.

The Pivotal Politics model assigns agenda setting power to the median legislator,[2] who is constrained by the need to satisfy competing "pivots"—actors that have veto power in the legislative process. According to Krehbiel, pivots include chamber medians, the 41^{st} and 60^{th} most conservative members of the Senate (the "filibuster pivots"), and either the President or the "veto-override pivot". This creates a gridlock interval where no alternative to the status quo can be enacted.

The pivotal politics model does not give the majority party an explicit role. Cox and McCubbins (2005) developed an alternative "Party Cartel" model where the majority party is able to kill legislation by refusing to bring to a vote bills that a majority of the majority party opposes. This model generates a partisan blockout zone—bills that are opposed by the majority party die before receiving a vote. Additionally, Cox and McCubbins posit that the majority party may also foster majority-party-favored alternatives against the centrist pressure of the median legislator.

These competing theories of lawmaking describe the likely policy outcome, as a function of the status quo and the preferences of the pivotal actors in the lawmaking process. As a result they have implications for the nature of policy representation. Some theories predict that the legislative process will generate policy outcomes that over-respond to the majority party's preferences, while others offer different predictions about whether and in which direction outcomes will be biased as a function of the particular configuration of preferences and initial status quos.

Testing these theories has proven quite challenging. If the preferences of political actors, the status quo, and the policy outcome could be measured on a common scale, it would be straightforward to test the competing theories of lawmaking. Unfortunately, the leading methods for estimating legislator preferences based on roll call voting—pioneered by Poole and Rosenthal (1991, 1997)—do not produce estimates of the policy outcome and the status quo. Instead, these techniques

[2]Of course, there are median legislators in both the House and the Senate. Krehbiel's model assigns agenda setting power to one of the medians, but his predicted gridlock intervals are invariant to which median is selected as the agenda setter.

only produce a reliable estimate of the cutpoint. In light of this limitation, the work of Krehbiel, Meirowitz and Woon (2005), Lawrence, Maltzman and Smith (2006), Wand (2006), and Stiglitz and Weingast (2010) has made remarkable progress in testing theories of lawmaking indirectly, using the distribution of cutpoints or the win rates of legislators.

Tests based on cutpoints and win rates are limited in terms of their power to distinguish among competing theories of lawmaking and this has led to interest in developing approaches for estimating policy outcomes and status quo locations. Clinton and Meirowitz (2001, 2003, 2004) and Jeong, Miller and Sened (2009) developed an approach for estimating the locations of legislative proposals using a series of related votes. The limitation of this approach is the coding requirements for applying this technique are quite steep. Consequently, studies employing the Clinton and Meirowitz technique have considered a single piece of legislation or a small number of pieces of legislation.

Work by Woon (2008), Richman (2011), and Peress (2013*b*) sought to systematically test theories of lawmaking by generating estimates for a more comprehensive set of bills or issues. Woon (2008) developed a technique for estimating the locations of bills using cosponsorship data. Peress (2013*b*) used a combination of voting data, cosponsorship data, and the legislative record to estimate both bill locations and status quo locations. Richman (2011) developed an approach for estimating proposal and status quo locations for tax policies and spending policies using the NPAT. Both Richman and Peress find support for theories of lawmaking that combine aspects of Krehbiel (1998)'s Pivotal Politics model and the cartel model of Cox and McCubbins (2005).

1.3 Policy Representation in the States

While much can be learned from separately studying representation in elections and the lawmaking process, there are inherent limitations. Erikson, Wright and McIver (1994) address these limitations and study policy representation in the U.S. States. They develop measures of state public opinion and state policy. Public opinion and policy were not measured on comparable scales, so like Miller and Stokes (1963), Erikson, Wright and McIver looked at the correlation between state public opinion and state policy. They found a relatively strong correlation between public opinion and policy. As with Miller and Stokes's work, Erikson, Wright and McIver could not rule out the possibility that policy was over-responsive to public opinion. Recent work by Lax and Phillips (2011) addressed this limitation, comparing state policy on a number of issues to public opinion specifically on those issues. Lax and Phillips's findings provided evidence that state policy is over-responsive to public opinion, in the sense that when a slight majority preferred policy X, there was a high likelihood of the state adopting policy X. Moreover, they found evidence that policy outcomes were often out of sync with voters' preferred outcomes.

Our present study builds on these three areas of research. First, we build on the recent work on representation in elections—on Shor and Rogowski's (2010) in particular—and we generate measures of ideology for political elites and voters on a common scale. Second, we build on Richman's

(2011) methodology for estimating proposal and status quo outcomes. Finally, our present study builds on Erikson, Wright and McIver (1994) and Lax and Phillips (2011) in studying policy representation in the states. Like Lax and Phillips, we are partially motivated to study representation in the states because the states offer us variation in electoral and legislative institutions.

Our methodology differs from Lax and Phillips in three important ways. First, while Lax and Phillips measure binary policy outcomes (e.g. does the state have an assault weapons ban?), we measure continuous policy outcomes (e.g. the state sales tax, mapped onto a continuous ideological space). Second, Lax and Phillips use issue-specific measures of public opinion while we use a single composite measure of public opinion. Third, we are able to generate measures of public opinion, policy outcomes, status quos, and the preferences of political actors, while Lax and Phillips only generate estimates of public opinion and policy outcomes. Our use of a single continuous measure of public opinion allows us to generate comparable estimates of the positions of legislators, governors, and the status quo. This then allows us to analyze the separate roles of electoral institutions and legislative institutions in generating the over-responsiveness which we along with Lax and Phillips have observed in state policy representation, but which Lax and Phillips' technique could not unpack. This study is the first able to separately and jointly analyze the process of representation from elections and lawmaking through policy outcomes.

2 Methodology

We extend and modify existing 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. Finally, we describe the theories of lawmaking that we will test.

2.1 Estimating the Common Space

Our approach for generating the common space leverages state legislative roll call data collected by Gerald Wright and survey data on candidates for office collected as part of Project Vote Smart's National Political Awareness Test. Our method builds on Shor and McCarty's (2011) approach for bridging the state legislatures using the NPAT, Shor and Rogowski's (2010) approach for bridging candidates for office and voters using common items found in the NPAT and National Annenberg Election Study (NAES), and Battista, Peress and Richman's (2013) work bridging the state legislatures using a *big-matrix* approach.

Our technique gives us estimates for state 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. 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 items which allowed us to merge these surveys into a common data set. Items that appeared in multiple surveys provided a bridge between the different surveys.

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. To overcome this problem, we merged in the roll call data from 99 state legislatures, the U.S. House, and the U.S. Senate. Here, the legislators who responded to the NPAT served as bridging observations for connecting the scale between the 101 chambers (Shor and McCarty, 2011). There are two potential objections to use of the NPAT to bridge the state legislatures however. First, because not all state legislators responded to the NPAT, there may be selection bias in terms of which legislators did respond. Second, roll call ideal points and NPAT ideal points may not be identical—for example, the electoral context might lead to different results for NPAT ideal points. Shor and McCarty (2011) addressed these points better than we possibly could here—they found that in most states, the average NPAT respondent ideal point and the average non-respondent ideal point were quite similar. Moreover, they found that in most states, the relationship between NPAT and roll call ideal points was the same for both parties.

We next extended Shor and Rogowski's (2010) approach and identified common items between the NPAT and NAES. The were only a handful of items common to the state legislative NPATs and the NAES, but there were considerably more items common between the congressional NPAT and the NAES. This indicates one of our motivations for including congressional candidates in the common space—we could use them to indirectly link voters and state legislators through congressional candidates. As before, 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.

Our resulting data set was a matrix with 74,751 rows (corresponding to state legislative candidates, gubernatorial candidates, congressional candidates, and NAES respondents) and 57,546 columns (corresponding to items from the NPAT, items from the NAES, and roll call votes from the 101 chambers, not double counting items from the NAES and NPAT that appeared in multiple surveys). The top part of Figure 1 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.

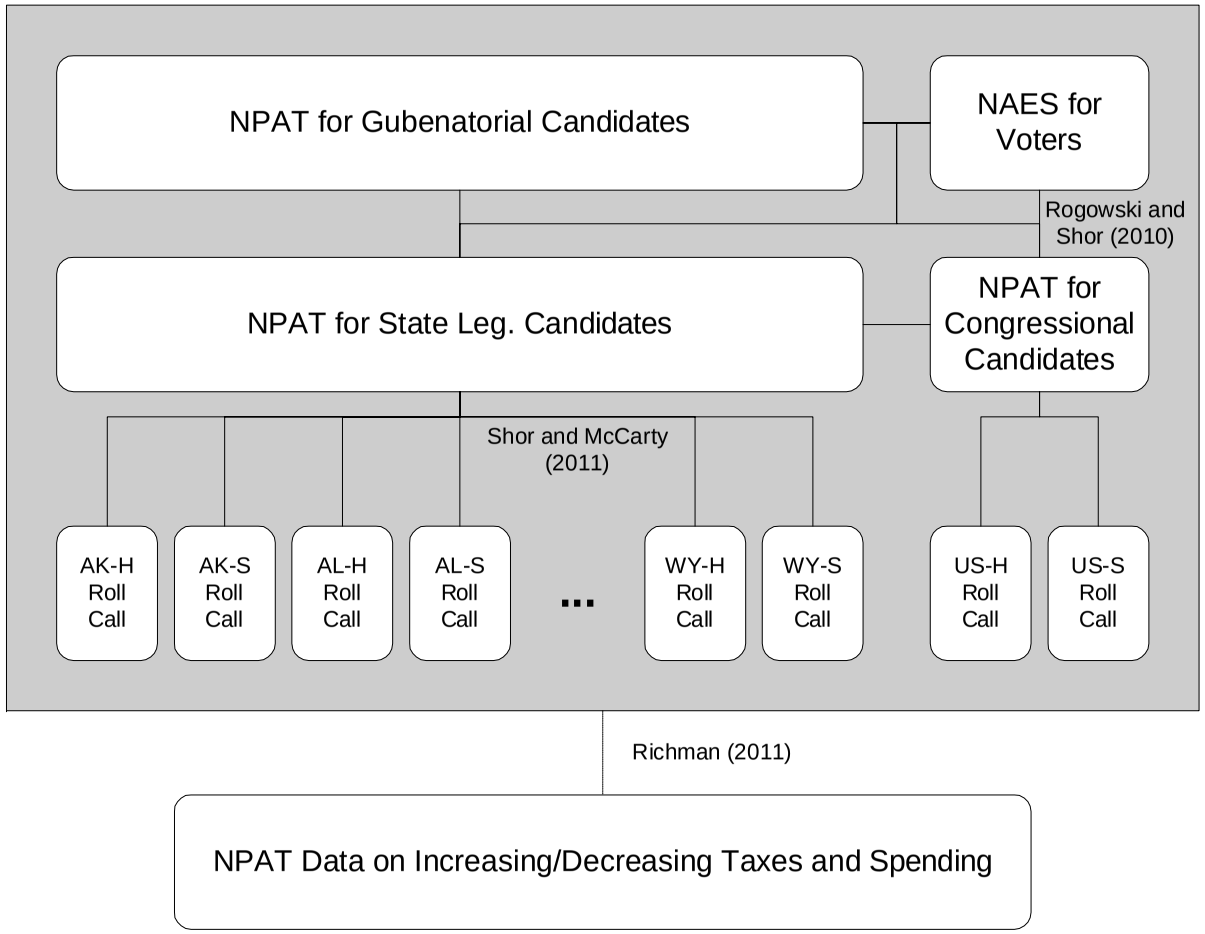

Figure 1: Summary of Data Used to Generate Common Space Estimates – Lines denote bridging observations between surveys and techniques used for creating bridging observations.

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 billions of entries, we have millions of non-missing entries. The key to our strategy was then developing software that skips the missing entries in the data matrix.[3] 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 over 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, Jackman and Rivers (2004) and a close relative of the models considered in Poole and Rosenthal (1991) and Poole and Rosenthal (1997). Specifically, the likelihood function is,[4]

$$l(\alpha, a, b) = \sum_{n=1}^{N} \sum_{t=1}^{T} \left[y_{n,t} \log \Phi \left(a_t + b_t \alpha_n \right) + (1 - y_{n,t}) \log \left(1 - \Phi \left(a_t + b_t \alpha_n \right) \right) \right] \quad (1)$$

We estimate the model via penalized maximum likelihood in order to deal with perfect separation problems due to perfect ideological voters and perfect roll call votes or survey items (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 at least feasible. Our estimation completed after running for a little over a month.

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 U.S. House is located at -1 and the median Republican in the U.S. 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 U.S. House than they are to have a sense of the differences between the parties in the state legislatures. We note that the normalization was based on congressional voting behavior between 1998 and 1999 and that the distance between the parties has roughly doubled since that time period, so one unit on the ideological scale represents roughly one-quarter of the difference between modern House Democrats and House Republicans.

We used our estimates of the ideal points of NAES respondents to compute the ideal points of the median voter in each state. The NAES does not identify which respondents voted in state legislative elections. Instead, we considered the median respondent among those respondents who indicated that they were highly likely to vote in the 2000 Presidential election.[5]

[3] See the appendix of Battista, Peress and Richman (2013) for further details.

[4] Here, $y_{n,t} = 1$ denotes yea vote, $y_{n,t} = 0$ denotes a nay vote, α_n denotes the ideal point of individual n, a_t and b_t are the item parameters for item t, and Φ denotes the normal cumulative distribution function.

[5] Our reasoning for restricting the sample is this way was that only the most committed voters were likely to be

In our final data set, we had a few missing values. Although we could compute the locations of chamber medians, party medians, etc., for all 101 chambers, we were missing ideal points for a handful of governors who did not respond to the NPAT and for the median voter in Alaska and Hawaii because the NAES did not sample in those states. We imputed the ideal points of the missing actors. 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, Wright and McIver's measure of state liberalism in 2000.[6]

2.2 Estimating Policy Outcomes and Status Quo Locations

Our approach for estimating policy outcomes and status quo locations builds on Richman's (2011) work. Richman's (2011) method 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.

To apply Richman's 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. The list of issues included in the analysis is given in Table 1.

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

Table 1: List of Spending Policies and Tax Policies in the State Legislative NPATs

sufficiently informed to cast a ballot for low level offices.

[6]We thank Gerald Wright for providing updated state liberalism scores for these states.

Figure 2 provides an illustration of the technique we employ. It displays the ideal points of NPAT respondents and their preferences on health care spending on the NPAT's scale, for state legislative candidates in Hawaii and Mississippi. The ideal points are estimated in a common unidimensional space. As expected, the state legislative candidates in Hawaii are on average more liberal than the state legislative candidates in Mississippi. However, more state legislative candidates in Hawaii want to see a decrease in the health care spending than in Mississippi. This is immediately suggestive that the status quo in Hawaii is more liberal than in Mississippi. Indeed, the status quo in Mississippi is far to the right of the status quo in Hawaii. For a fixed level on the ideal point axis, Figure 2 suggests that candidates in Hawaii will be more supportive of a shift to the right on health care spending. The exact status quo can be approximated by searching for where the smoothing plot for each state intersects the maintain status quo line, and this exercise indicates that the status quo should be slightly less than 1 in Hawaii and around 3 in Mississippi.

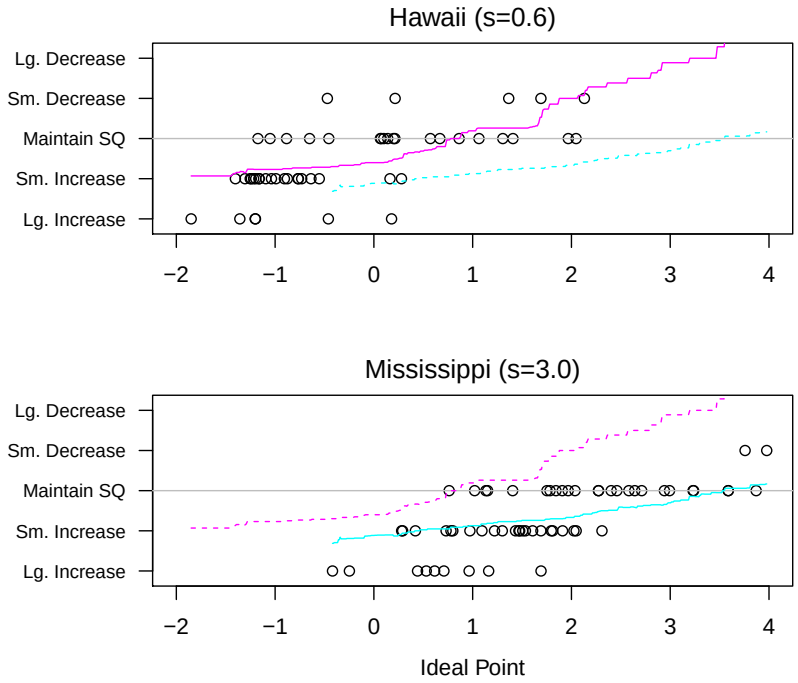

Figure 2: Illustration of the Status Quo Estimation Technique – Each dot denotes a response to the health care spending preference item in Hawaii or Mississippi. The magenta line is a smoothing plot based on responses in Hawaii and the cyan line is a smoothing plot based on responses in Mississippi.

Our final estimates depart from these values somewhat because we employ an ordered probit model to account for the ordinal scale used in the NPAT. For each tax policy and spending policy in each state, we estimated an ordered probit model predicting the survey response based on the respondent's common space ideal point. We then set the current status quo equal to the ideal point which maximized the probability of observing a "maintaining the current level" response. This

probability could be characterized as,[7]

$$\Pr(MaintainSQ) = \Phi(c_3 - \beta x_n) - \Phi(c_2 - \beta x_n) \tag{2}$$

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

$$\widehat{SQ} = \frac{\hat{c}_2 + \hat{c}_3}{2\hat{\beta}} \tag{3}$$

A respondent would be most likely to give such an answer if the current policy was equal to his ideal point. We used the bootstrap 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, subject to some drift due to inflation. Richman (2011) 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.

This process has limits that circumscribe the set of recoverable status quo locations. For one thing, specific NPAT survey responses are not always closely linked to the common space. Some issues, particularly in some states, simply are not ideological enough for the ordered probit model to be estimated with much confidence. Transportation, agriculture, and law enforcement policies tend not to sharply divide on the left-right common space, and as a result the status quo locations for these issues tend not to be recoverable. Richman (2011) reports similar problems for specific issues. When the relevant preference dimension for a policy are not closely linked to the common space, status quo locations estimated on the common space are unlikely to be informative. In order to winnow out these imprecisely estimated status quo locations we exclude from our analysis issues for which the Chi-square test for the ordered probit model was not statistically significant. If we employed estimates of the status quo for issues where the coefficient on ideology was not statistically significantly different from zero, we would be dividing by a number that is effectively zero in (3).

In other instances extreme status quos cannot 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. Estimation of status quo locations would have to be on the basis of the ordered probit functional form. Some such estimates were dropped because of perfect separation in the ordered-probit model. The remaining such points typically had

[7]Here, Φ denotes the normal cumulative distribution function, β 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.

very large standard errors, introducing measurement error into our estimates for s (the status quo) and x (the policy outcome). To deal with measurement error, we took two different approaches. When the measurement error only appeared in the dependent variable or where the statistic we were computing was a linear function of x or s, we employed weighting to account for measurement error. Estimates with very large standard errors were effectively excluded from the analysis because they would receive very low weight. When x or s appeared as an independent variable or when we were computing a statistic that was nonlinear in x or s, we dropped all data with very large standard errors.[8]

2.3 Modeling Framework

The one-dimensional theories of law-making we consider select some legislator—typically the median legislator—as the "proposer". They place constraints on the proposer by introducing veto players. For example, according to the Pivotal Politics model, the other chamber, the filibuster pivots, and the president have a veto, where the presidential veto my be over-ridden by the veto override pivots. Some models also assume that there are actors that can kill legislation before it is considered—the Party Cartel model in particular assumes that the majority party median has this ability. Below, we describe the five theories of lawmaking we consider in this paper.

Median Legislator Model: The median legislator model is more a normative representational standard than it is an attempt to encapsulate actual state legislative politics. State policy outcomes are shaped by majoritarian legislative decision-making.

Pivotal Politics Model: According to the Pivotal Politics model (Krehbiel, 1998), the median legislator retains the ability to propose legislation, but must consider the constraints imposed by the gubernatorial veto (subject to an over-ride), supermajority requirements imposed by the possibility of a filibuster, and supermajority requirements for raising taxes or passing a budget.

Party Cartel Model: The Party Cartel model (Cox and McCubbins, 2005) predicts that the majority party in each legislative chamber will block legislation that would roll the party. Therefore, any policy outcomes predicted by the Median Legislator Model that would make the majority party median of either chamber worse off will not occur.

Cartel and Pivots Model: This model is a hybrid of the Pivotal Politics and Party Cartel models. The median legislator proposes, but must consider the various pivots and supermajority requirements and may not get a chance to act if the majority party prefers to block legislation.

[8] In the analysis reported in the paper, we dropped values of x and s when there associated standard errors were greater than 1.5. We experimented with alternative reasonable cutoffs and found similar results.

Setter and Pivots Model: The Party Cartel model endows the majority party with the power to block legislation. The majority party could conceivably have sufficient control of the agenda to prevent its proposals from being moderated by the median legislator. The Setter and Pivots model gives the majority party median the proposal power, but the proposer must consider the various supermajority requirements.

In appendix A, we describe our modeling framework in more detail.

3 Estimates of the Common Space

In this section, we report some results of our common space estimation. To check the validity of our estimates, we correlated our estimates of the ideology of the median voter with two other measures of state ideology—the right-wing vote share in the 2000 Presidential race[9] and Erikson, Wright and McIver's (1994) measure of state ideology. The correlation of the median voter with right-wing vote share was 0.866 and the correlation with Erikson, Wright and McIver's state liberalism index was -0.739—both indicating very close relationships. We also compared our estimate to estimates computed by Peress (2013*a*) based on a principal components decomposition of the 2000 NAES data. The correlation between our estimates and Peress's estimates was 0.913.

In Figure 3, we report the distribution of ideal point estimates for state legislators and voters. We find that the distribution of ideology is unimodal for voters, but bimodal for state legislators. Moreover, 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.

In Figure 4, we report the distribution of estimates for voters and state legislative candidates by party. Here, 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. We also see that Republican voters are somewhat more homogeneous than Democratic voters—a pattern that makes sense given that in 2000, many conservative southerners continued to identify with the Democratic party. The difference between the median Democratic voter and the median Republican voter is about half the difference between the median Democratic and Republican state legislative candidate. We also find that Libertarian candidates are far more conservative than Republican candidates. The general patterns reported here are largely consistent with other results of public and elite ideology in the literature (Bafumi and Herron, 2010; Stone and Simas, 2010).

The most liberal lower houses were found in Connecticut, New York, and Maryland. The most conservative lower houses were found in Ohio, South Carolina, and North Dakota. The most polarized lower houses were Arizona, Colorado, and Washington. The least polarized houses were Rhode Island, Kansas, and Hawaii. These results are largely consistent with existing estimates of the state legislatures (Shor and McCarty, 2011; Battista, Peress and Richman, 2013).

[9]The right-wing vote share was the sum of Bush and Buchannan's vote share.

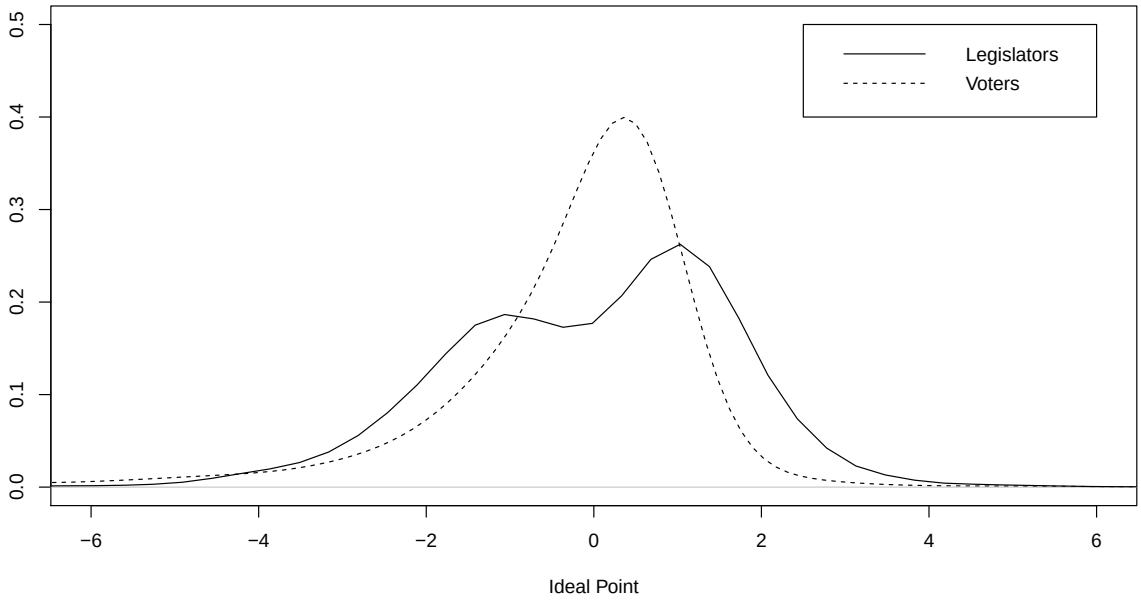

Figure 3: Density of Ideal Point Estimates for State Legislators and Voters

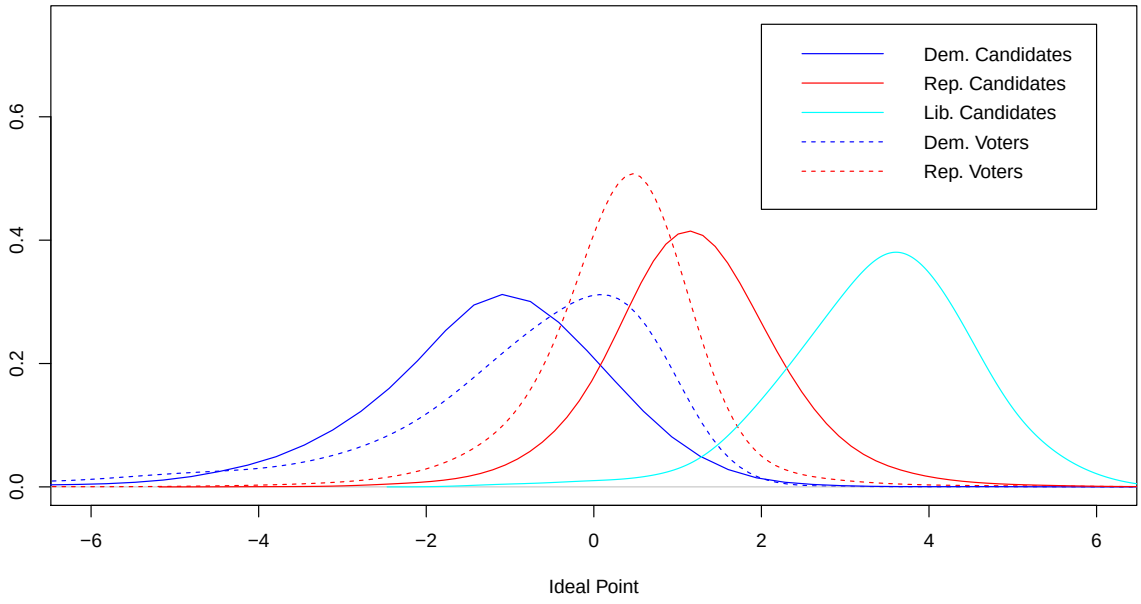

Figure 4: Density of Ideal Point Estimates for State Legislative Candidates and Voters by Party

4 Policy Representation

We begin by studying representation overall—how is public opinion translated into policy outcomes? In Figure 5, we present a scatter plot where average policy outcomes are plotted against the median voter in the state. The dashed line indicates average outcomes that lie on the median voter's position, or "perfect" representation of the median voter. The black regression line plots the overall relationship between policy outcomes and the median voter. The positive slope indicates that a more right-wing median voter is associated with more right-wing average policy outcomes. The slope of the regression line is greater than the dashed line, indicating that average policy is over-responsive to the median voter. The degree of variation around the regression line indicates imperfect "policy representation"—something we will decompose later in this paper.

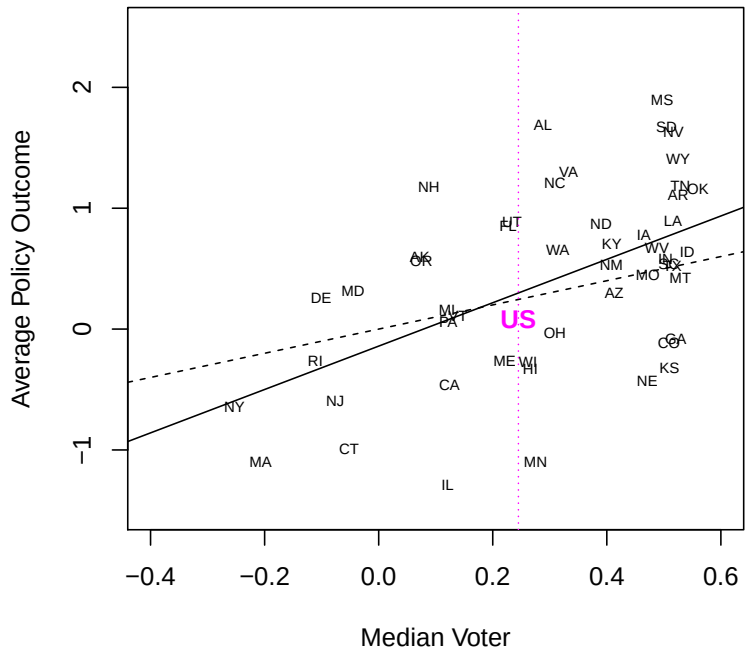

Figure 5: Policy Representation in the State Legislatures – Scatter plot of the average policy outcome vs. the median voter in the states. Each point represents an average policy outcome in the state indicated by its' abbreviation. The doted black line denotes the 45 degree line and the solid black line denotes the regression line. The dashed magenta line denotes the position of the U.S. median voter.

Note that the solid and dashed line intersect near the U.S. median voter, indicating that in a state where the median voter is close to the U.S. median, the expected average policy outcome is not biased in one direction or another. However, states that are to the right of the U.S. median

have policies that are on average too conservative for their median voter and states that are to the left of the U.S. median have policies that are on average too liberal for their median voter.

These results are further illustrated in Table 2. We can see that the effect of the median voter is statistically significant. The coefficient on median voter indicates that if the median voter moves one unit, the policy outcome is expected to move slightly less than two units. A correlation of 52.6% suggests a moderately strong correlation between average policy outcomes and the median voter. The results also suggest that the bias of policy at the U.S. median is not statistically significantly different from zero. The RMSE (Root Mean Squared Error) and the ADE (Average Deviation Error) are measures of the average distance between the average policy outcome and the median voter.[10] The estimates suggest that the average distance between the policy outcome and the median voter is slightly more than one quarter of the distance between the Republican and Democratic U.S. House medians in 1998. We take this as evidence of a moderately strong correspondence between average policy outcomes and the median voter in the states (though Figure 5 indicates that the average policy outcome in the U.S. is even closer to the U.S. median voter).

If policy outcomes are only moderately correlated with the median voter's ideal point, then why? Is it because elections select winning candidates that poorly represent the median voter or because the legislative process produces outcomes that are unrepresentative of the median legislator? And which specific electoral and legislative institutions harm representation in the states? We address these question in the next two sections.

	(1)
Constant	-0.141
	(0.140)
Median Voter	1.794***
	(0.355)
R^2	0.277
Correlation	0.526
N	50
Bias at U.S. Median	0.054
	(0.097)
RMSE	0.684
	(0.171)
ADE	0.554
	(0.057)

Table 2: Patterns of Policy Representation – The dependent variable is the average policy outcome and the independent variable is the state's median voter. Robust standard errors are in parentheses. One star indicates statistical significance at the 5% level. Two stars indicates statistical significance at the 1% level. Three stars indicates statistical significance at the 0.1% level. A plus sign indicates statistical significance at the 10% level.

[10] We compute the RMSE as $\sqrt{\frac{1}{I}\sum_i(\bar{x}_i - m_i)^2}$ where I is the number of states, $\bar{x}_i$ is the average policy in state i, and m_i is the median voter in state i. We compute the ADE as $\frac{1}{I}\sum_i |\bar{x}_i - m_i|$.

5 Representation in Elections

We first study representation in elections. Specifically, we regress the ideological location of the various pivotal actors on the ideal points of the median voter. We note here that previous work has regressed the ideal points of individual legislators on the ideal point of the median voter in the district. This approach goes back to the work of Miller and Stokes (1963). We instead regress the ideal points of the median House member, the Median Senate member, the Governor, etc., on the median voter in the state. We note that previous work could not take our approach—in previous work on the U.S. Congress, using the overall median as the independent variable would mean that there would be no variation in the independent variable. By investigating the state legislatures, we can use variation across the states.

Why then focus on the positions of pivotal actors rather than the positions of individual legislators? Our study of policy representation builds on the work of Erikson, Wright and McIver (1994) and Lax and Phillips (2011), but unpacks the policy-making process into electoral and legislative "phases". The relationships between the median voter and the positions of the pivotal actors are more directly relevant for understanding the causes of imperfect representation because the theories of lawmaking we study in the next section model policy outcomes as a function of the location of the status quo and the ideal points of these pivotal actors. A more detailed study could unpack the electoral phase even further and study legislator positioning and then study how geography (and the institution that determines geography—districting) aggregates individual legislators into the pivotal actors, but this is beyond the scope of our study.

	(1)	(2)	(3)	(4)	(5)
DV:	**House Median**	**Senate Median**	**Governor**	**House Maj. Median**	**Senate Maj. Median**
Constant	-0.355+	-0.285	-0.654*	-0.475	-0.595+
	(0.197)	(0.193)	(0.299)	(0.314)	(0.334)
Median Voter	1.879***	1.534**	2.380**	1.846*	2.111*
	(0.469)	(0.471)	(0.740)	(0.773)	(0.831)
N	49	50	50	48	50
R^2	0.264	0.089	0.246	0.103	0.075
Correlation	0.514	0.298	0.496	0.321	0.274
Bias at U.S. Median	-0.139	-0.155	-0.315*	-0.268	-0.323
	(0.112)	(0.156)	(0.153)	(0.192)	(0.241)

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. The sample size is 49 for the House median because Nebraska does not have a lower chamber and is 48 for the House majority median because the Washington House was tied in the time period of our study. One star indicates statistical significance at the 5% level. Two stars indicates statistical significance at the 1% level. Three stars indicates statistical significance at the 0.1% level. A plus sign indicates statistical significance at the 10% level.

We present the results in Table 3. The results indicate that all five pivotal actors are over-responsive to the median voter, but relatively unbiased. A one unit change in the ideology of the state median voter is associated with more than double that change in the location of some pivotal actors. The relationship is always statistically significant. Moreover, the regression line passes through the 45 degree line around the position of the overall median in all cases except for governors—governor ideal points were slightly biased to the left. The results indicate over-responsiveness but little bias, and a fairly high correlation between the position of the median voter and the positions of the median legislators and governor. The correlation is somewhat weaker for the majority party medians and somewhat weaker for the state Senates. Clearly a major source of policy over-representation in the states is this pattern of over-representation by pivotal actors.

5.1 Pivotal Actors and Electoral Institutions

Thus far, we have applied a single model of representation to the fifty states. The states, however, differ in many electoral and legislative institutions. In fact, these differences were one of our motivations for studying the state legislatures. The state legislatures differ in such institutions as whether elections are publicly financed, whether passing the budget requires a supermajority vote, the power committees have to schedule legislation, etc. One approach to studying the effect of such institutions is implemented in Lax and Phillips (2011). Lax and Phillips regress policy outcomes and policy congruence on various electoral and legislative institutions.

The direct analogy of applying Lax and Phillips's approach to our data would regress the policy outcome on the median voter, measures of institutions, and interaction terms, but this approach would not leverage the unique features of our measurement strategy. Because we have measures of pivotal actors in the state legislatures, we can break up the analysis into two parts. We first study the effects of electoral institutions on electoral representation. In the next section, we study the effects of legislative institutions on legislative outcomes.

We consider the following institutional variables—public funding of elections, whether the legislature is a career legislature, whether the legislature is a citizen legislature, whether term limits are in effect, and an index of primary system type.[11] Each of these variables is plausibly related to the positions that candidates for office take. Public funding may free candidates for office from pandering to potential donors, and may lead to more moderate candidates. Legislators may be more beholden to their party in career legislatures, and may be forced to take more extreme positions, with the opposite being true for citizen legislatures. Term limits may make legislators less beholden to the current electorate, which may lead them to take more extreme positions in order to raise money for election to higher office. More open primary elections may lead to greater responsiveness to the median voter because moderate voters can play a greater role in the primary election. Of

[11] 0 indicates a closed primary, 1 indicates a hybrid primary, 2 indicates an open primary, and 3 indicates a blanket or top-two primary.

course, for each of these institutional variables, one could make plausible alternative arguments, and the true direction of the effect can best be determined by looking at the data.

The approach we take is to include the institutional variables and to interact the institutional variables with the position of the median voter. The intercept terms for each of the institutional variables indicates whether the institution leads to left-wing or right-wing bias in the positions of the pivotal actors. The interactions of the institutional variables with the median voter's position indicates the effects of the intuitional variables on responsiveness. All institutional variables were centered at their means for ease of interpretation.

Results are given in Table 4. Few of the institutional variables are statistically significant at the 5% level. The exceptions to this are the index of primary-openness and the term limits variable. When term limits are in effect, we have a more right-wing Senate median and majority median. For the Senate median, the Senate majority median, and the governor, we find that more open-primaries are associated with a small left-wing bias and significantly more responsiveness.

The result that open primary systems are associated with more responsiveness corresponds closely with a finding reported, but not emphasized, in McGhee et al. (forthcoming)—candidates are more responsive to the median voter in their *district* in open primary states. We are able to add to their finding in four ways. First, because we measure voter and candidate positions on the same scale, we demonstrate that the increased responsiveness found in open primary states involves an increase in over-responsiveness. This suggests a different normative interpretation than what might be otherwise drawn from McGhee et al.'s results. Second, we find a lack of evidence that alternative electoral institutions affect responsiveness. Third, since our focus is on policy representation,[12] the positions of pivots in the legislative process is more directly relevant than the positions of individual legislators. Fourth, as we do in section 7, we can measure the effects of primary systems on policy outcomes by simulating the entire electoral and legislative process.

6 Theories of Lawmaking

We next move on to testing a number of competing theories of lawmaking in the state legislatures. We begin with a baseline majoritarian model—the chamber median makes a proposal which must receive a majority vote in both chambers to become law. We consider a mixture of models (as described in appendix A) where the House median and the Senate median each make a proposal with probability one half. The second model adds supermajority requirements into the mix. Specifically, the governor has a veto, subject to the prevailing veto-override requirements in the state, legislators may filibuster legislation in those chambers were a supermajority is necessary for ending debate, and supermajority requirements for passing a budget or increasing taxes may be present.[13] Again,

[12] McGhee et al.'s study was focused on explaining polarization in the state legislatures.

[13] We coded the tax and budget supermajority requirements and the cloture requirements directly from the state legislative rule books.

DV:	(1) House Median	(2) Senate Median	(3) Governor	(4) House Maj. Median	(5) Senate Maj. Median
Bias					
Constant	-0.390+	-0.612*	-0.774**	-0.515	-1.066**
	(0.233)	(0.238)	(0.238)	(0.442)	(0.345)
Public Funding	-0.469	-0.921+	-0.435	-0.184	-1.273
	(0.373)	(0.481)	(0.579)	(0.727)	(0.849)
Career Legislature	0.325	0.397		-0.269	0.575
	(0.417)	(0.364)		(0.650)	(0.614)
Citizen Legislature	0.507	-0.563		-0.083	-0.815
	(0.688)	(0.752)		(1.412)	(1.053)
Term Limits in Effect	0.197	0.650		-0.032	1.289+
	(0.471)	(0.478)		(0.993)	(0.763)
Primary Type	-0.217	-0.639**	-0.559*	-0.276	-0.996**
	(0.256)	(0.209)	(0.217)	(0.522)	(0.337)
Responsiveness					
Median Voter	2.110***	2.399***	2.964***	2.103*	3.207***
	(0.555)	(0.603)	(0.690)	(1.034)	(0.916)
Public Funding * MV	0.996	0.388	2.323	0.743	0.810
	(1.454)	(2.085)	(2.109)	(2.268)	(3.483)
Career Legislature * MV	0.612	-0.173		2.047	-2.047
	(1.353)	(1.177)		(2.004)	(1.912)
Citizen Legislature * MV	-0.785	0.718		0.378	0.945
	((1.465)	(1.858)		(3.004)	(2.514)
Term Limits in Effect * MV	0.540	0.078		2.410	-0.667
	(1.142)	(1.194)		(2.309)	(1.828)
Primary Type * MV	0.337	1.394*	1.153*	0.124	1.553+
	(0.663)	(0.602)	(0.586)	(1.177)	(0.943)
N	49	50	50	48	50
R^2	0.374	0.311	0.335	0.204	0.319

Table 4: Pivotal Actors and Electoral Institutions – The dependent variables are the ideal points of pivotal actors and the independent variables include the state's median voter, measures of electoral institutions, and interactions between the median voter and electoral institutions. Robust standard errors are in parenthesis. One star indicates statistical significance at the 5% level. Two stars indicates statistical significance at the 1% level. Three stars indicates statistical significance at the 0.1% level. A plus sign indicates statistical significance at the 10% level.

we consider a mixture there the House and Senate medians each propose with one half probability. In the third model, we assume that the chamber median is the proposer and that the majority party can prevent legislation from being considered on the floor. The fourth model mixes aspects of the Pivotal Politics and Party Cartel models. The final model gives the majority party even more control over the agenda—the median member of the majority party gets to make a proposal, that is subject to the various supermajority requirements of the pivot model. As with the other models, we consider a mixture here—we assume that the House majority median and Senate majority median each propose with equal probability. Following Richman (2011), we allowed for inflation drift for tax issues and spending issues.[14]

	(1)	(2)	(3)	(4)	(5)
Model:	**Median Legislator**	**Pivotal Politics**	**Party Cartel**	**Cartel and Pivots**	**Setter and Pivots**
Constant (drift)	1.129***	0.778***	0.894***	0.748***	0.796***
	(0.126)	(0.134)	(0.132)	(0.141)	(0.137)
Tax (drift)	-1.493***	-1.186***	-1.264***	-1.112***	-1.180***
	(0.146)	(0.116)	(0.144)	(0.112)	(0.114)
Prediction	0.211	0.621***	0.485***	0.597***	0.553***
	(0.145)	(0.099)	(0.073)	(0.079)	(0.078)
N	432	432	432	432	432
Clusters	49	49	49	49	49
R^2	0.250	0.417	0.374	0.443	0.429

Table 5: Testing Theories of Lawmaking – The dependent variable is the policy outcome. The independent variables include a constant term and a dummy for tax issues (which together model drift due to inflation) and the prediction of each of the five theories of lawmaking. Results are estimated using Weighted Least Squares and restricted to status quo estimates with sufficiently small standard errors. Standard errors clustered by state are in parenthesis. One star indicates statistical significance at the 5% level. Two stars indicates statistical significance at the 1% level. Three stars indicates statistical significance at the 0.1% level. A plus sign indicates statistical significance at the 10% level.

The results of our test can be seen in Table 5. We can compare the fit of the model based on the size of the R-squared. To facilitate this comparison, the five models have the same dependent variable and are estimated on a common sample. Furthermore, the number of parameters is equal across the models, so alternative measures of model fit, such as the AIC and the BIC, would yield the same ranking of models as the R-squared. The results indicate the the Cartel and Pivots model is the single best fitting model. The R-squared of 44.3% provides evidence of a strong correlation between the prediction of the Cartel and Pivots model and the policy outcome. The fit of the Setter and Pivots model is very similar to the fit of the Cartel and Pivots model.[15]

[14]Specifically, we measure the policy outcome using the status quo in the next legislative session, so it is likely that the policy outcome has drifted due to inflation in the intervening period, if tax and spending policies are denominated in nominal dollar amounts.

[15]An important pattern is that the fit of these models are still somewhat inferior to the fit of similar models for the U.S. Congress—Richman (2011) reports an R-squared of 56% for the best fitting model. Some care must be taken

Nearly all of the models tested in Table 5 incorporate substantial cross-state institutional variation. The effects of party blocking vary substantially across states with unified and divided legislatures. Some states have gubernatorial vetoes (and consequent veto pivots) which require a mere majority for override while other states have much higher override margins. Some states require supermajorities to enact budgetary and/or tax policy changes. Other states do not. Some states have filibuster-type institutions, while many others lack such institutions. All of this institutional and representational variation forms the basis for the nuanced predictions of the models, including (and especially) the hybrid models. In sum the results suggest this cross-state variability in the effects of pivotal politics and the party cartel is an important factor if we would understand state policy outcomes.

We next pause to consider some of the choices we made in testing the competing models of lawmaking. First, we assigned an equal probability of proposing for the House and Senate medians for four of the models and an equal probability of proposing for the House and Senate majority medians for the Setter and Pivots model. A case could be made for modeling the House median or House majority median as the proposer with probability one as many state lower houses require spending and revenue bills to originate in the lower house. Our interpretation here of the probability of proposing is that it reflects bargaining power and the requirement that bills originate in the lower house may increase the lower house's bargaining power. When we compared models where the House had exclusive proposal power, we found that the Cartel and Pivots model was still the best fitting and we found that the mixture models were superior to the model where the House proposes. For completeness, we performed the same check for the case where the Senate has exclusive proposal power and found that the Cartel and Pivots model was still the best fitting model and that the mixture models out-performed the models where the Senate proposes. Finally, we tested models where the probability of each chamber proposing was a freely estimated parameter. Again, we found that the Cartel and Pivots model was the best fitting model. For this model, we found that the estimated proposal probabilities were nearly equal and not statistically significantly different, validating the modeling choice we made earlier.

A second choice that we made was to simultaneously consider all three types of supermajority requirements—the gubernatorial veto, the filibuster, and the tax and budget supermajority requirements. While it would be very surprising if models neglecting a gubernatorial veto or the supermajority requirements for tax and spending bills were not better fitting, the filibuster is a more interesting case. State legislatures might not make use of supermajority requirements for cloture, much as the US Senate did not do so until the late 19^{th} century (Binder and Smith, 1997; Koger, 2010). We tested all 8 combinations of models and found that the model with all three types of supermajority requirements was the best fitting, consistently across the different models.

The tests we have provided so far have been comparative in nature. We can also provide an

however because there is likely to be more measurement error in the state legislative data due to the smaller sample sizes available for estimating the proposal and status quo locations, reducing the R-squared.

absolute test of the Cartel and Pivots model (the best fitting model). According to the theory, status quos located in the blockout zone should lead to gridlock, hence we should observe no policy change for such status quos. In practice, we observe policy outcomes measured in the next legislative session, when the policy outcomes may have drifted somewhat due to inflation. Furthermore, there is measurement error in the policy outcomes, that will lead us to measure some change even when there is no change at all. We therefore predict that there should be less policy change for status quos in the blockout zone. We measure policy change by the average squared deviation between the status quo and the policy outcome. For status quos in the blockout zone, the average policy change was 0.692. For status quos outside the blockout zone, the average policy change change was 1.313. There is substantially more policy change exactly where the Cartel and Pivots theory would predict policy change and this difference is statistically significant at the 1% level.

6.1 Mixture Models

We previously found that the Cartel and Pivots model fits better than the Pivotal Politics model and the Setter and Pivots model. These differences in model fit, however, could be argued to be small. To further distinguish between the theories, we estimated mixture models. We previously estimated models of the form,

$$x_{ij} = \alpha + \beta tax_j + \gamma \hat{x}_{ij}^{pred} + \epsilon_{ij} \tag{4}$$

where x_{ij} denotes the policy outcome in state i on issue j and $\hat{x}_{ij}^{pred}$ denotes a predicted policy outcome. It may be the case that different states have different lawmaking institutions, and it may be that for a given issue, different lawmaking institutions are chosen with some probability. We allow for this by employing mixture models. Specifically, we consider mixtures of three theories—the pivotal politics theory (whose prediction we denote by $\hat{x}_{ij}^{piv}$), the Cartel and Pivots theory (whose prediction we denote by $\hat{x}_{ij}^{cp}$), and the Setter and Pivots theory (whose prediction we denote by $\hat{x}_{ij}^{sp}$).

Consider first a mixture of the Pivotal Politics and the Cartel and Pivots theories. We have,

$$x_{ij} = \alpha + \beta tax_j + \gamma(w^{piv}\hat{x}_{ij}^{piv} + (1 - w^{piv})\hat{x}_{ij}^{cp}) + \epsilon_{ij} \tag{5}$$

Here, $w^{piv} \in [0, 1]$ is a weight placed on the Pivotal Politics theory relative to the Cartel and Pivots theory. This model can be estimated using constrained least squares, i.e.,

$$(\hat{\alpha}, \hat{\beta}, \hat{\gamma}, \hat{w}) = \underset{(\alpha,\beta,\gamma,w^{piv}):0\leq w^{piv}\leq 1}{\arg\min} \sum_{i,j} \left(x_{ij} - \alpha - \beta tax_j - \gamma(w^{piv}\hat{x}_{ij}^{piv} + (1 - w^{piv})\hat{x}_{ij}^{cp}) \right)^2 \tag{6}$$

Going one step further, we can consider three competing theories of lawmaking,

$$x_{ij} = \alpha + \beta tax_j + \gamma(w^{piv}\hat{x}_{ij}^{piv} + w^{cp}\hat{x}_{ij}^{cp} + (1 - w^{piv} - w^{cp})\hat{x}_{ij}^{sp}) + \epsilon_{ij} \quad (7)$$

where $w^{piv} \geq 0$, $w^{cp} \geq 0$, and $w^{piv} + w^{cp} \leq 1$, and where the model can again be estimated by constrained least squares.

These various estimation problems can be characterized as quadratic programs (i.e. minimizing a quadratic objective function subject to linear inequality constraints), so we use quadratic programming software to estimate the model parameters. Computing standard errors for the parameters is more tricky because the constrained parameters will not have asymptotically normal distributions. Instead, we rely on the bootstrap to compute confidence intervals for the model parameters.

The results are given in Table 6. In column (1), we consider a mixture between the Pivotal Politics and Cartel and Pivots models. We see that our estimate of γ is statistically significant, indicating that the models have explanatory power. We also see similar patterns in inflation to the ones we observed in Section 6. Our point estimate of w^{piv} suggests that 0% of observations are explained by the Pivotal Politics model and 100% of observations are explained by the Cartel and Pivots model. This is supportive of our earlier conclusion that the Cartel and Pivots model provides a better fit. The confidence interval on w^{piv} suggests that at the 95% significance level, we can reject that the weight placed on the Pivotal Politics model is greater than 16%. We cannot reject that the weight placed on the Pivotal Politics model is zero.

Turning to column (2), we incorporate the Setter and Pivots model as well. We again find little support for the Pivotal Politics model—the confidence interval for the weight on the Pivotal Politics model ranges from 0 to 10%. The point estimate suggests a 0% weight on the Pivotal Politics model, a 77% weight on the Cartel and Pivots model, and a 23% weight on the Setter and Pivots model. We can reject that the weight on the Cartel and Pivots model is 0 and we cannot reject that the weight on the Cartel and Pivots model is 1. The confidence interval for the weight on the Setter and Pivots model ranges from 0% to 80%. Earlier, we noted that the Cartel and Pivots and Setter and Pivots models seemed to fit equally well, but we could not determine whether this was the case because we did not have power to distinguish between the theories or because the true model was somewhere in between these two theories. Here, we have evidence that the former is the case—although we can say confidently that the majority party median has some role in determining state legislative outcomes, we cannot confidently say whether this role takes the form of negative or positive agenda control.

6.2 Legislative Institutions

We next investigate variables that moderate lawmaking in the state legislatures. If there is heterogeneity in which theory applies in which situation, it may also be the case that the weights of the different theories of lawmaking depend on some state-specific institutions. For instance, we could

specify,

$$x_{ij} = \alpha + \beta tax_j + \gamma(w_i^{piv}\hat{x}_{ij}^{piv} + (1 - w_i^{piv})\hat{x}_{ij}^{cp}) + \epsilon_{ij} \tag{8}$$

where $w_i^{piv} = \lambda' z_i$. We want to ensure that the weights are strictly between 0 and 1 for all values of z_i, so we specify that $0 \leq \lambda' z_i \leq 1$, which leads to the following constrained least squares estimator,

$$(\hat{\alpha}, \hat{\beta}, \hat{\gamma}, \hat{\lambda}) = \underset{(\alpha,\beta,\gamma,\lambda):0\leq\lambda' z_1\leq 1,\ldots,0\leq\lambda' z_{50}\leq 1}{\arg\min} \sum_{i,j} \Big(x_{ij} - \alpha - \beta tax_j - \gamma((\lambda' z_i)\hat{x}_{ij}^{piv} + (1 - \lambda' z_i)\hat{x}_{ij}^{cp})\Big)^2 \tag{9}$$

We can similarly consider a mixture between the three theories, with,

$$x_{ij} = \alpha + \beta tax_j + \gamma(w_i^{piv}\hat{x}_{ij}^{piv} + w_i^{cp}\hat{x}_{ij}^{cp} + (1 - w_i^{piv} - w_i^{cp})\hat{x}_{ij}^{sp}) + \epsilon_{ij} \tag{10}$$

where $w_i^{piv} = \lambda'_{piv} z_i$, $w_i^{cp} = \lambda'_{cp} z_i$, $\lambda'_{piv} z_i \geq 0$, $\lambda'_{cp} z_i \geq 0$, and $\lambda'_{piv} z_i + \lambda'_{cp} z_i \leq 1$.

We include four institutional variables in the models. We include measures of the power of chamber leaders and the power of committees in the legislature.[16] We also include two measures of professionalisation—whether the chamber is a career legislature and whether the chamber is a citizen legislature. The first two variables capture variation in the formal rules of the chamber that may be related to the agenda setting power of the majority party. The latter two variables capture the legislative environment which may make majority party legislators more or less beholden to their leadership, and may thus affect the ability of the majority party to control the agenda, perhaps through enforcing greater unity on procedural votes.

Returning to Table 6, we consider columns (3) and (4). Here, we find that (perhaps surprisingly) none of the interactions terms are statistically significant at conventional levels. From column (3), it appears that the Cartel and Pivots model is more appropriate than the Pivotal Politics model, for all states, regardless of the particular powers of chamber leaders and committees and regardless of the level of professionalism of the legislature. Similar results are found in column (4), although we again have difficulty distinguishing the Cartel and Pivots model from the Setter and Pivots model.

[16] Leader Tools is the average value of the following leader power indices: leader appointment powers index, leader committee powers, leader bill referral powers, leader procedural and scheduling powers, and leader tenure power. Committee Tools is the average value of the following committee power indices: committee powers to receive legislation, committee powers to screen legislation, committee powers to shape legislation, committee powers to help bill passage, and committee information-gathering powers. The components that make up the Leader Tools and Committee Tools variables were collected by Martorano (2004).

	(1) **Pivots vs. Cartel**	(2) **Pivots vs. Cartel vs. Setter**		(3) **Pivots vs. Cartel**	(4) **Pivots vs. Cartel vs. Setter**	
Constant	0.748*	0.750*		0.748*	0.743*	
	(0.530,0.966)	(0.534,0.965)		(0.522,0.949)	(0.516,0.935)	
Tax Issue	-1.112*	-1.119*		-1.112*	-1.124*	
	(-1.433,-0.796)	(-1.454,-0.816)		(-1.437,-0.810)	(-1.426,-0.836)	
Gamma	0.597*	0.601*		0.603*	0.605*	
	(0.492,0.711)	(0.497,0.725)		(0.494,0.719)	(0.515,0.735)	
	$\boldsymbol{w}^{piv}$	$\boldsymbol{w}^{piv}$	$\boldsymbol{w}^{cp}$	$\boldsymbol{w}_i^{piv}$	$\boldsymbol{w}_i^{piv}$	$\boldsymbol{w}_i^{cp}$
Constant	0.000 †	0.000†	0.767*	0.000	0.000	0.154
	(0.000,0.156)	(0.000,0.102)	(0.195,1.000)	(-0.376,0.501)	(-0.380,0.241)	(-0.809,1.128)
Leader Tools				0.000	0.000	0.021
				(-0.063,0.052)	(-0.026,0.037)	(-0.027,0.143)
Committee Tools				0.000	0.000	0.050
				(-0.038,0.208)	(-0.008,0.168)	(-0.204,0.212)
Citizen Legislature				0.000	0.000	0.473
				(-0.201,0.561)	(-0.153,0.476)	(-0.895,1.000)
Career Legislature				0.000	0.000	0.540
				(-0.230,0.324)	(-0.171,0.406)	(-0.337,1.000)
Minimum Weight				0.000†	0.000†	0.359
				(0.000,0.000)	(0.000,0.000)	(0.000,1.000)
Maximum Weight				0.000†	0.000†	1.000*
				(0.000,0.871)	(0.000,0.718)	(0.727,1.000)
N	432	432		432	432	
R^2	0.443	0.445		0.443	0.450	

Table 6: Theories of Lawmaking and Legislative Institutions – The dependent variables is the policy outcome. The models are estimated using constrained Weight Least Squares. Confidence intervals are computed using the bootstrap. One star indicates that a coefficient is statistically significantly different from 0 at the 5% level. For the estimated weights, one dagger indicates that the weight is statistically significantly different from 1 at the 5% level.

It may appear that the types of legislative institutions we consider do not have any effect on legislative outcomes. This is not the case for two reasons. A number of legislative institutions—the gubernatorial veto, bicameralism, etc.—were incorporated into the competing theories of lawmaking we considered and were thus necessary in explaining the variation across states. Beyond this, as we show below, while the formal power of leaders and committees does not seem to moderate the relative fit of the competing models, the power of committees does moderate the fit of the best fitting model.

Our estimates indicate that (not surprisingly) the Cartel and Pivots model does not perfectly predict legislative outcomes. Some of this lack of fit comes from the fact that the policy outcome is measured with error, but we can show that the differences are also caused simply by the fact that actual outcomes depart from the predictions of the theory. These departures from the theories—or "noise" in the legislative process—are partially explained by institutional variables. Specifically, we consider the residuals from the best fitting model, $\hat{\varepsilon}_{ij}$. There are two components to these residuals—one part coming from measurement error in the dependent variable and another part coming from the fit of the Cartel and Pivots model. To measure the effect of legislative institutions on departures from the Cartel and Pivots model (correcting for measurement error) we employ the following Nonlinear Least Squares estimator,

$$\hat{\kappa} = \arg\min_{\kappa} \sum_{i,j} \left(\hat{\varepsilon}_{ij}^2 - (\sigma_{ij}^x)^2 - e^{\kappa' z_n} \right)^2 \tag{11}$$

where σ_{ij}^x is the standard error of x_{ij}.

We consider three specifications for z_n. In the first case, we consider variables that are related to the legislative process. As before we include Leader Tools, Committee Tools, Citizen Legislature, and Career Legislature. In addition, we include total legislature size, public funding of state legislative campaigns, and term limits in effect for the state legislature, which may all affect the incentives for state legislators to vote a certain way. In the second specification, we include variables that may affect the outcome after the legislative process has ended. Judges may invalidate legislation and the incentives of judges to do so may depend on whether they must compete in elections. The initiative process may also change policy outcomes outside of the legislative process. The third specification includes both sets of variables.

Our results are given in Table 7. We find that only one variable—Committee Tools—is statistically significant. The results suggest that if the committee has more power to screen, shape, and promote legislation, the legislative outcomes will be less noisy. Interestingly, this comports with findings presented in Anzia and Jackman (2013), who find that powers of legislative committees to block legislation and to schedule legislation are related to the roll rate of the majority party. They interpret this result as suggesting that the majority party is more powerful in legislatures with strong committee systems. Our results suggest a somewhat different interpretation—Committee

Tools do not affect the relative fit of the Pivotal Politics and Cartel and Pivots models, but instead affect the overall fit of the Cartel and Pivots model. Chambers with weak committees are not less partisan—they are instead less predictable. Interestingly, this finding comports with the results of many studies of state legislative committees which almost universally find that the committee system appears to be organized to provide information (Richman, 2008; Battista, 2009). More powerful and better equipped committees appear to be able to reduce errors in policy outcomes much as informational theory suggests. Weaker committees are less able to guide the legislative process toward the outcomes that legislators prefer.[17]

	(1)	(2)	(3)
Constant	0.861	0.116	0.704
	(0.701)	(0.170)	(0.805)
Leader Tools	0.041		0.059
	(0.095)		(0.105)
Committee Tools	-0.323*		-0.389*
	(0.163)		(0.176)
Legislature Size	-0.001		-0.001
	(0.002)		(0.002)
Public Funding of State Legislative Campaigns	0.105		0.100
	(0.267)		(0.284)
Career Legislature	0.226		0.123
	(0.210)		(0.250)
Citizen Legislature	-0.051		-0.095
	(0.253)		(0.277)
Term Limits in Effect	0.110		0.189
	(0.209)		(0.291)
Elected Judges		0.206	0.298
		(0.178)	(0.215)
Initiative		0.037	-0.005
		(0.176)	(0.328)
N	392	392	392

Table 7: Noise and Legislative Institutions – The dependent variables is the squared residual from the Cartel and Pivots model, adjusted to eliminate the component of the residual that is due to measurement error in the policy outcome. The models are estimated using Nonlinear Least Squares. One star indicates statistical significance at the 5% level. Two stars indicates statistical significance at the 1% level. Three stars indicates statistical significance at the 0.1% level. A plus sign indicates statistical significance at the 10% level.

[17] We note that the variables we used to measure the power of committees are different than those employed by Anzia and Jackman (2013). Anzia and Jackman generously provided their variables and we replicated our results with their variables. We found that the weights on the theories of lawmaking were unrelated to Anzia and Jackman's institutional variables and that the noisiness of the outcomes was related to the various measures of committee power employed in Anzia and Jackman's study.

7 Moderators of Representation and Counterfactuals

Our final result in the previous section—that chambers with powerful committees have less noisy outcomes—generates an interesting question. Do powerful committees improve policy representation? We found that more open primary systems lead to more over-responsiveness in elections, but how do primary systems affect policy-representation? Finally, a number of legislative institutions were implicitly incorporated in the analysis, including supermajority requirements, the gubernatorial veto, etc. How do these legislative institutions affect policy representation? Having broken up the policy-making process into electoral and legislative phases, it is now time to put these two phases back together again. Specifically, we will use the models estimated in the previous two sections to simulate policy outcomes as a function of the median voter's position and various electoral and legislative institutions.

Our approach works as follows. First, we regress the positions of pivotal actors on the position of the median voter, some institutional variables, and interactions of institutional variables and the position of the median voter. These are the same regressions we reported in Table 4, except that we also ran such regressions for the other pivotal actors (the filibuster pivots, etc.).[18] We then use the positions of the pivotal actors to generate the predictions from one of the five theories of lawmaking. We add noise to this prediction based on the model reported in column (3) of Table 7. This generates a simulated value of x_{ij}, i.e. the policy outcome for state i on issue j.

When we use the estimated parameters from tables 4 and 7 along with the Cartel and Pivots model, we have our *baseline* result, or the result we expect under existing institutions. We characterize x_{ij} in a number of ways. We regress x_{ij} on the median voter's position. When we use this regression to predict x_{ij} when the median voter is set equal to the U.S. median, we have a measure of the bias at the U.S. median's position. The slope from this regression is a measure of responsiveness of policy-outcomes to the median voter's position, with coefficients of greater than one indicating over-responsiveness. The residual standard error is a measure of the "noise" in the system. We also report the root mean-squared error and the average deviation error, which are both measures of overall representation—how close the average policy outcome is to the position of the median voter in the state. The results for the baseline scenario, reported in Table 8, very closely resemble the results reported in Table 2.

We consider a number of alternative scenarios which will lead to differences in policy representation. First, we consider a "perfect" election—were every pivotal actor has an ideal point equal to the state median voter. This is obviously an unrealistic scenario, but serves as a best case. Here, we find no bias, perfect responsiveness, and less noise than any other scenario we consider. Relative to the baseline outcome, the RMSE decreases by 0.35 and the ADE decreases by 0.28, which both represent substantial improvement.

We next consider a legislature that resembles the electorate—we set both chamber medians equal

[18] See Table 9 in Appendix A for the full list of pivotal actors.

to the state median voter, we select the filibuster pivots to equal the relevant quantiles of the voter ideology distribution, we set the majority party medians to be equal to the median party identifier among the larger party in the state, etc. Our results indicate a substantial bias towards the left. This occurs because the Democratic party holds a majority of identifiers in most states in 2000.[19] We see evidence of over-responsiveness, but substantially less than in the baseline scenario. This result indicates that some of the over-responsiveness we observe is due to elections selecting extreme candidates while some over-responsiveness is due to supermajoritarian and partisan institutions in the state legislatures. The RMSE and ADE improve somewhat relative to the baseline.

We next consider altering the models of lawmaking. When we consider the median legislator model (an unrealistic benchmark), we find a small reduction in over-responsiveness and a significant improvement in the RMSE and ADE. If we could eliminate all supermajoritarian institutions and explicit and implicit veto rights, we could obtain substantially better outcomes. Considering the Pivotal Politics model next, the outcomes are very similar to the Pivots and Cartel model. Allowing the majority party to have agenda setting power does not lead to substantially worse outcomes when all the other forms of supermajority requirements are already present.

When we consider the Cartel model, we consider the impact of removing all supermajoritarian institutions. We find a small improvement in the RMSE and ADE over the baseline—if we could eliminate the gubernatorial veto, the budget and tax supermajority requirements, and the filibuster, we would achieve somewhat better outcomes. The Setter and Pivots model leads to very similar outcomes to the Cartel and Pivots model, so there is little to loose by giving the majority party positive agenda setting power vs. negative agenda setting power. We can consider eliminating the supermajoritarian institutions one at a time. Eliminating the tax and budget supermajority requirements leads to a very small improvement, but eliminating either the state House or the state Senate leads to a more substantial improvement.

Overall, the results suggest that partisan institutions lead to worse representation—the Pivotal politics model performs better than either the Cartel and Pivots and the Setter and Pivots models. Moreover, the results suggest that supermajoritarian institutions also lead to worse representation, presumably because they lead to increased gridlock—the Majoritarian and Cartel models outperform the Pivotal Politics and Cartel and Pivots models, respectively. Of the various supermajoritarian institutions, eliminating Bicameralism would seem to lead to the largest improvement in representation, possibly because it is an institution that exists in almost every state.

[19] Democratic identifiers outnumbered Republican identifiers in 30 states.

	Bias at U.S. Median	Responsiveness	Noise	RMSE (imp. over base.)	ADE (imp. over base.)
Baseline	-0.30	2.14	1.45		
Manipulate Election Results					
All pivots are state median voter	0.01	0.98	1.12	0.35	0.28
Chambers perfectly represent voters	-0.49	1.42	1.32	0.10	0.09
Manipulate Agenda Setting Models					
Median legislator model	-0.34	1.73	1.24	0.22	0.17
Pivotal politics model	-0.28	2.09	1.43	0.02	0.02
Cartel Model	-0.30	1.98	1.37	0.08	0.06
Setter and Pivots model	-0.31	2.20	1.47	-0.02	-0.01
No filibuster	-0.30	2.14	1.45	0.00	0.00
No tax/budget supermajority requirements	-0.37	2.16	1.42	0.03	0.02
No gubernatorial veto	-0.26	2.10	1.45	0.01	0.01
No state house	-0.34	2.00	1.38	0.07	0.06
No state senate	-0.28	2.06	1.37	0.09	0.07
Manipulate Electoral Rules					
Closed primaries in every state	0.04	1.82	1.45	-0.01	-0.01
Open primaries in every state	-0.70	2.79	1.46	-0.05	-0.04
Manipulate Legislative Rules					
Increase Committee Tools by 1 s.d.	-0.31	2.15	1.34	0.11	0.09
Decrease Committee Tools by 1 s.d.	-0.30	2.14	1.58	-0.13	-0.10

Table 8: Simulated Policy Outcomes – Bias, Responsiveness, Noise, RMSE, and ADE are simulated according to a baseline scenario and a number of alternative scenarios.

If we altered the primary election system to institute closed primaries in all states, we would have more right-wing outcomes and little change in the RMSE and ADE. If instead we instituted open primaries in all states, we would have more left-wing outcomes, more over-responsiveness, and a small increase in RMSE and ADE. Evidentally, instituting open primaries would not improve representation since the current set of institutions are already too responsive to the median voter. We also considered increasing and decreasing the Committee Tools index by one standard deviation. There is a direct relationship between Committee Tools and the level of noise—increasing Committee Tools leads to lower noise as well as improved representation, as measured by the RMSE and the ADE.

8 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. Our results allowed us to study policy representation, decompose policy representation into electoral and legislative components, and attribute imperfect representation to particular electoral and legislative institutions. Common-space measures of the preferences of voters, elite political actors, and policy outcomes make possible a study of elections and legislating in a unified framework. Measuring voters, legislators, and outcomes on a common scale, addresses Achens (1978) critique of Miller and Stokes (1963). The results provide clear evidence that the responsiveness of policy outcomes to state ideology found in Erikson, Wright and McIver (1994) takes the form of over-responsiveness.

This is the first analysis able to decompose policy representation into electoral and legislative components, and hence to attribute imperfect representation to particular electoral and legislative institutions. It contributes to our understanding of lawmaking institutions across state legislatures, demonstrating that the predominant model is a hybrid of the party cartel and pivotal politics models. Common space measurement of legislators and outcomes makes it possible to distinguish the relative fit of competing theories of lawmaking from the absolute fit (something that is not possible if one relies on the majority party roll rate as a measure of the fit of the Party Cartel model). Furthermore, our analysis provides evidence concerning the ways in which electoral outcomes interact with legislative institutions to shape policy outcomes across the states. Elections produce over-responsiveness in which elite political actors are extreme relative to the median voter. This over-responsiveness is in turn exacerbated rather than ameliorated by legislative institutions such as the majority party cartel. Elections select extremists and existing legislative institutions exacerbate this problem.

Beyond key roles played by polarized electoral outcomes, pivotal politics and political parties, our models are striking in the degree to which variation in other plausible cross-state institutional factors has modest or no effect. On the legislative side, the policy effects of partisan agenda control do not appear to be strongly moderated by extant variation in leader tools or legislative

professionalization. However, we do find that committee tools reduce uncertainty and increase the predictably of outcomes. In the electoral arena this study adds to the results of other recent work suggesting public finance has little consequence for polarization, but we do find that open primaries increase (over) responsiveness.

In both instances, the common space framework provides a context that shapes novel normative conclusions. Previous work suggested that more open primaries would lead election outcomes to be more responsive to the median voter (something we would tend to normatively prefer). While this appears to be true, our results imply that election outcomes are over-responsive (which is perhaps less normatively appealing) and that this over-responsiveness in election outcomes translates into policy outcomes less congruent with the median voters preferences. On the legislative side, we found that chambers with powerful committees had more predictable legislative outcomes. Our normative conclusions again differed from previous work. Previous work suggested that increasing committee power would lead to more partisan outcomes (which may be normatively unappealing). In fact, we found that increasing committee power led to better representation by leading to less noisy outcomes as the informational model of committees implies.

Overall, the analysis implies that key institutions (pivotal politics and party cartels) shape outcomes across states, and that a common space model of electoral and legislative processes is necessary for assessing both the quality of representation and how institutions moderate the quality of representation.

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A Online Appendix – Theories of Lawmaking

In this appendix, we develop a framework that incorporates the existing theories of lawmaking. We develop our framework to handle mixtures of theories of lawmaking—in particular, rather than assume a single proposer, we assume that different individuals are selected to be the proposer with a certain probability. We do this for two reasons—first, it provides a natural approach for incorporating bicameralism, by allowing for example each chamber median to be the proposer with some probability. Second, because we are considering multiple state legislatures, we allow for the possibility that state legislatures differ in who the proposer is likely to be. In addition, whether any one of the above models applies to all of the states is in some doubt. Spiegelman (2010) and Anzia and Jackman (2013) argue that the party cartel model does not apply equally well to all states. Our framework allows for mixtures of models to allow for the possibility that, for example, the Party Cartel model applies to some states, while the Pivotal Politics model applies to other states.

Our framework can be described as follows. In period 1, a random proposer is selected from the set of possible proposers and the identify of the proposer becomes known to the other players in the game. This set of proposers may include the medians of each chamber, or as in the Setter and Pivots model, the majority party medians.

In period 2, a set of a-prior veto players have the ability to block legislation. If the a-priori veto players choose to block legislation (anticipating that they prefer the status quo to the ultimate outcome of the legislative process), then the status quo becomes the policy outcome. This set of a priori veto players would typically include no one, or the majority party medians in each chamber in the case of the Party Cartel and Cartels and Pivots models. This stage of the game exists to model the fact that the majority party may be able to kill legislation in the committee stage, but may not be able to kill legislation once floor action is already underway.

In period 3, the proposer makes a proposal. In the game, the proposal is not amended. This is not meant to suggest that proposals cannot be amended—instead, the proposer is simply interpreted as representing the eventual outcome of the amending process. If the state legislatures are majoritarian in nature, the median legislator's preferred proposal should eventually prevail, in which case the proposer would be modeled to be the median legislator. The case where each chamber median is selected as the proposal with some probability is meant to model a bicameral legislature where each chamber is majoritarian in nature and conflict between the chambers is resolved in such a way that neither chamber wins with probability one.

In period 4, the legislature and the governor decide on whether to allow the proposal to pass, according to the prevailing supermajority requirements. These would typically require that in order to become law, the proposal must receive a majority in each chamber, be approved by the governor or have sufficient support for a veto override, meet the relevant requirement to end debate in those chambers were a filibuster is possible, and meet the prevailing supermajority requirements for raising taxes and passing a budget in states where such supermajority requirements exist.

The outcome of this game can be summarized as follows. In period 4, we can characterize the set of proposals that will win against the status quo as the Winset, $W(s) = [l, u]$. In period 3, a proposer with ideal point α will make the proposal,

h_m	House Median
s_m	Senate Median
h_{maj}	House Majority Median
s_{maj}	Senate Majority Median
h_{fl}	House Lower Filibuster Pivot
h_{fu}	House Upper filibuster Pivot
s_{fl}	Senate Lower Filibuster Pivot
s_{fu}	Senate Upper Filibuster Pivot
g	Governor
h_{ol}	House Lower Override Pivot
h_{ou}	House Upper Override Pivot
s_{ol}	Senate Lower Override Pivot
s_{ou}	Senate Upper Override Pivot
h_t	House Tax Supermajority Pivot
h_b	House Budget Supermajority Pivot
s_t	Senate Tax Supermajority Pivot
s_b	Senate Budget Supermajority Pivot

Table 9: Notation for Theories of Lawmaking.

$$p^*(s,\alpha) = \begin{cases} \alpha, & s \leq 2l - \alpha \\ 2l - s, & 2l - \alpha \leq s \leq l \\ s, & l \leq s \leq u \\ 2u - s, & u \leq s \leq 2u - \alpha \\ \alpha, & s \geq 2u - \alpha \end{cases} \tag{12}$$

In period 2, the a priori veto players will veto any legislation for which the anticipated proposal $p*(s,\alpha)$ is inferior to the status quo. Let l' denote the ideal point of the left-most a priori veto player and let u' denote the ideal point of the right-most a priori veto player. We can represent the policy outcome if a proposer with ideal point α is selected by,

$$x^*(s,\alpha) = \begin{cases} \alpha, & s \leq 2min\{l', l, a\} - \alpha \\ 2m_{l\alpha} - s, & 2min\{l', l, \alpha\} - \alpha \leq s \leq 1\{m_{l\alpha} < l'\}m_{l\alpha} + 1\{m_{l\alpha} \geq l'\}(2l' - \alpha) \\ s, & 1\{m_{l\alpha} < l'\}m_{l\alpha} + 1\{m_{l\alpha} \geq l'\}(2l' - \alpha) \leq s \leq 1\{m_{u\alpha} > u'\}m_{u\alpha} + 1\{m_{u\alpha} \leq u'\}(2u' - \alpha) \\ 2m_{u\alpha} - s, & 1\{m_{u\alpha} > u'\}m_{u\alpha} + 1\{m_{u\alpha} \leq u'\}(2u' - \alpha) \leq s \leq 2max\{u', u, \alpha\} - \alpha \\ \alpha, & s \geq 2max\{u', u, \alpha\} - \alpha \end{cases} \tag{13}$$

where $m_{l\alpha} = min\{l, \alpha\}$ and $m_{u\alpha} = max\{u, \alpha\}$. Finally, before period 1, we can characterize the expected proposal using,

$$E[x^*(s)] = \beta_1 E[x^*(s, \alpha_1)] + ... + \beta_J E[x^*(s, \alpha_J)] \tag{14}$$

For the Median Legislator and Cartel models, we have $l = min\{h_m, s_m\}$ and $u = max\{h_m, s_m\}$.[20] For the Pivotal Politics, Cartel and Pivots, and Setter and Pivots models, l and u depend on whether

[20] The notation in summarized in Table 9.

the issue is a tax level (in which the tax supermajority requirement is relevant) or a spending level (in which case the budget supermajority is relevant. For tax issues, we have,

$$l = max\{min\{h_m, s_m, h_{fl}, s_{fl}, g\}, min\{h_m, s_m, h_{fl}, s_{fl}, h_{ol}, s_{ol}\}\} \tag{15}$$

$$u = min\{max\{h_m, s_m, h_{fu}, s_{fu}, h_t, s_t, g\}, max\{h_m, s_m, h_{fu}, s_{fu}, h_t, s_t, h_{ou}, s_{ou}\}\} \tag{16}$$

and for spending issues, we have,

$$l = max\{min\{h_m, s_m, h_{fl}, s_{fl}, g\}, min\{h_m, s_m, h_{fl}, s_{fl}, h_{ol}, s_{ol}\}\} \tag{17}$$

$$u = min\{max\{h_m, s_m, h_{fu}, s_{fu}, h_b, s_b, g\}, max\{h_m, s_m, h_{fu}, s_{fu}, h_b, s_b, h_{ou}, s_{ou}\}\} \tag{18}$$

For the Median Legislator and Pivotal Politics models, we have $l' = min\{h_m, s_m\}$ and $u' = max\{h_m, s_m\}$. For the Cartel, Cartel and Pivots, and Setter and Pivots models, we have $l' = min\{h_{maj}, s_{maj}\}$ and $u' = max\{h_{maj}, s_{maj}\}$.

Now, considering the proposers, for the Median Legislator, Pivotal Politics, Cartel, and Cartel and Pivots models, we have that the proposer is equal to h_m or s_m, each with equal probability. For the Setter and Pivots model, we have that the proposer is equal to h_{maj} or s_{maj}, each with equal probability.