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The Statistical Analysis Of Roll-Call Data: A Cautionary Tale

Roll-call voting and congressional procedures are two of the most heavily studied aspects of the U.S. Congress. To date, little work has focused on the effect of procedures on the composition of the roll-call record. This article takes a step in this direction by demonstrating the effect of chamber rules and institutional constraints on House and Senate roll-call data, as well as on the inferences that scholars have drawn from the roll-call record. More specifically, I focus on recent efforts to measure party effects and ideological alignments, and I demonstrate that the composition of the roll-call record can affect these measures.

Roll-call voting is one of the most heavily studied aspects of the U.S. Congress. The large number of actors combined with availability of data in "machine-readable" form have led scholars to do extensive theoretical and empirical work with the congressional roll-call record. Measures derived from roll-call votes, such as the Rice index of party voting (Rice 1925), as well as more-sophisticated scaling analyses, have allowed scholars to discover patterns and alignments in roll-call voting. Further, the development of the spatial model of voting and advances in computer technology have enabled scholars to develop even more-sophisticated measures of patterns in roll-call voting through algorithms such as NOMINATE (Poole and Rosenthal 1997) and, more recently, Bayesian Ideal Point Estimation (Clinton, Jackman, and Rivers 2004; Martin and Quinn 2002).

At the same time, congressional scholars have long understood the critical role that procedural details, such as committee jurisdictions, "closed" rules in the House, and unlimited debate in the Senate, play in shaping the content of the roll-call record and policy outcomes (Bach and Smith 1988; Binder and Smith 1997; Lee 2006; Shepsle 1979). Largely absent from the literature are studies that discuss the

influence of institutional features of the two chambers on patterns of roll-call voting. As Morton (1999) argues, making inferences from empirical data requires that the analyst understand and evaluate the role of the data-generating process. This article takes a step in this direction by highlighting ways in which seemingly obscure chamber rules and institutional constraints in the House and Senate affect the observed patterns in roll-call data. This article serves as a cautionary tale for scholars who wish to test theories of legislative behavior using aggregate roll-call patterns. The examples I present illuminate the perils of treating the roll-call record as exogenous and not paying careful attention to how rules, strategies, and agenda control shape the roll-call record. More specifically, I focus on recent efforts to measure party effects and ideological alignments, and I demonstrate that the composition of the roll-call record can affect these measures.

Studying the Roll-Call Record

Studies of the congressional roll-call record have spawned scores of books and articles over the past several decades. Many of the studies have been behavioral in nature, focusing on subjects such as the "cues" that members rely on when casting votes (Matthews and Stimson 1975), the structure of the decision-making process that members use when casting their votes (Kingdon 1977), and the nature of the policy dimensions members use to evaluate bills that come to a vote in Congress (Clausen 1973; Poole and Rosenthal 1997). In addition to explaining how members approach the voting decision, a large literature reports efforts to uncover and explain patterns in voting, such as the extent to which parties structure voting (Brady 1973; Lee 2006), the relationship between committees and the parent chamber (Krehbiel 1991; Maltzman 1997), and regional and cross-party coalitions in voting (Cooper 2001).

The most widely cited and used study of roll-call voting in the U.S. Congress to date is the work of Keith Poole and Howard Rosenthal, who developed and implemented a scaling algorithm to describe the underlying spatial structure of roll-call voting. The variety of NOMINATE scores that they have produced for members of Congress, as well as presidents, has become a staple of most modern studies of decision making in Congress (McCarty, Poole, and Rosenthal 1997). Their most important findings are that, for most eras, voting is of low "dimensionality," that in the modern era the liberal/conservative dimension accurately characterizes most roll-call decisions, and that members of Congress tend to express very stable policy positions across their careers.

Scholars have employed NOMINATE and other measures of legislators' "ideal points" as independent or dependent variables in efforts to understand the effects of various institutional forces on roll-call voting. For example, Jenkins (1999, 2000) used the overlapping memberships in the U.S. and Confederate Houses to assess the effect of parties and constituency preferences on the voting behavior of members serving in both institutions. In a similar vein, Nokken (2000) and Nokken and Poole (2004) found evidence that members of Congress who switch party affiliations while serving in Congress exhibit changes in revealed policy preferences, although these changes vary considerably across individuals and eras. Further, Rothenberg and Sanders (2000) have found evidence that members exhibit changes in revealed policy preferences after they have been defeated in a primary or have decided to retire.[1]

All of these studies rely either explicitly or implicitly on the spatial theory of voting (Enelow and Hinich 1984), which maintains that, when faced with a roll-call decision, members compare the expected utility of voting the "yea" position to the expected utility of voting the "nay" position, choosing the alternative with the highest expected utility. The spatial voting model allows scholars to locate and identify pivotal members of a legislature, such as the median, the veto pivot, or the filibuster pivot in the Senate (Krehbiel l998).

Of course, scholars have recognized that, from time to time, members may not vote myopically on each individual roll call. In fact, a large branch of the literature seeks to identify instances of sophisticated voting, such as when a member strategically votes against her or his preferences when considering "killer" amendments, in order to gain a more-desirable outcome on the final content of the bill in question (Calvert and Fenno 1994; Denzau, Riker, and Shepsle 1985; Jenkins and Munger 2003). Yet the overriding assumption is that each member of Congress has a fixed ideal point that determines her or his behavior on most, if not all, roll calls. Further, although some roll-call-based studies find consistent evidence that changes in legislative institutions can produce changes in observed roll-call behavior, these and other roll-call-based studies implicitly assume that the composition of the roll-call record is relatively constant across chambers and across time and that the presence of "strategic" voting does not affect ideal-point estimates (but see Lee 2006).[2] In the next section, I examine variations in the composition of the roll-call record and ways in which rules and procedures can make it difficult to draw accurate inferences from these data.

Rules, Procedures, and the
Changing Roll-Call-Voting Record

The Constitution generally left decisions about parliamentary procedure for the members of the House and Senate to decide. Over the years, the chambers have made numerous changes in their internal procedures that have complicated the comparison of the roll-call record across time both within and across chambers. These differences—over matters including amendment consideration and debate closure—affect the composition of the roll-call record considerably and may bias the inferences we draw about the political forces at work in congressional decision making.

The House and Senate rules differ drastically in terms of how amendments to bills may be considered. The House has a very strict germaneness rule that sharply curtails the ability of members to offer extraneous amendments to bills.[3] The Senate has no germaneness rule, so its members can freely offer amendments or entire bills that are in no way related to the original bill.[4] Another key difference in amendment consideration is that the House often dissolves itself into a body known as the Committee of the Whole on the State of the Union (COW) to initially consider most public bills.[5] The most important difference in terms of the composition of the roll-call record is that, prior to the 92d Congress (1971–72), the House did not allow recorded voting in the COW, a rule that sharply limited the number of amendment votes in the House roll-call record.[6] Following the adoption of recorded voting in the COW in 1971 and the advent of voting by electronic device in 1973, the House began casting hundreds of votes on amendments (Rohde 1991; Smith 1989). As Smith and I (Roberts and Smith 2003) have demonstrated, this change in the nature of the House roll-call record had a noticeable impact on the observed level of party voting in the House. In fact, when we disaggregated the roll-call record to compare voting in the COW to voting in the House, we found that much of the rise in party voting in the 1970s was attributable to the changing composition of the roll-call record and not to an increase in partisanship in the House.

Thus, structural rules and procedures both shape and cause institutional differences in the roll-call record, both within and across chambers. While these differences are interesting in and of themselves, they are important to the extent that they have a substantive effect on the ability of scholars to draw accurate inferences from the roll-call record. If Poole and Rosenthal (1997) are correct that legislators "die in their ideological boots," then changes in the composition of the

roll-call record should have little or no effect on estimates of legislators' ideal points and the rank order of legislators within a given Congress. If, however, as Jenkins (2000) and Snyder and Groseclose (2000) suggest, legislators' revealed policy preferences shift across institutional settings and can be influenced by party pressure, then changes in the composition of the roll-call record could skew interpretations of patterns in roll-call voting. If the changing nature of the roll-call record affects ideal-point estimates and other measures derived from the roll-call record, then many of the assumptions that scholars make when using roll-call data would be compromised.[7] The remainder of this article highlights some of the potential and actual problems with using the roll-call record, referring to recent papers by Cox and Poole (2002) on party effects in legislative voting and by Clinton, Jackman, and Rivers (2004) on ideal-point estimation and ideological alignments.

Party Leaders and Ideological Alignments in the 107th Senate

Discussions of ideological alignments are ever present in American politics. Many court scholars and journalists point to Justice Anthony Kennedy as being the "swing vote," or median, on the Supreme Court (Martin and Quinn 2002). And the fact that the *National Journal* identified Senator John Kerry (D-MA) as the most liberal member of the Senate received a considerable amount of play in the 2004 presidential campaign. Additionally, many theories of political bargaining rely on identifying "veto players," such as the median member of a congressional committee (Krehbiel 1991), the filibuster pivot in the Senate, or the veto override pivots in both chambers (Krehbiel 1998).

Beginning with Truman (1959), a number of scholars have developed and tested theories concerning the ideological location of party leaders. Truman's "middleman" thesis contends that congressional parties will select a person at or near the party median as leader. Median-voter theories suggest that the candidate closest to the median would be successful in a caucus election, but Truman argues that, as an agent of the party, the leader must stay at or near the middle of the party to maintain the support of a majority of the party to continue as leader. Subsequent work has challenged Truman's thesis, with McGann (2002) demonstrating that the method for choosing the leader can promote the election of extreme leaders, and Grofman, Koetzle, and McGann (2002) demonstrating that a party's leader is most likely to represent the mode rather than the median of the party caucus. Other

scholars have suggested that parties, especially the minority party, may benefit from employing ideologically extreme leaders (Clausen and Wilcox 1987; May 1973). Minority parties are rarely able to win their preferred policy position, but by staking out an extreme position, the minority party may be able to secure a policy closer to their ideal point (Merrill et al. 1999). Empirical assessments of the "middleman" thesis have been mixed. Truman (1959) and Kiewiet and McCubbins (1991) found considerable support for the theory (especially in the House), but Grofman, Koetzle, and McGann and Clausen and Wilcox found that leaders are usually more extreme than the median member of the caucus. The implicit assumption in all of this literature is that the ideal points of party leaders are stable across issues and agendas. I focus here on the 107th Senate (2001–02) to demonstrate how seemingly insignificant procedural minutiae can make accurate inferences about the relative position of party leaders difficult to draw from the roll-call record.

The 107th Senate was remarkable in a number of ways. In addition to a hotly contested presidential election, the 2000 election also produced a Senate evenly divided between Democrats and Republicans. This split created a great deal of controversy as to which party could lay claim to "majority" status in the chamber. The majority party traditionally receives a larger proportion of seats on committees than does the minority, and the majority leader traditionally receives the "right of first recognition," which enables the majority leader to control the Senate agenda. Republicans argued that since the President of the Senate—Vice President Richard B. Cheney—was a Republican, the Republicans should be considered the majority party. Democrats argued that, with the Senate split 50/50, there was no clear majority; thus they asked for and ultimately received a power-sharing arrangement. Under this arrangement, the Republicans were nominally considered the majority party, but committee assignments and staff were divided equally between the parties. The Senate proceeded under this unique arrangement until May 24, 2001, when James M. Jeffords of Vermont announced that he would leave the Republican party and become an Independent. Jeffords also announced that he would vote with the Democrats for organizational purposes, thus giving the Democratic party a 51–49 majority in the Senate.

Jeffords's switch had profound organizational consequences for the Senate. Tom Daschle (D-SD) became majority leader; former majority leader Trent Lott (R-MS) was relegated to minority leader. Also, each Republican committee chair was replaced by a Democrat and the Democratic party gained a one-vote advantage on each

FIGURE 1
Change in Party Control and
Ideological Alignments in the 107th Senate
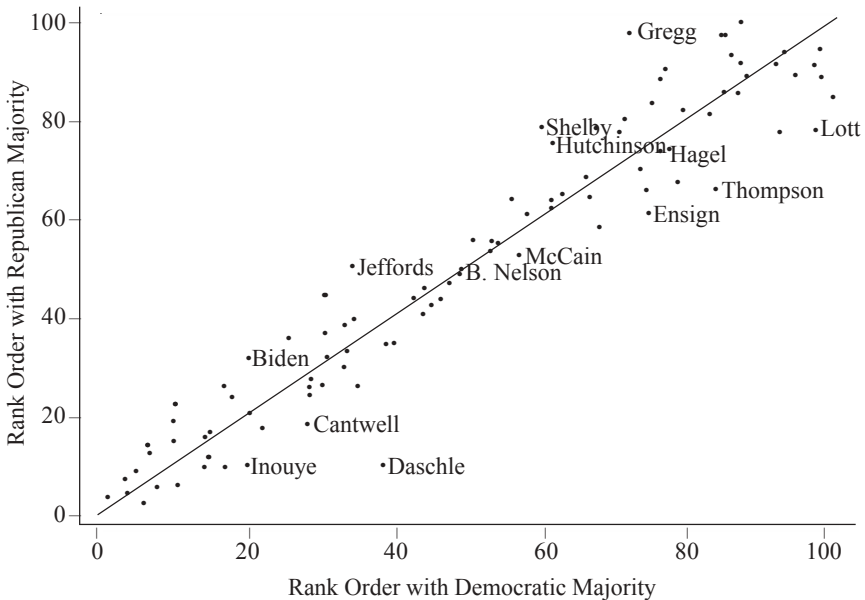
Note: Rank-order data estimated on roll-call data from the 107th Senate (2001–02) using the unidimensional Bayesian item-response model employed by Clinton et al. (2004). The x-axis is the ordering (1 equals most liberal) with Democratic control; the y-axis is the ordering with Republican control. Senators below the 45-degree line moved in a conservative direction after the Democratic party gained majority status; senators above the line moved in a liberal direction after the change in majority status.

committee. The switch in party control put the Senate's agenda-control powers into the hands of Tom Daschle. The agenda-control powers in the Senate are not as substantial as those in the House of Representatives, but the right of first recognition gives the majority leader considerable influence over which bills reach the Senate floor.

Jeffords's switch provides a unique opportunity to assess the extent to which parties and leaders in the Senate exert influence on the revealed preferences of senators. The membership and rules of the Senate remained constant across the switch in party control; thus any observed change in the behavior of senators could be attributed to either a change in the agenda or party influence. As Figure 1 shows, the switch in party control produced a substantial change in rank order for some senators.[8] As Clinton, Jackman, and Rivers (2004) note,

Jeffords exhibited considerable change in his roll-call behavior after he left the Republican party, moving approximately 14 places in the liberal direction. Given the identical membership of the Senate on both sides of Jeffords's switch, Clinton, Jackman, and Rivers suggest that the observed changes in ideal-point estimates were likely due to party effects.

Clinton, Jackman, and Rivers have also noted that the two party leaders, Tom Daschle and Trent Lott, were two of the biggest movers in terms of the behavior before and after the change in party control. Daschle appeared to become more moderate after becoming majority leader, whereas Lott moved in a conservative direction as the minority leader. As majority leader, Lott was the twenty-fourth most conservative Republican, putting him squarely in the middle of his party; as minority leader, Lott was more conservative than all but three of his Republican colleagues. Daschle's apparent movement was even more drastic: as minority leader, he was more liberal than all but ten of his Democratic colleagues, but as majority leader he was more conservative than all but ten of his Democratic colleagues. Lott seems to have been a middleman while acting as majority, but not minority, leader. Daschle was never near the center of his party but was closer to the party median as majority leader. Noting that both leaders exhibited more-moderate behavior as majority leader, Clinton, Jackman, and Rivers have speculated that being in the majority may force leaders to moderate their policy stances. This interpretation fits May's (1973) argument that a party could benefit from having an extreme leader while in the minority and Truman's argument that a majority party would require its agent to be at or near the median. Yet a detailed inspection of the roll-call record produces an explanation that reveals the difficulty of interpreting observed shifts in roll-call behavior.

When one looks at party splits on roll calls in the 107th Senate, one finds a number of votes for which the majority leader is the only member of the majority party not voting the same position as the rank-and-file members. On a number of occasions while the Democrats were in the majority, Senator Daschle would be the lone Democrat voting against invoking cloture. For example, during consideration of the Equal Protection of Voting Rights Act of 2001 (S 565), Daschle signed a petition seeking to have cloture invoked on the bill, then first voted *against* cloture before later moving to have the cloture motion reconsidered and voting in favor of cloture. After this later attempt at invoking cloture failed, Daschle remarked that he was hopeful that the bill could pass the Senate. On the surface, this type of behavior is puzzling. Why would a senator vote against a cloture petition that he had signed, all the while expressing support for the underlying bill? Rule XIII of the

Senate provides a potential explanation: "When a question has been decided by the Senate, any Senator voting with the prevailing side . . . may, on the same day or on either of the next two days of actual session thereafter, move a reconsideration. . . ." Thus, if the majority party is on the losing side of a vote and later rounds up enough votes to prevail or finds that the opposing party has members absent, the majority would be unable to move to have the vote reconsidered unless one of their own had voted on the winning side—and presumably against both the party's position and personal preferences. This strategy would be especially useful with votes on cloture, since there are a number of steps and time constraints involved in filing a cloture petition.

In the 107th Senate, there were 5 such votes out of the 148 cast when the Republican party was in the majority, and 11 out of 349 under Democratic control. I removed these votes from the two roll-call matrices and estimated ideal points and rank orders without these votes to determine if the "wrong"-side votes were the source of the observed changes in Lott and Daschle's ranks.

The ideal-point estimates presented are from a one-dimensional Bayesian item response model generated using Andrew Martin and Kevin Quinn's MCMCpack routine for the R statistical software (Martin and Quinn 2005).[9] Each legislator is assumed to have an ability or ideal point denoted θ_j, and each roll call has a difficulty parameter, α_i, and a discrimination parameter, β_i. The model assumes each legislator has an unobserved utility ζ_j, which dictates their choice on each roll call:

$$\zeta_{ij} = \alpha_i \beta_i \theta_j + \varepsilon_{ij} \ . \tag{1}$$

The following results employ rank orders derived from estimates of θ_j.

The results in Table 1 suggest that these votes were largely responsible for the changes in rank for Lott and Daschle across the change in party control. With a Republican majority, Daschle was the eleventh most liberal member of the Senate but, serving as majority leader, Daschle was the forty-first most liberal member of the Senate— a seemingly substantial jump of 30 places in rank order. But when the 11 votes in which Daschle voted the "wrong way" are excluded, Daschle is only the twenty-fifth most liberal senator, putting him squarely in the middle of his party. Further, Table 1 reveals that once the uncertainty about the estimated rank is taken into account, the evidence for Daschle's moderation is diminished considerably. A similar pattern holds true for Trent Lott. As majority leader, Lott was estimated to be the seventy-sixth most liberal member of the Senate and in the middle

TABLE 1
The Effect of Being Majority Leader
on Ideological Alignment in the 107th Senate

Name	Majority Party	Votes Excluded	Rank Order	95% Credible Interval
Tom Daschle	Republican	No	11	1.6–20.4
Tom Daschle	Democrat	No	41	34.9–47.1
Tom Daschle	Democrat	Yes	25	16.6–33.4
Trent Lott	Republican	No	76	65.1–86.9
Trent Lott	Republican	Yes	92	79.7–100
Trent Lott	Democrat	No	97	94.2–99.8

of his party; after the Democrats took control of the Senate, Lott became the ninety-seventh most liberal member, a considerable shift to the conservative end of the spectrum. If, however, we exclude the "wrong way" votes, then Lott ranks as the ninety-second most liberal senator as majority leader, which is statistically indistinguishable from his rank as minority leader and not particularly close to the middle of his party in either instance.

The observed change in the roll-call behavior of Daschle and Lott seems to be largely a result of the majority party needing to have one person vote on the winning side of an issue in order to be able to offer a motion to reconsider. What on the surface appears to be a significant change in behavior, perhaps related to the demands of leading the majority party, turns out to be a product of procedural minutiae. Unfortunately, this problem is not unique to the 107th Senate; it is simply more easily highlighted because of the change in party control. This analysis suggests that empirical tests of Truman's "middle-man" thesis—or any other theory of behavioral change—that do not account for "wrong way" voting by the majority leader could produce misleading conclusions about the relative location of party leaders.[10]

Party Effects in Legislative Voting

One of the most vexing problems in the literature on congressional politics is how to determine the independent effect of political parties on the roll-call behavior of their members. For more than a century, scholars have sought to separate the effects of party,

constituency, and personal preferences, with varying degrees of success (Lowell 1902). Most scholars agree that parties can and do have an effect on the roll-call behavior of party members, but devising an empirical measure of the magnitude of that effect has proven quite difficult. To measure party independent of constituency or personal preferences, one needs a measure of preferences uncontaminated by any potential party effects. This pure measure is difficult to create with roll-call data, because any party effect exerted on a member would be reflected in the voting behavior itself. The majority party often determines what questions are brought to a vote, and any party pressure on the member's behavior would be reflected in the vote cast. That is, evidence that a party pressured a member to vote "yea" rather than "nay" cannot be found by looking solely at the vote in question.

Cox and Poole (2002) developed a novel method of measuring party effects that uses all non-unanimous roll calls. The authors have admitted that measures of preferences such as NOMINATE are contaminated by any "average" party effect that might be present across the entire Congress. They utilize this feature of NOMINATE, however, to estimate an expected level of party unity, or Rice index, on a particular roll call. This expected value is then compared to the actual Rice index to identify votes that have high, low, or average party pressure. This technique is unique because it exploits the fact that party and preferences are both present in roll-call data in order to measure variation in the level of party pressure across votes and across Congresses. Cox and Poole have found that certain types of votes, such as organization and procedural votes, votes on special rules, votes on the election of the Speaker, and votes on core party issues (such as taxes and welfare), demonstrate above-average party effects, whereas most other substantive votes have average or below-average party pressure.

Interpreting Cox and Poole's findings with regard to the proportion of votes with above- or below-average party effects remains difficult, because the Cox-Poole method assesses variation from an average level of party effects without measuring the actual average. So if parties consistently exert a high amount of pressure across all votes, then the Cox-Poole method will fail to register many votes with large party effects. Similarly, if parties rarely exert any pressure on members, then the Cox-Poole method will not show many votes with large or small party effects. Thus, to interpret Cox and Poole's results across time, one must be sensitive to factors that could cause the average level of party effects to be particularly high or low. For example, Cox and Poole found very few instances of votes with high levels of party pressure during the "czar era" of Speakers Thomas B. Reed (R-ME)

and Joseph Cannon (R-IL). This result is initially puzzling because most scholars agree that this era was the height of party power in the House. But with such a high level of average party pressure, there is little room for above-average party effects.[11] Cox and Poole have drawn on variations in this average to point out that party effects in the House are stronger on procedural votes in the postreform era of the House, while at the same time demonstrating a smaller proportion of votes with high party effects for the entire roll-call record.[12] The finding with regard to procedural votes is consistent with much of the scholarly literature (Rohde 1991), which asserts that the reforms gave the majority party more power to influence the course of legislation in the House. Although this point is not in dispute, there is evidence to suggest that at least some of the observed change in the proportion of votes with high party effects in the postreform period can be attributed to the addition of Committee of the Whole votes into the roll-call record in 1971.

As discussed earlier, the House did not adopt recorded voting in the COW until the 92d Congress (1971–72). After the adoption of electronic voting in 1973, COW votes soon constituted approximately one-third of the roll-call record. COW votes are nearly exclusively on amendments, which may differ systematically from other types of votes in the nature of the vote choices that legislators confront. Amendment votes are often decided by very close margins, involve issues that divide the parties, and tend to produce cut-points that fall between the party medians (Roberts and Smith 2003). Further, amendment votes are substantive in nature, which is particularly relevant in this case, because Cox and Poole have suggested that party effects are not as great on substantive votes.

Table 2 presents the results of two ordered-probit models of whether a vote had low, average, or high party effects as a function of differing types of votes.[13] Table 2 reveals that procedural votes, votes on special rules, and votes on taxes and welfare are much more likely to exhibit high levels of party effects, whereas COW votes are significantly less likely to demonstrate high levels of party pressure. Substantively, the probability of a vote on a special rule showing high party effects is approximately 0.4. In contrast, an amendment vote taken in the COW has only about a .12 probability of demonstrating high party effects. The rule change providing for recorded voting in the COW added a large number of votes with average or below-average party effects to the roll-call record.

The addition of a large number of COW votes with average or below-average party effects has two effects on Cox and Poole's

TABLE 2
Party Effects by Vote Type in the
U.S. House of Representatives, 1973–98

Variable	Model 1 Coefficient (Std. Error)	Model 2 Coefficient (Std. Error)	Wald χ^2 (p-value)	ΔPr High Party Effects
COW Votes		−0.06* (0.03)		−.02
Core Procedural	0.64* (0.034)	0.61* (0.038)	3.75 (0.05)	.16
Special Rule	0.29* (0.05)	0.30* (0.05)	3.02 (0.09)	.09
Party Label Votes	0.46* (0.09)	0.45* (0.09)	0.09 (0.76)	.15
Contested Elections	0.76* (0.23)	0.76* (0.22)	0.03 (0.87)	0.25
Cut-point 1	−0.53 (0.08)	−0.57 (0.06)		
Cut-point 2	1.25 (0.08)	1.20 (0.06)		
Number of Cases	7020	7020		
Log Likelihood	−6364.62	−6362.71		
Pseudo R^2	0.05	0.05		

*$p \leq .05$.

Note: Coefficients are from an ordered probit model of whether a vote has low, average, or high party effects as defined by Cox and Poole, who use ideal-point estimates and the cut-point and gap estimates for each roll call to generate an "expected" level of party voting, or Rice index. Cox and Poole compare this expected Rice index score and standard deviation to the actual Rice score to determine if a vote has low, high, or average party effects. Independent variables are dummy variables indicating vote types. Congress-specific fixed-effects were estimated but not reported. The Wald χ^2 column presents a Wald χ^2 statistic comparing coefficients across the two models. The last column represents the change in probability of high party effects as the variable goes from 0 to 1 in Model 2, if we hold all other variables at the mean.

findings. First, as Table 3 shows, the number of votes with cut-points between the party medians increases with the addition of COW votes. Cox and Poole use only votes with cut-points between the party medians to measure party effects, so increasing the number of these votes increases the number of votes on which party effects could have been

TABLE 3
Party Effects and Voting in the Committee of the Whole

Congress	Between Medians	COW Between Medians	High	COW High	Percent High	Percent High w/o COW
83	63	n/a	19	n/a	30.16	n/a
84	66	n/a	12	n/a	18.18	n/a
85	96	n/a	41	n/a	42.71	n/a
86	101	n/a	33	n/a	42.57	n/a
87	119	n/a	40	n/a	33.61	n/a
88	126	n/a	38	n/a	30.16	n/a
89	194	n/a	75	n/a	38.66	n/a
90	182	n/a	71	n/a	39.01	n/a
91	137	n/a	48	n/a	35.04	n/a
92	236	124	88	41	37.28	43.00
93	403	235	116	60	28.78	33.00
94	556	263	164	72	29.47	32.60
95	606	324	185	92	30.53	34.41
96	575	272	138	42	24.00	33.81
97	329	162	85	30	25.84	37.86
98	492	233	97	28	19.72	29.41
99	543	231	79	7	14.55	24.74
100	552	226	80	14	14.49	20.74
101	496	188	79	16	15.93	21.99
102	563	198	78	13	14.03	19.52
103	715	271	87	20	12.17	15.80
104	920	429	131	59	14.24	14.74
105	643	213	107	21	16.64	19.85

present (that is, increases the denominator). Thus, after the adoption of recorded voting in the COW, we see an increase in the number of votes with high party effects (the numerator) but an even larger increase in the number of votes with cut-points between the party medians (the denominator), which has the effect of reducing the proportion of votes with high party effects. In all Congresses, the addition of COW votes to the roll-call record reduces the proportion of votes considered to have high levels of party effects. Table 3 demonstrates that the decline in the percentage of votes with high party effects starting in the 93d

Congress is almost completely attributable to the addition of COW votes to the roll-call record. In the five Congresses prior to the adoption of recorded voting in the COW (87th–91st), the average proportion of votes with high party effects is 35.29. In the five Congresses after recorded COW voting begins, the average falls to 30.0. But if COW votes are excluded, then the proportion of votes with high party effects is 35.36.

Second, Cox and Poole noted an increase in the ability of the majority party to influence procedural votes in the postreform House, but when their model is refit (see Table 2) to control for voting in the COW, a Wald χ^2 test reveals that the increase in party pressure on procedural votes is significantly reduced. This example demonstrates how sensitive measures derived from the roll-call record are to changes in the types of votes taken. Contrary to my findings with Smith (Roberts and Smith 2003) that adding COW votes to the roll-call record *increases* the number and proportion of party votes in the House, my present example demonstrates that adding COW votes actually *decreases* the appearance of party effects in legislative voting. The presence of a large number of party votes increases the "average" party effect that is the baseline that Cox and Poole use in their search for votes with high party influence. Taken together, these two examples demonstrate not only that measures derived from the roll-call record are sensitive to changes in the composition of the record, but also that changes in the record can either enhance or suppress the effect estimated, depending on the metric one uses.

Discussion

The congressional roll-call record is a rich source of data on the behavior of members of Congress. The large number of actors and meticulously recorded votes provide an unmatched source of readily available data on the behavior of elite political actors. Analyses of these data have allowed generations of congressional scholars to provide unique insights into congressional behavior. Recent advances in computer technology have made it possible for anyone with a desk-top computer and a web browser to analyze decades of roll-call data with a minimal amount of time and technological expertise. Yet this article suggests that interpretation and comparison of patterns in roll-call data can be compromised by the differences in the composition of the roll-call record across chambers and over time.

For most of congressional history, it was difficult to gain a recorded vote on amendments in the House, but it has always been

easy to gain a recorded vote on amendments in the Senate. Once the House began to allow recorded voting in the Committee of the Whole, the substantive content of the House roll-call record changed immediately, producing important fluctuations in measures of the extent of party influence in the House, perhaps without an overall change in the effect of party on members' voting behavior. These and other differences in the composition of the roll-call record wreak havoc on efforts to measure party effects in the House.

Analysis of the roll-call record for the 107th Senate provides several noteworthy results that highlight the themes of this article. First, members who switch parties, such as James Jeffords, often do exhibit a change in roll-call behavior. This alteration could result from the effects of party on the individual or could just as likely result from the individual switching to a party that more closely reflects his or her policy preferences. Second, the continuity of membership across the switch in party control provides a natural experiment for the effects of party on voting alignments. The results suggest that majority party agenda control has a substantial effect on ideological alignments, lending credence to the idea that revealed policy positions do, in fact, change over time. Third, my analysis of Senators Lott and Daschle in the role of Senate majority leader points out how seemingly obscure procedural details, such as the Senate rule concerning the motion to reconsider, can have a substantial effect on the substantive interpretation of roll-call voting.

The fact that rules changes and procedural details can skew substantive interpretations of the roll-call record seriously complicates the task of the analyst who seeks to draw accurate inferences from roll-call data. Parsing the roll-call record into various subsets as I have done is time consuming, results in a loss of precision in the estimated quantities of interests, and requires the analyst to have a detailed understanding of the content of the roll-call record. The approach suggested by Clinton and Meirowitz (2003) improves precision by integrating specific knowledge about the roll-call record into the model estimates, but this approach still requires a detailed understanding of the content of the roll-call record as well as the technical expertise to program complicated statistical models. Thus, despite considerable advances in the statistical analysis of roll-call data, proper interpretation of the data remains as difficult as ever.

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NOTES

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1. See Carson et al. 2004 for a critique of the findings of this study.

2. Poole and Rosenthal (1997, 146–47) claim that the presence of sophisticated voting does undermine the dimensional analysis of roll-call voting if members vote sincerely on sophisticated equivalents.

3. This rule is not self-enforcing; a member must raise a point of order, which is subject to a majority vote. Similarly, the House can waive this or any other standing rule through a special rule (Oleszek 2004).

4. The Senate does prohibit nongermane amendments after cloture has been invoked and on budget bills, and it may choose to do so at any other time through unanimous consent.

5. This "committee" is composed of all House members and meets in the House chamber, but its rules for transacting business are less formal than those in the full House. For instance, the quorum requirement in the COW is 100, as opposed to an absolute majority of 218 in the House; the Speaker does not preside when the COW is in session; and the threshold of members needed to trigger a recorded vote is only 25 in the COW, compared to 44 in the House (Oleszek 2004).

6. Prior to the rule change, "teller voting" was employed in the COW. Members would simply walk past one of two tellers (yea or nay) and their vote would be recorded but not their name (Smith 1989). Recorded voting on amendments that had been adopted in the COW could take place in the House if it was requested by members, but there was no mechanism to have a recorded vote on a failed amendment.

7. McCarty, Poole, and Rosenthal (2006) use simulated roll-call agendas to demonstrate that their global finding of increased polarization in Congress is robust to changes in the identity of the agenda setter. Their simulations do not address the problems discussed in this article.

8. I estimated rank order from roll-call data from the 107th Senate (2001–02), using the unidimensional Bayesian item response model employed by Clinton, Jackman, and Rivers (2004).

9. I placed a standard normal prior on each bill parameter and ideal-point estimate. Each chain ran 51,000 iterations, with 1,000 burnin iterations—posterior densities formed by thinning the chain by 10—resulting in 5,000 draws for each legislator.

10. This example also points out the difficulty of interpreting changes in rank order. In recent Congresses, the two parties have displayed a high degree of unity, which has a produced a roll-call record in which many senators have almost identical voting records. In such a situation, a change in a small number of votes (in this case, just over 3% of the total votes cast) can have a large effect on the observed rank order, even when the voting records are not that dissimilar. These problems are only compounded when an analyst attempts to recover cardinal ideal-point estimates from the roll-call record.

11. If parties achieved perfect discipline or never influenced a vote, then there would be no votes that showed high party pressure.

12. The 93d Congress (1973–74) is considered the first postreform Congress.

13. Cox and Poole use ideal-point estimates and the cut-point and gap estimates for each roll call to generate an "expected" level of party voting, or Rice index. They compare this expected Rice index score and standard deviation to the actual Rice score to determine if a vote had low, high, or average party effects. The resulting variable is the dependent variable in Table 2.

REFERENCES

Bach, Stanley, and Steven S. Smith. 1988. *Managing Uncertainty in the House of Representatives: Adaptation and Innovation in Special Rules.* Washington, DC: Brookings Institution.

Binder, Sarah A., and Steven S. Smith. 1997. *Politics or Principle? Filibustering in the United States Senate.* Washington, DC: Brookings Institution.

Brady, David W. 1973. *Congressional Voting in a Partisan Era: A Study of the McKinley Houses and a Comparison to the Modern House of Representatives*. Lawrence, KS: University of Kansas Press.

Calvert, Randall L., and Richard F. Fenno. 1994. "Strategy and Sophisticated Voting in the Senate." *Journal of Politics* 56: 349–76.

Carson, Jamie L., Michael Crespin, Jeffrey A. Jenkins, and Ryan Vander Wielen. 2004. "Shirking in the Contemporary Congress: A Reappraisal." *Political Analysis* 12: 176–79.

Clausen, Aage R. 1973. *How Congressmen Decide: A Policy Focus*. New York: St. Martin's.

Clausen, Aage R., and Clyde Wilcox. 1987. "Policy Partisanship in Legislative Recruitment and Behavior." *Legislative Studies Quarterly* 12: 243–63.

Clinton, Joshua, and Adam Meirowitz. 2003. "Integrating Voting Theory and Roll-Call Analysis: A Framework." *Political Analysis* 11: 381–96.

Clinton, Joshua, Simon Jackman, and Douglas Rivers. 2004. "The Statistical Analysis of Roll-Call Data." *American Political Science Review* 98: 355–70.

Cooper, Joseph. 2001. "The Twentieth-century Congress." In *Congress Reconsidered*, 7th ed., ed. Lawrence Dodd and Bruce Oppenheimer. Washington, DC: CQ Press.

Cox, Gary W., and Keith T. Poole. 2002. "On Measuring Partisanship in Roll-Call Voting: The U.S. House of Representatives, 1877–1999." *American Journal of Political Science* 46: 477–89.

Denzau, Arthur, William H. Riker, and Kenneth A. Shepsle. 1985. "Farquharson and Fenno: Sophisticated Voting and Home Style." *American Political Science Review* 79: 1117–34.

Enelow, James M., and Melvin J. Hinich. 1984. *The Spatial Theory of Voting: An Introduction*. Cambridge: Cambridge University Press.

Grofman, Bernard, William Koetzle, and Anthony J. McGann. 2002. "Congressional Leadership 1965–96: A New Look at the Extremism versus Centrality Debate." *Legislative Studies Quarterly* 27: 87–105.

Jenkins, Jeffery A. 1999. "Examining the Bonding Effects of Party: A Comparative Analysis of Roll-Call Voting in the U.S. and Confederate Houses." *American Journal of Political Science* 43: 1144–65.

Jenkins, Jeffery A. 2000. "Examining the Robustness of Ideological Voting: Evidence from the Confederate House of Representatives." *American Journal of Political Science* 44: 811–22.

Jenkins, Jeffery A., and Michael C. Munger. 2003. "Investigating the Incidence of Killer Amendments in Congress." *Journal of Politics* 65: 498–517.

Jenkins, Jeffrey A., Eric Schickler, and Jamie L. Carson. 2004. "Constituency Cleavages and Congressional Parties: Measuring Homogeneity and Polarization, 1857–1913." *Social Science History* 28: 537–73.

Kiewiet, D. Roderick, and Mathew D. McCubbins. 1991. *The Logic of Delegation: Congressional Parties and the Appropriations Process*. Chicago, IL: University of Chicago Press.

Kingdon, John. 1977. "Models of Legislative Voting." *Journal of Politics* 39: 563–95.

Krehbiel, Keith. 1991. *Information and Legislative Organization*. Ann Arbor: University of Michigan Press.

Krehbiel, Keith. 1998. *Pivotal Politics: A Theory of U.S. Lawmaking*. Chicago, IL: University of Chicago Press.

Lee, Frances. 2006. "Agenda Content and Senate Party Polarization, 1981–2004." Presented at the annual meeting of the Midwest Political Science Association, Chicago.

Lowell, A. Lawrence. 1902. "The Influence of Party upon Legislation in England and America." In *Annual Report of the American Historical Association*. Washington, DC: AHA.

Maltzman, Forrest. 1997. *Competing Principals: Committees, Parties, and the Organization of Congress.* Ann Arbor: University of Michigan Press.

Martin, Andrew D., and Kevin M. Quinn. 2002. "Dynamic Ideal Point Estimation via Markov Chain Monte Carlo for the U.S. Supreme Court, 1953–1999." *Political Analysis* 10: 134–53.

Martin, Andrew D., and Kevin M. Quinn. 2005. *MCMCpack: Markov Chain Monte Carlo (MCMC) Package*. http://adm.wustl.edu.

Matthews, Donald R., and James A. Stimson. 1975. *Yeas and Nays: Normal Decision-Making in the U.S. House of Representatives*. New York: Wiley.

May, John D. 1973. "Opinion Structure of Political Parties: The Special Law of Curvilinear Disparity." *Political Studies* 21: 135–51.

McCarty, Nolan M., Keith T. Poole, and Howard Rosenthal. 1997. *Income Redistribution and the Realignment of American Politics*. Washington, DC: AEI.

McCarty, Nolan M., Keith T. Poole, and Howard Rosenthal. 2006. *Polarized America: The Dance of Ideology and Unequal Riches*. Cambridge, MA: MIT Press.

McGann, Anthony J. 2002. "The Advantages of Ideological Cohesion: A Model of Constituency Representation and Electoral Competition in Multi-Party Democracies." *Journal of Theoretical Politics* 14: 37–70.

Merrill, Samuel, Bernard Grofman, Thomas Brunell, and William Koetzle. 1999. "The Power of Ideologically Concentrated Minorities." *Journal of Theoretical Politics* 11: 57–74.

Morton, Rebecca B. 1999. *Methods and Models: A Guide to the Empirical Analysis of Formal Models in Political Science.* Cambridge: Cambridge University Press.

Nokken, Timothy P. 2000. "Dynamics of Congressional Loyalty: Party Defection and Roll-Call Behavior, 1947–1997." *Legislative Studies Quarterly* 25: 417–44.

Nokken, Timothy P., and Keith T. Poole. 2004. "Congressional Party Defection in American History." *Legislative Studies Quarterly* 29: 545–68.

Oleszek, Walter J. 2004. *Congressional Procedures and the Policy Process*. 6th ed. Washington, DC: CQ Press.

Poole, Keith T., and Howard Rosenthal. 1997. *Congress: A Political-Economic History of Roll-Call Voting*. Oxford: Oxford University Press.

Rice, Stuart A. 1925. "The Behavior of Legislative Groups: A Method of Measurement." *Political Science Quarterly* 40: 60–72.

Roberts, Jason M., and Steven S. Smith. 2003. "Procedural Contexts, Party Strategy, and Conditional Party Voting in the U.S. House of Representatives, 1971–2000." *American Journal of Political Science* 47: 305–17.

Rohde, David W. 1991. *Parties and Leaders in the Postreform House*. Chicago, IL: University of Chicago Press.

Rothenberg, Lawrence S., and Mitchell S. Sanders. 2000. "Severing the Electoral Connection: Shirking in the Contemporary Congress." *American Journal of Political Science* 44: 316–25.

Shepsle, Kenneth. 1979. "Institutional Arrangements and Equilibrium in Multidimensional Voting Models." *American Journal of Political Science* 23: 27–59.

Smith, Steven S. 1989. *Call to Order: Floor Politics in the House and Senate*. Washington, DC: Brookings Institution.

Snyder, James M., and Timothy Groseclose. 2000. "Estimating Party Influence in Congressional Roll-Call Voting." *American Journal of Political Science* 44: 193–211.

Truman, David. 1959. *The Congressional Party*. New York: Wiley.