

# **Is Choice Space Dimensionality a Variable? Roll Call Voting Across Issues and Through Time**

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## **Abstract**

Formal analyses show that dimensionality in a choice space introduces instability to it. Yet too many current formal and empirical studies of congressional behavior assume unidimensionality and proceed. Much of the empirical justification stems from analyses that are based on session averages, but averages can conceal. We have begun a research program aimed at addressing where unidimensionality in legislative choice spaces breaks down. In this paper, we report the first efforts in this program. Utilizing a new dataset on congressional roll call voting that documents congressional action across time and issues, we assess the dimensionality of roll call votes in eighteen distinct policy contexts. Every vote from 1946 through 2000 is coded based on its policy content according to the Policy Agendas Project's established guidelines. Using these data, we consider how dimensionality varies across different policy domains. This paper introduces this new dataset, one of the most reliable of its kind, while revisiting a long-standing debate in political science—the dimensionality of legislative decision-making. We find considerable variability by issue and across time, and conclude that the dimensionality of choice should be treated not as a constant but as a variable, conditioned at least on time and issue content.

## **Introduction**

In politics, dimensionality adds instability. The higher the initial dimensionality in a choice space, the more unstable the resulting choice set will be, and this holds for a single decider as well as a collectivity. We advocate a direct examination of this instability, at least supplementing the relentless focus on order and stability that has characterized the study of American formal institutions. One could characterize the field with only slight exaggeration as analogous to a situation in which earth scientists focused on the stability of the tectonic plates of the earth's crust, exhibiting no real scientific curiosity about the violent, sudden earthquakes that can punctuate the stability.

There are both exogenous and endogenous factors in political change (Sornette 2006). Here we focus on the internal dynamics of change. We have begun a research program that is aimed at assessing when low dimensional, well-structured choice spaces break down and the choice space becomes punctuated by higher order dimensions. We examine various aspects of legislative roll call voting in order to pursue this program empirically. This paper is the first outcome of that program.

### **Instability in Choice**

While decision-making in unidimensional choice spaces involves uncertainty over outcomes, the bounds on this uncertainty are well defined. But in multidimensional choice situations, this uncertainty becomes instability. In unidimensional spaces, shifts in the preferences of some actors, even large ones, lead to predictable shifts in outcomes. In multidimensional choice spaces, even minor shifts can lead to major changes in outcomes.

It is well known from formal studies of voting in structured choice situations, such as in legislatures, that dimensionality leads to instability, but interestingly enough, most of the debates about that instability have not grasped this fundamental and irrefutable insight. Rather the arguments have simply denied instability, claimed that any instability that might exist is solved by structure, induced by the committee system (Shepsle 1979), or that it is subordinated to the legislative party structure. The result is a mostly unidimensional voting structure on the House floor (nobody seems to examine the Senate) and that structure is fundamental, whether it is based on ideology, preference, or institutional structure.

This theorizing has contributed to our understanding of decision-making in legislative institutions, but it misses the more fundamental point: multidimensionality leads to unpredictability in choice. A second, underexplored point is the standard assumption that dimensionality is constant across issues and time. If a legislative choice space were ever multidimensional, perhaps reduced by some sort of structure-induced equilibrium, or induced by parties, then it seems likely that the arrangement will collapse at some time and place. Empirically we ought to look for these collapses. Scholars need to seriously contend with these collapses, rather than simply claim that any scientific pursuit is necessarily based on finding equilibria, as Ordeshook (1980) did on facing Riker's abandonment of the centrality of the concept.<sup>1</sup>

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<sup>1</sup> Ordeshook's (1980: 447) lament is fascinating. He comments in the first paragraph of his paper commenting on Riker's essay that Riker has told him "that I cannot attain that goal toward which my research is directed: a scientific understanding of political processes... While not all of us abide by the same paradigm, or use a similar professional argot, most of us do share, knowingly or unknowingly, a common goal: to search for political equilibria."

The literature on multidimensionality in political choice was so vigorous at one time it seems a great shame to drop the insights gleaned from that debate and move on as if it never happened. Let's first examine the essential aspects of this debate.

In voting systems in which preferences are one-dimensional (or, alternatively, are single-peaked), the median preference is the equilibrium choice (Black 1958). As importantly, it is stable, which basically means that the value of a median in a particular choice system doesn't change very much when preference values are 'perturbed' (so long as there are a reasonable number of deciders involved). Moreover, the median preference position—as the equilibrium choice—is not affected by the presentation order of alternatives and represents the Condorcet winner (the alternative that beats all other alternatives in a paired-choice vote).

If preferences are multidimensional, there is still an equilibrium value—the multidimensional median (a median calculated with respect to the dimensions involved), but it is not stable. Small changes in preferences can lead to large changes in outcomes. Additionally, the value of the outcome choice can be highly sensitive to the order of presentation of the alternatives. As a result, multidimensional choice situations introduce significant complexity into understanding and predicting the outcomes of choice and evaluating outcomes with respect to evaluative criteria, such as representation in legislative institutions (Jones, Larsen-Price, Wilkerson, 2008). In the case of just two dimensions, the coalitions may vary across the dimensions and predicting winning outcomes requires knowledge of the saliency of each dimension (Jones 1994) and the role of agenda gatekeepers (Rosenthal 1992)

Where decision-making is multidimensional, institutional rules and norms may limit considerations of some dimensions, or divide them out so each dimension is addressed by a different decision-making mechanism, as is the case for structure-induced equilibrium (Shepsle 1979; Shepsle & Weingast 1981). Because the outcome of a multidimensional choice is directly dependent on how dimensions are introduced, multidimensional issues create opportunities for strategic interference by legislators through agenda manipulation and logrolling. Such strategic action can create stable majorities as committees act as agenda gatekeepers and legislators trade votes to express preference intensity (Buchanan & Tullock 1962; Tullock 1981).

Other theories find the answer to multidimensional instability in parties. If legislators economize demands on their attention by relying on partisan cues to make decisions, because there are two parties, the choice space must be unidimensional. Others assume a left-right ideology and preferences are basic, and the parties are more epiphenomena. Consider the classic model by which multiple issues become integrated into a simple, unidimensional spatial model in which legislators positions are arrayed from most liberal to most conservative. Legislator positions in this situation can be considered summary preferences and be utilized to predict winning coalitions. Because unidimensional models assume bundling of issues together, ideology presents legislators with a readily available heuristic to ease decision-making across complex sets of issues. In either case, a unidimensional choice space results.

These considerations of the dimensional structure of voting generated a truly exceptional academic debate, surely one of the most productive in political science. One might trace interest in the issue back to Arrow's (1951) investigations of social choice

axioms and the concept of ‘issue cycling.’ Political scientists were introduced to such language as the ‘chaos theorems’ (McKelvey 1976), structure-induced equilibria (Shepsle 1979), and heresthetics (Riker 1990a). Basically the debaters divided themselves roughly into two camps: those who searched for ways to restore formally equilibrium analysis and those who advocated dealing directly with the instability in choice. The most fascinating interchange occurred following William Riker’s wonderful 1980 APSR essay, “Implications from the Disequilibrium of Majority Rule for the Study of Institutions” (Riker 1980a, 1980b; Ordeshook 1980; Rae 1980; Simon 1985).

Surely some dimensions of choice are more important than others. Riker later explored the potentials of thinking about choice systems as weighted multidimensional Euclidean systems. Hinich (1977) noted the special problems of what he called ‘correlated preferences,’ in which the preference axes were not orthogonal, and Jones (1994) showed how shifts in the dimensional weights in a multidimensional choice space can lead to major differences in voting outcomes. The lesson here is that in multidimensional systems both the dimensionality and the weights on those dimensions affect choice outcomes. Graverson (2004) reveals through a set of computer simulations that the essential instability in a multidimensional choice system attenuates fairly rapidly as the weight of one of the dimensions increases.

### **Is Their Dynamism in Legislative Voting?**

We don’t see any right or wrong approaches in this debate, because all participants accepted the basic instability in political choice systems. There were, however, right and wrong answers, but we don’t know what they are. The reason is that the legislative studies field chose to proceed as if the debate had never occurred, simply

going back to the safe and secure world of Duncan Black and unidimensional medians. Fundamental arguments shifted to pivot points and veto points in essentially single-dimensional choice systems (Krehbiel 1998). Again, these were important contributions, but we know of no systematic examination of the sensitivity of these results to the assumption of a stable, single-dimensional choice system. But what happens when this system breaks down? As Riker (1990b: 46) put it,

As far as I know, the candidates (or parties) and their platforms or, alternatively, the motions are all that anyone has proposed as moving parts. But nothing inherent in the model prevents other parts from moving...[Candidates] might change the space itself, distorting it by adding or subtracting dimensions or by expanding dimensions as if they were elastic.

The introduction of new issues and/or dimensions may fundamentally change the voting space and, consequently, legislative behavior. This strategic action on the part of legislators need not occur at the voting stage. Talbert, Jones, and Baumgartner (1995) find committees often hold hearings in an effort to highlight particular dimensions of an issue and build winning coalitions. The introduction of new dimensions may result in shifts in attentiveness, as problems are redefined according to different attributes. As attentiveness to these difference dimensions wax and wane, inter-temporal choice reversals may result as a previously ignored dimensions come to light (Jones 1994).

All this suggests that the dimensionality of legislative voting has important consequences for the way in which we understand decision-making in legislative institutions. As Talbert and Potoski (2002: 865) state, “the dimensional structure of the issue agenda is fundamental: If the underlying issue agenda is truly low-dimensional, there is no room for strategic entrepreneurs to shift debate venues for political

advantage.” In other word, dynamism in American politics is in some ways premised on the absence of equilibrium, or at least its absence at critical moments.

### **Issues, Positions, and Congress**

Early studies on floor voting in Congress posited an issue based dimensional structure (Clausen & Cheney 1970; Clausen 1973; Sinclair 1982). Clausen and Cheney (1970) develop a model based on two dimensions reflecting two distinct policy areas, economics and welfare. The former, they argue, reflects the partisan distinctions among members of Congress while the latter reflects constituency-based concerns.

Debates regarding the dimensionality of floor votes continued intensely but consensus began to emerge that the dimensionality of voting in Congress was low. Scholarship, however, continued to be divided over whether partisan or policy-based dimensions were more important (Wilcox & Clausen 1991). Research in this area culminated with the publication of Poole and Rosenthal’s (1997) landmark study of two centuries of congressional roll call voting. Their work strongly suggested that just one dimension was necessary to account for most votes across most time periods of U.S. history. This singular dimension, they argue, reflects the political partisanship among the parties. A second dimension reflecting regional politics and race only becomes important in two time periods and disappears after the 1970s.

Since the work of Poole and Rosenthal (1997), the debate over the dimensional structure of Congress seem to settle and scholars have generally agreed that the choice structure of floor voting centers on partisan conflict among legislators. Yet a key mistake of this research was the lack of consideration of dimensional variation among issue areas. Research on agenda setting suggests that the ways in which in issues are organized has

profound consequences for legislative behavior (Baumgartner & Jones 1993). As Hinich and Munger (1995: 2) note:

[I]ssues for which prevailing ideologies have clear implications simply change the relative position of candidates in the existing space of politics, while new issues, those for which the existing ideologies afford no guidance, transform both the shape and dimensionality of political space (Quoted in Talbert and Potowski 2002).

Poole and Rosenthal (1997) only partially address the question of dimensionality in different policy areas through an examination of the interpoint distance correlations among Clausen's (1973) five categories (government management, social welfare, agriculture, civil liberties, and foreign/defense policy). They find high correlations among these categories which, as they state, "hardly suggest that each of these clusterings of substantive issues generates a separate spatial dimension" (Poole and Rosenthal 1997: 67).

Not all substantive areas are created equal, however. Some issues are fully integrated into the partisan structure of the parties, leaving little doubt that a unidimensional model would provide a full account of voting in such areas. But, other policy areas are unlikely to exhibit such partisan policy dynamics.

We envision three scenarios when a partisan, unidimensional model would fail to explain congressional decision-making. First, the issue area may not present strategic opportunities for the party to expand their electoral coalition. Second, the issue may cross-cut traditional ideological concerns. Third, new issues may have emerged that have yet to be integrated into the partisan dimension but will eventually do so.

*Lack of Strategic Opportunities.* Parties have few incentives to take positions on issues that garner little attention from the public. As Wolbrecht (2002: 237) suggests,

“party positions are determined by the perceived value of specific issue positions for maintaining and expanding the party’s coalition of electoral support.” Instead, other coalitional dynamics will likely operate in such circumstances. For example, Hurwitz, Moiles, and Rohde (2001) reveal that agriculture policy in the House is characterized by both distributive and partisan concerns, depending on the particular issue up for consideration. Policy areas characterized by a distributive dimension are likely to exhibit higher dimensionality than those characterized by more partisan concerns.

*Cross-cutting issues.* Krehbiel (1991) suggests that “legislative choices in salient policy domains are median choices” (Krehbiel 1991: 263). Is saliency the key to understanding *which* issues become partisan? This could occur if parties unify in the face of the electoral threats associated with saliency. But, on the other hand, salience may highlight essential divisions, causing legislators to choose between party and constituency, or between one aspect of a complex problem and a second.

In the case of the recent \$700 billion bailout bill, the choice structure was bi-dimensional (Jones and Surface-Shifren 2009). Some highly salient issues may challenge partisan coalitions in new ways, as traditional conflict over redistribution and government intervention in the economy fail to adequately account for some attributes of the policy problem. Other important and highly salient recent votes that divided party coalitions include the Medicare Reform Act of 2004; the NAFTA vote of 1994. The second prong of our research program involves examining such votes to see if indeed they unify or divide party coalitions.

*New Issues.* A third pathway toward higher dimensionality is possible when new issues are introduced but have not yet been integrated into the party’s coalitions. In

Wolbrecht's (2002) account of party realignment on women's rights, she reveals how partisan divisions emerged, dissolved, and then re-emerged in altogether new fashion over a period of three decades. Some new issues are integrated into the partisan structure with ease but others violently upset traditional partisan structures, as civil rights did in the 1960s.

The key point here is that dimensionality is a *variable* that can and does change with the issues under consideration. What this means for scholars of legislative behavior is that any consideration of dimensionality requires both an understanding of preference aggregation and attention allocation. When multidimensional structures are present, attention to incoming information becomes critical to understanding the outcome of choice.

### **Changes in Dimensionality: The Research Program**

Our research program is directed at dropping the assumption of a stable, one-dimensional choice space in legislative voting systems and exploring the ramifications of this empirically. We examine issues, time, and importance. We ask the following questions:

- Does dimensionality vary by issue content?
- Does dimensionality vary by the newness of the issue—in the sense that the content of the issue has not been dealt with before?
- Does dimensionality vary by the interaction of time and issue?
- Does dimensionality vary by the importance of the issue?

In this paper we explore whether dimensionality varies by issue content, and whether there might be a content-by-time interaction. In a second paper, we address

whether important issues might call forth multidimensionality (Jones and Surface-Shifrin 2009).

In order to examine issues, however, one needs a systematic way to assess when a vote is on one issue and not another, and this assessment must be reliable across time. We make two contributions to the scholarship in this area. First, we introduce a new dataset on congressional roll call voting that documents congressional action across time and issues. This new dataset provides scholars with opportunities to consistently and reliably track congressional action across a wide range of issues. Second, utilizing this new dataset, we assess the dimensionality of roll call votes in eighteen distinct policy areas. We find what may seem unexpected to scholars in the legislative studies field—that different policy areas are characterized by differing degrees of dimensionality.

### **Content Coding of Legislative Roll Calls**

Congressional roll call voting has been a centerpiece of many studies in the field of American public policy. Despite the diversity of research topics, few scholars have attempted to examine how the attributes of different issues impact the dimensionality of legislative decision-making. A major reason so few studies to date have considered how the dimensionality of legislative roll call votes varies across different issue contexts is the lack of reliable time-series data that traces legislative activity across policy areas.

Two major roll call voting datasets have been utilized in past research, each of which includes topical coding schemes. Although, data sets of congressional roll call votes exist, none of them seek to code each vote by its policy focus, which enables scholars to select and compare activity across topics and analyze how activity on the floor relates to other venues. David Rohde and the Political Institutions and Public Choice

Program (PIPC) collected and compiled roll call voting records for the U.S. House of Representatives. The PIPC dataset includes eight meso-level categories (Symbolic, Internal, and Procedural; Appropriations; Defense; Foreign Policy; Economy, Taxes, and Budget; Energy and Environment; Government Operations; Welfare and Human Services; and Miscellaneous) and over five hundred more specific policy issues. The second major roll call voting dataset frequently used in studies of legislative behavior is the Voteview project's Congressional Roll Call Voting Records (Voteview) dataset created by political scientists Keith Poole and Howard Rosenthal. The Voteview dataset catalogues 106 policy issues of varied scope. While both of these datasets were vast undertakings in their own right, neither was created with the explicit purpose of tracking the policy content of legislative decision-making. As a result, both have major flaws from a measurement perspective.

In order to track reliably policy processes across time and policy areas, datasets must be characterized by a hierarchical system of topics, cross-time comparability, mutually exclusive categories, and a system to insure coding reliability, essentially making sure that similar items are treated similarly. Hierarchical coding schemes organize topics from general to more specific, which facilitates the grouping of similar issues together. Hierarchy also ensures that categories are of roughly similar scopes. It is impossible to track policy change reliably when comparing two categories of vastly different scope (e.g., abortion versus defense policy). Hierarchy, however, is meaningless without cross-time compatibility. As discussed by Baumgartner, Jones, and Wilkerson (2002), many public policy databases have become geared toward information retrieval and organized by key words terms and subject indices. Yet, because new

identifiers are added frequently without any attempt to update past records, it is impossible to track public policy change across time. For example, what was once civil defense is now homeland security yet tracking such policy developments in information retrieval systems becomes impossible because the vocabulary of public policy shifts over time. Third, reliable content coding schemes must code records into mutually exclusive categories. The mutual exclusivity principle makes it possible to directly compare different policy areas. Finally, all systems are characterized by coding reliability, but not all systems assess that reliability. Without such systematic assessment, the researcher cannot know whether his system consistently measures a policy, or whether he or she is studying random assignment to categories.

Studying legislative behavior from a public policy perspective requires the development of consistent and reliable datasets that track activities in different areas. The reliability and consistency of our datasets in turn depends on the content coding systems we design to track activity. Both Rohde’s PIPC dataset and Poole and Rosenthal’s Voteview datasets fail to meet the principles of hierarchy, cross-time comparability, and mutual exclusivity. Table 1 compares each of these datasets based

**Table 1. Measuring Policy Content in Legislative Decision-making**

<b>Dataset</b>	Hierarchical	Cross-Time Comparability	Mutually Exclusive	Reliabilities Reported
Rohde's PIPC Data	X		X	
Poole & Rosenthal's Issue Codes			X	
Policy Agendas Project	X	X	X	X

on these principles with the a new addition, the Policy Agendas Project’s Roll Call Voting Dataset (PAP). With nineteen major topics and over two hundred subtopics, the dataset is unique in its ability to track legislative activity consistently and reliably in different policy areas across time. Each roll call record was collected and coded based

on its policy content for every congressional session from 1948 through 2004 (N = 39,074). Inter coder reliabilities reached 80 percent at the subtopic level and over 90 percent at the major topic level (neither of the other two datasets reported inter-coder reliabilities). The resulting dataset is the most comprehensive attempt to track the agenda of congressional roll call voting.

We reconsider the dimensionality of roll call votes using this new dataset. We concentrate our attention on findings from the U.S. House of Representatives rather than both chambers. Because the institutional structure of the House provides more limitations on amendment introductions during bill consideration, we would expect the dimensionality of the chamber to be lower, on average, than that of the Senate. In this sense, to the extent that any bias is introduced because of our consideration of the House, it biases our findings in the direction of the null. Table 2 summarizes the eighteen policy

<u>Policy Area</u>	<u>N</u>
Macroeconomics	1282
Civil Rights	693
Health Care	674
Agriculture	683
Labor & Employment	951
Education	642
Environment	630
Energy	699
Transportation	927
Law & Crime	900
Social Welfare	541
Housing	503
Business & Commerce	835
Defense	2233
Science & Technology	474
Trade	474
Foreign Affairs	1691
Public Lands & Resources	1417
<b>Total</b>	<b>16249</b>

areas we analyze. The issues we consider run the gamut of policymaking in American politics. They span the relatively routine (e.g., public lands) to the intensely partisan (e.g., economics). Because we consider such a large number of issues, we are better able to assess how the dimensional structure of floor votes is shaped by the political context in which different issues are shaped.

## **Methods**

There has been much debate over the proper assumptions and empirical approaches used to examine the dimensionality of roll call votes (Heckman & Snyder 1997; Poole & Rosenthal 1997). We do not enter this debate here; instead, our choice of methodology was driven by the desire to utilize an approach widely used in the congressional literature. While Poole and Rosenthal's (1997) research did not fully settle the debate regarding the appropriate empirical approach to the study of floor votes, it represents the culmination of decades of methodological and empirical work. To maximize our empirical leverage over the questions considered here, we utilize W-NOMINATE, the methodological approach developed by Poole and Rosenthal to assess dimensionality in single congressional sessions.<sup>2</sup> NOMINATE is an estimation procedure that reduces floor votes to one or more dimensions and then identifies legislator's scores among those dimensions utilizing a logit specification. To examine differences in dimensionality across both issue areas and time, votes for each congress and policy area were scaled using the W-NOMINATE package developed for the statistical program R.<sup>3</sup>

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<sup>2</sup> Available at <http://www.voteview.org>

<sup>3</sup> For some policy areas and congressional sessions, there were too few votes to scale.

A variety of approaches may be utilized to determine the number of statistically significant dimensions with multivariate scaling techniques. Possible approaches include error reduction, the size of the eigenvalues, and variance explained. Our approach is straightforward in that we use the “elbow test” to assess the number of significant dimensions. Developed by Cattell (1966), the elbow test assesses dimensionality through the visual examination of scree plots, which plot the size of the eigenvalues against each dimension. An elbow or sharp change in curvature in the plot suggests more dimensions do little to explain variation in the data. When the visual identification of an elbow in the scree plot was not possible, we considered the size of the eigenvalues, which provide a more accurate account of statistically significant dimensions in cases where eigenvalues decrease smoothly as a function of dimensionality (see Steyvers 2001 for a discussion). All dimensions with eigenvalues larger than two were considered significant for the purposes of analysis, a more conservative benchmark than that advocated in the literature.

Because assumptions of uni-dimensionality are so widespread in the literature on congressional roll call voting, we also consider the *strength* of the first dimension in select policy areas. In Poole and Rosenthal’s (1997) research, the first dimension is interpreted as traditional partisan ideology represented by the left-right spatial continuum. Yet, as indicated above, we suspect that not all policy areas are equally characterized by partisan ideology. To assess the strength of the first dimension and, in turn, the partisanship of different policy areas, we measure the size of the eigenvalue for the first dimension relative to the total eigenvalues. This provides a measure of dimension strength that is used to test the extent to which partisanship and the uni-dimensional model that accompanies is characteristic of each of the policy areas we consider.

Using the initial assessment of dimensionality as a base, we identified three broad

**Table 3. Descriptive Statistics for Partisan, Semi-Partisan, and Messy Policy Areas<sup>a</sup>**

<b>Congress</b>	<b>Partisan<sup>b</sup></b>	<b>Semi-Partisan<sup>c</sup></b>	<b>Messy<sup>d</sup></b>
90 (1967-1968)	2.0 (0.7)	2.0 (0.0)	2.0 (1.2)
91 (1969-1970)	3.0 (0.0)	- -	- -
92 (1971-1972)	1.5 (0.5)	5.0 (0.0)	5 (0.0)
93 (1973-1974)	3.0 (1.0)	7.0 (6.2)	7.4 (5.3)
94 (1975-1976)	1.3 (0.5)	2.0 (0.0)	2.6 (0.9)
95 (1977-1978)	1.3 (0.5)	1.5 (0.6)	2.3 (0.7)
96 (1979-1980)	1.4 (0.5)	1.8 (0.5)	2.3 (0.9)
97 (1981-1982)	1.2 (0.5)	2.3 (0.6)	2.7 (0.7)
98 (1983-1984)	1.7 (0.5)	2.3 (1.0)	2.0 (0.8)
99 (1985-1986)	1.3 (0.5)	2.0 (1.0)	2.0 (0.6)
100 (1987-1988)	1.4 (0.7)	1.7 (1.2)	2.3 (0.5)
101 (1989-1990)	1.6 (0.5)	1.3 (0.5)	2.3 (0.7)
102 (1991-1992)	1.6 (0.5)	1.5 (0.6)	2.4 (1.0)
103 (1993-1994)	1.3 (0.5)	1.3 (0.5)	1.8 (0.4)
104 (1995-1996)	1.1 (0.3)	1.3 (0.5)	2.0 (0.9)
105 (1997-1998)	1.3 (0.5)	1.3 (0.5)	2.0 (0.6)
106 (1999-2000)	1.2 (0.4)	1.0 (0.0)	2.2 (0.7)
107 (2001-2002)	1.0 (0.0)	1.3 (0.5)	2.2 (0.7)
108 (2003-2004)	1.0 (0.0)	1.0 (0.0)	1.3 (0.5)

**Notes:**

<sup>a</sup> Table displays mean dimensionality for each policy category from 1967 to 2004. Standard deviations reported in parentheses. Cells with missing values indicate that scaling could not be implemented because of small vote totals.

<sup>b</sup> Includes economics, health, environment, welfare, housing, labor, and defense policy.

<sup>c</sup> Includes civil rights, education, law and crime, and commerce policy.

<sup>d</sup> Includes agriculture, transportation, science, trade, public lands, energy, and foreign affairs.

categories of policymaking: partisan, semi-partisan, and messy. Table 3 presents descriptive statistics for the three categories. Partisan policy areas were those that exhibited very low dimensionality across the time period of study. These included economics, health care, environment, social welfare, housing, labor, and defense policy. Each of the areas is characterized by a high degree of traditional left-right ideological implications— all involve government regulation, wealth redistribution, and hawk-versus-dove divisions. Semi-partisan policies were those that exhibited high dimensionality early on but have since “settled.” In this sense, these areas are trending towards a partisan organization. These included civil rights, education, law and crime, and commerce. Finally, messy policy areas were those that were generally characterized by high dimensionality and more often than not, revealed evidence of more than two dimensions. Messy policy areas included both classic pork-barrel policy issues such as agriculture and transportation and ill-defined areas such as science and foreign affairs. We explore the characteristics of these policy areas in greater depth in our findings.

## **Findings**

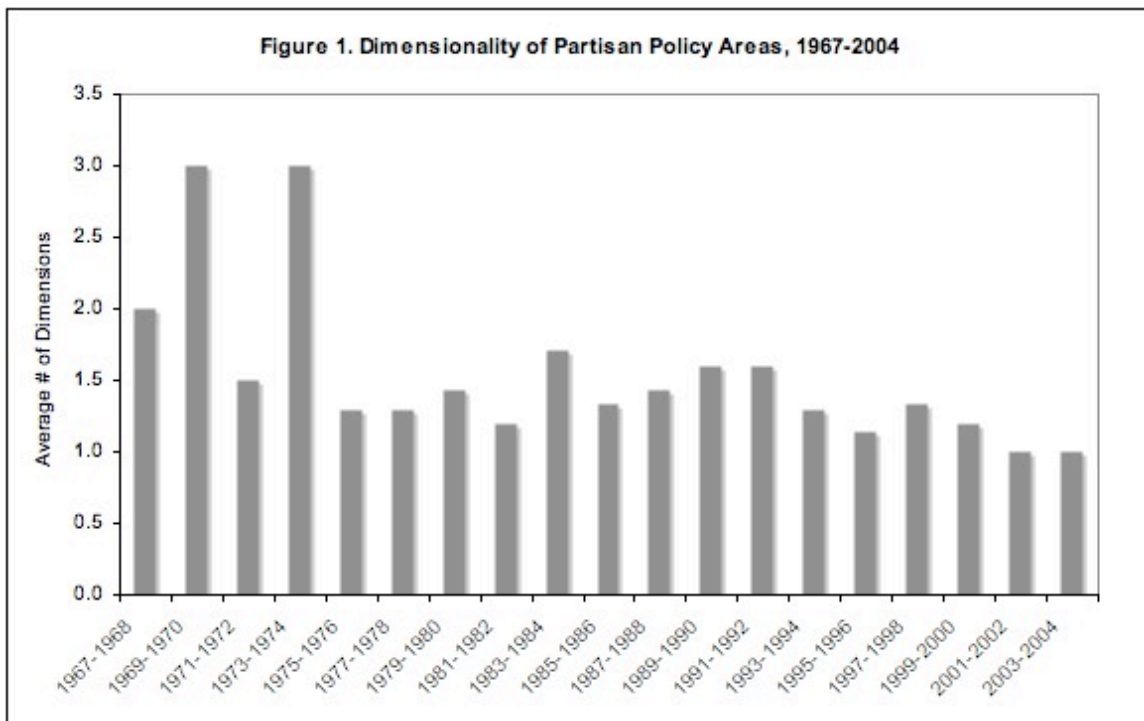
In what follows, we reconsider the dimensionality of roll call votes in eighteen different policy areas. The thrust of our hypothesis centers on how dimensionality varies across issues and time. We present aggregated results for the three broader policy areas we identified—partisan, semi-partisan, and messy policy areas.

### **Partisan Policy Areas**

Partisan politics is characterized by conflict along a relatively stable dimension— frequently interpreted as government intervention into the economy. Parties organize

partisan politics by creating a structure of belief systems that is relatively coherent. As a result, party coalitions aggregate a large number of issues into a single dimension of conflict, providing members a reliable heuristic for making decisions.

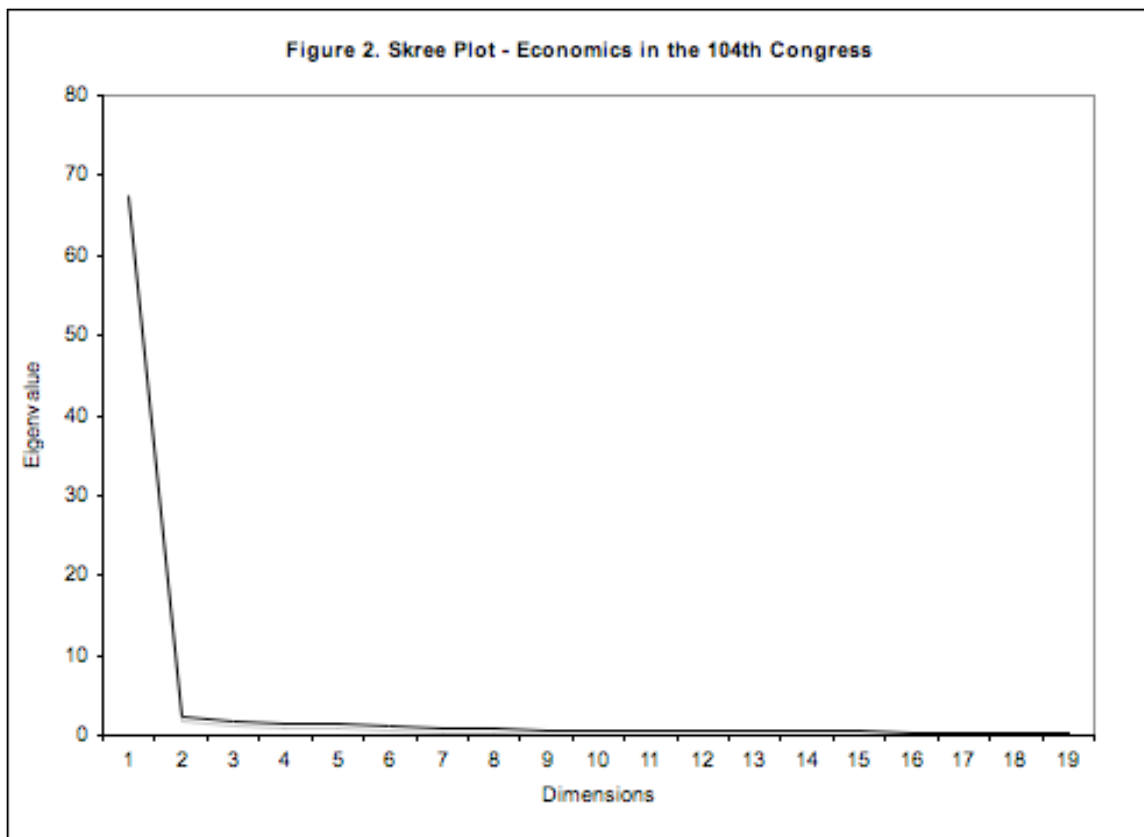
In our analysis of eighteen different policy areas, we identified just six that exhibited the low dimensionality so characteristic of partisan politics: economics, health care, environment, social welfare, housing, labor, and defense policy. Each of these policy areas were characterized by just one or two dimensions for almost every congressional session. Figure 1 plots the mean number of dimensions across every congressional session from 1967 through 2004. It reveals that for any given congressional session, the mean number of dimensions was less than two.



The two exceptions to this finding occur in the 91<sup>st</sup> and 93<sup>rd</sup> congresses. In the former, our sample is biased because just one policy area—defense—would scale using the NOMINATE methodology. Defense policy during this session of congress peaked at

three dimensions and the corresponding coordinate plot reveals that partisan identifiers do not characterize defense voting in this period. In the latter case, the case of labor policy pulls up the overall average. During this session, voting on labor issues exhibited a high dimensionality ( $D = 4$ ) and the first dimension eigenvalue captured just under eleven percent of the total, suggesting a relatively poor fit. This outlier belies the overall trends in labor policy where the mean number of dimensions is just 1.35 from 1967 through 2004.

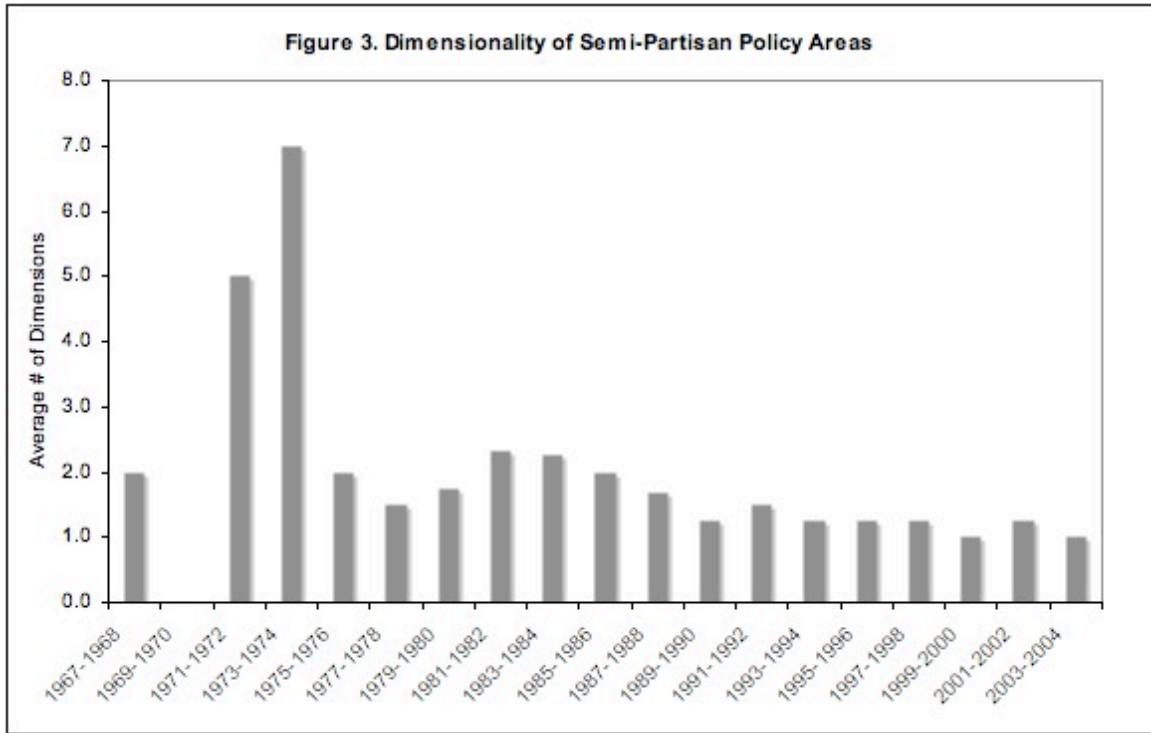
Macroeconomics is perhaps the quintessential partisan issue. Economic issues have divided the parties since the Federalist period, when conflict over taxes came to front (Poole and Rosenthal 1997). Figure 2 plots eigenvalues for the first twenty



dimensions of the 104<sup>th</sup> Congress for votes on economic issues. The scree plot reveals very clearly the low dimensional space characteristic of partisan policy areas. The first

dimension eigenvalues captures over 95 percent of the total variance and the aggregate proportional reduction error (APRE)—a measure that assesses the reduction in errors a dimension provides—is high at 0.83, consistent with the values reported by Poole and Rosenthal in their aggregate analyses.

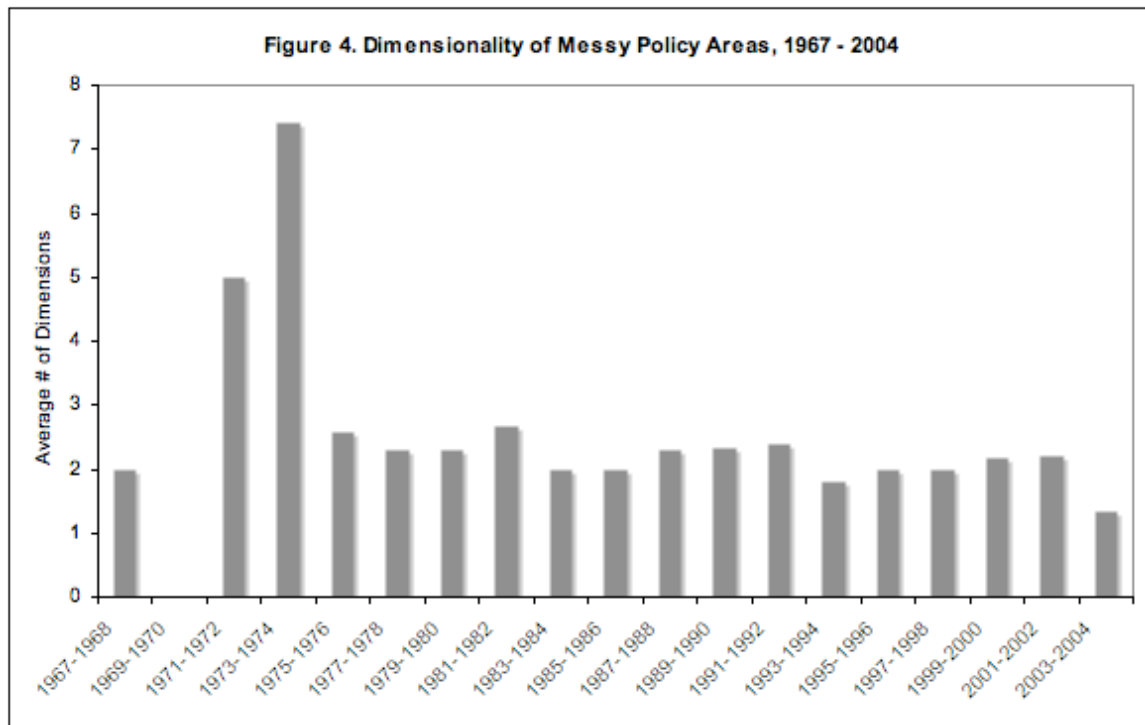
Partisan policy areas like economics confirm the dimensional structure presented in Poole and Rosenthal’s analysis of two centuries of congressional roll call voting. But not all policy areas are equally structured by partisan conflict. New issues that emerge onto the agenda sometimes take time to be integrated into the partisan structure. As a result, we would expect a dimensionality punctuated by the initial uncertainty only to settle into a more stable pattern as the partisan structure stabilizes around the new issue. Four policy areas were characterized by such a pattern: civil rights, education, law and crime, and commerce. Each of these areas were characterized by higher dimensionality, on average, than partisan policy areas but are trending towards a more partisan orientation and uni-dimensional structure. Figure 3 plots the average number of number of dimensions across these four policy areas. Dimensionality peaked during the 93<sup>rd</sup> congress (1973-1974), when the average number of dimensions exceeded five. After the early 1970s, dimensionality declined for each of the policy areas we consider reaching a low of just one dimension in the 108<sup>th</sup> congress (2003-2004). The pattern we



observe has much face validity—the late 1960s and early 1970s led to the emergence of a wide range of “new issues,” which had previously not been central to the congressional agenda (e.g., education, law and crime, civil rights). At the same time, older issues became redefined as, for example, the consumer movement provided fresh perspective on more traditional business and commerce issues.

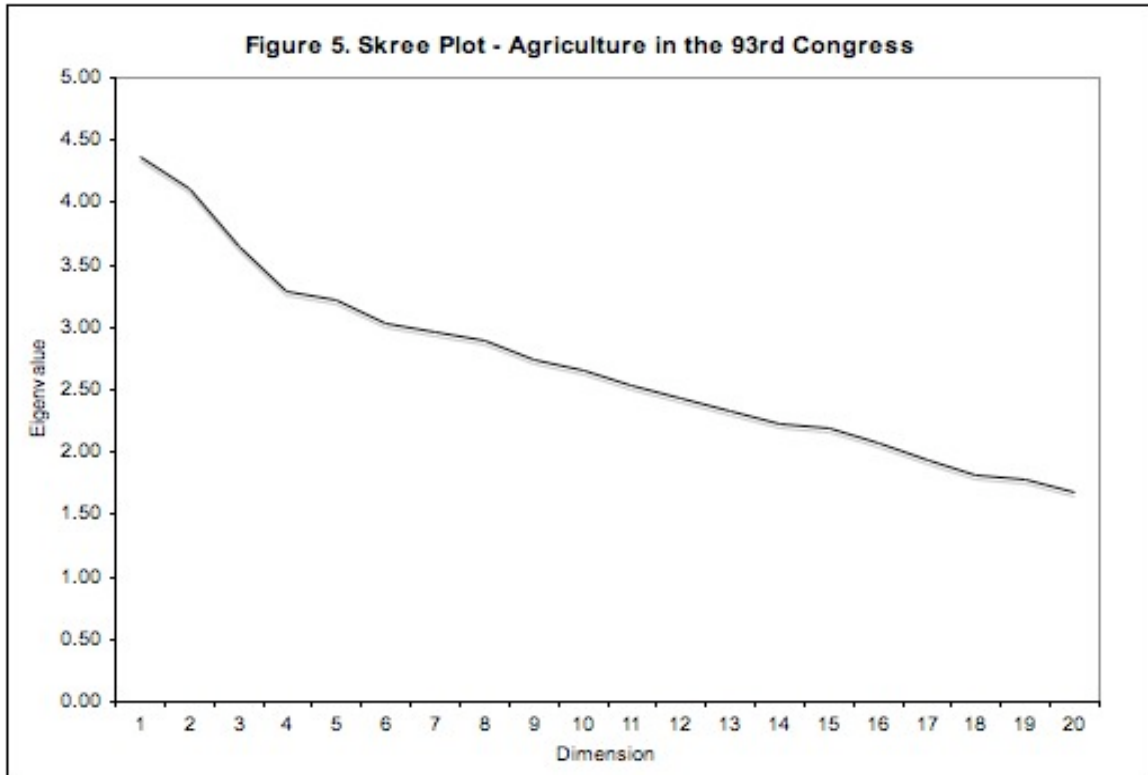
Thus far, we have considered partisan issues that are highly structured by partisan ideology and largely exhibit a uni-dimensional structure and semi-partisan issues, which exhibit higher dimensionality early on but settle into a more partisan structure during the later periods under study. Our final analyses consider “messy” policy areas—issues which tend to exhibit high dimensionality across the period. These messy policy areas include agriculture, transportation, science, trade, public lands, energy, and foreign affairs. In general, a partisan dimension does not accurately characterize messy policy

areas—although this dimension may sometimes emerge as influential depending on the issue under consideration. Figure 4 presents data on the mean number of dimensions



across the messy policy areas from 1967 through 2004. Once again, the dimensionality of this set of issues peaks in the early 1970s and declines thereafter settling around two dimensions for the remainder of the time period.

Agriculture is a particularly interesting place to explore how “messiness” looks in action. As Huritz, Moiles, and Rohde (2001) suggest, agriculture policy is characterized by both distributive and partisan issues and whether either dimension dominates depends on the characteristics of the issue, the interest group structure, and the institutional structure. Figure 5 plots the eigenvalues for the first twenty dimensions in the 93<sup>rd</sup>



congress for votes on agriculture policy issues. It reveals a very high dimensional structure, with the first eigenvalue accounting for just 14 percent of the total. Just 74 percent of legislators were correctly classified on the first dimension and APRE remains low for the first and second dimensions at 0.07 and 0.11, respectively. This finding suggests that a uni-dimensional model provides a poor fit for some policy areas and time periods. This is, of course, not always the case. Sometimes partisan issues will structure even messy policy areas as vote trading and logrolling effectively aggregates issues into the partisan structure. But the analysis presented here suggests that such aggregation is punctuated by periods of high dimensionality.

### **Conclusions**

Formal analyses show that dimensionality in a choice space adds instability to it. Yet too many current formal and empirical studies of congressional behavior assume

unidimensionality and proceed. Much of the empirical justification stems from analyses that are based on session averages, but averages can conceal.

We have begun a research program aimed at addressing where unidimensionality in legislative choice spaces breaks down. In this paper, we report the first efforts in this program. We have coded roll-calls using the Policy Agendas system, and then subjected each of the eighteen major policy issue areas to Poole's metric scaling algorithm. We find considerable variability by issue and across time.

Underlying our research program is an explicit acceptance of Riker's (1980) call to address disequilibrium in governing institutions forthrightly and directly, and a rejection of Ordeshook's (1980: 447) claim associating scientific inquiry with the search for equilibria. Only by addressing directly such processes of disequilibrium can we grasp the manner in which legislative institutions adjust (and contribute to) the vast exogenous changes that sweep modern societies.

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