Does Bicameralism Matter?

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1. Introduction

Perhaps the most conspicuous variation in modern legislatures concerns the practice of granting legislative authority to two separate chambers with distinct memberships. While the majority of national governments empower but a single chamber, at least a third of national legislatures practice some form of bicameralism as do 49 of the 50 American state governments.[1]

Scholars have made a number of arguments to explain the emergence of bicameral legislatures. One of the most common arguments for the emergence of bicameralism in Britain and its American colonies is that it helped to preserve "mixed governments," to ensure that upper class elements of society were protected (Wood 1969, Tsebelis and Money 1997). In such settings, bicameralism allowed the upper chamber, dominated by aristocrats, to have a veto on policy. More generally, an explicit role of some bicameral systems has been the protection of some minority who is overrepresented in the upper chamber.

A second rationale for bicameralism is the preservation of federalism. The United States, Germany, and other federal systems use a bicameral system in order to ensure the representation of the interests of individual states and provinces, as well as the population

[1] Tsebelis and Money (1997, 15) define bicameral legislatures as "those whose deliberations involve two distinct assemblies." This definition, however, masks considerable variation in the roles of each chamber in policymaking. Many "upper" chambers have legislative prerogatives that are limited in important ways; for instance, the British House of Lords is unable to originate monetary legislation and, at best, can delay bills for a year rather than permanently veto those they disagree with. For our purposes, we wish to define bicameralism more narrowly. We define bicameralism as the requirement of concurrent majority support from distinct assemblies for new legislation. It is important to note that our definition treats concurrent majorities as a necessary, but not sufficient, condition for enacting legislation. Thus, it does not preclude other legislative procedures or constitutional requirements, such as the signature of the executive or supermajoritarianism within one of the chambers. Our definition does not map cleanly onto Lijphart's (1984) distinction between strong and weak bicameralism. His dichotomy classifies systems where both chambers have similar constituent bases as weak even if they required concurrent majorities.

of the country. Under "federal bicameralism", the lower house is typically apportioned on the basis of population, while the upper house is divided amongst the regional units. Some countries, such as the United States, provide equal representation for the states regardless of their population or geographic size, while others, like the Federal Republic of Germany, unequally apportion the upper chamber by providing additional representation to the larger units.

However, despite its prominence, the role of bicameralism in contemporary legislatures has not received the scholarly attention that other legislative institutions have. In this essay, we review and analyze many of the arguments made on behalf of bicameralism using the tools of modern legislative analysis -- the spatial model, multilateral bargaining theory, and games of incomplete information.[2] Importantly, this analytical approach allows us to distinguish the effects of bicameralism from those of the institutional features which are often packaged with it, such as supermajoritarian requirements, differing terms of office, and malapportionment. We also review existing evidence of bicameralism's effect on policymaking.

2. Spatial Models of Policymaking

The spatial model of policymaking has become the workhorse model in the study of legislative institutions. Its stark parsimony makes tractable the analysis of a number of institutional arrangements. Such models have proven quite useful in studying the consequences of bicameralism and other multi-institutional policymaking settings (i.e., Tsebelis and Money 1997, Ferejohn and Shipan 1990).

[2] We will not review the arguments about the role of bicameralism in the formation and duration of parliamentary cabinets (Druckman and Thies 2002, Diermeier, Eraslan and Merlo 2003).

Before we draw out the implications for bicameralism, consider a baseline unicameral model. Assume that a unicameral legislature has an odd number of members, n, with ideal points, x_i , arrayed along a single ideological dimension represented by the real line. We index the ideal points from left to right so that x_1 is the leftmost member and x_n is the rightmost member. The legislature seeks to pass legislation to change a policy with a status quo q , which is also represented by a point on the spectrum. We assume that each legislator has single-peaked, symmetric preferences so that member i weakly prefers y to z if and only if $|y - x_i| \leq |z - x_i|$. The standard prediction, based on Black's theorem, is that the outcome of this type of chamber would lie at the ideal point of the median legislator x_m where $m = \frac{n+1}{2}$. Any other policy outcomes could be defeated by some other policy proposal in a pairwise majority vote. This outcome is independent of the status quo location, q .

Krehbiel (1998) and Brady and Volden (1997) have extended the insights of the simple spatial model into multi-institutional settings. Krehbiel's formulation, dubbed "Pivotal Politics," is based on the interaction of 'pivotal' legislators. A legislator is pivotal if her support is necessary for the passage of new legislation giving the institutional structure of the policymaking process and the distribution of preferences.

Krehbiel's model can easily be modified to accommodate bicameralism and concurrent majorities. To do so, consider a basic spatial model with two legislative chambers with sizes n_1 and n_2, both odd. Under concurrent majoritarianism, any revision to the status quo must receive majority support in both chambers. Let

$m_1 = \frac{n_1 + 1}{2}$ and $m_2 = \frac{n_2 + 1}{2}$. It is easily seen that if m_1 prefers the status quo q to some proposal y, a majority of chamber 1 will also prefer q to y. Thus, m_1's support is necessary or "pivotal" to the passage of any revision to q. Similarly, m_2 is pivotal in chamber 2.

Since m_1 and m_2 must agree to any policy change, the model predicts that any status quo in the interval $\left[\min\left\{x_{m_1}, x_{m_2}\right\}, \max\left\{x_{m_1}, x_{m_2}\right\}\right]$ cannot be legislated upon. Any attempt to revise q would be vetoed by one of the chamber medians.

However, when the status quo is outside this "gridlock interval", the two chambers will prefer to enact new legislation. Clearly, the new legislation will lie in the $\left[\min\left\{x_{m_1}, x_{m_2}\right\}, \max\left\{x_{m_1}, x_{m_2}\right\}\right]$ interval, because otherwise some other policy proposal will be strictly preferred by some concurrent majority. The pivotal politics model does not give specific point predictions about which policies will be adopted when q is outside the gridlock interval. Such predictions will depend on specific protocols for inter-branch bargaining such as differential rights of initiation and procedures for the reconciliation of differences such as the conference committee.[3]

While quite simplistic, this model demonstrates two of the arguments which are forwarded in support of bicameral systems. The first is that bicameralism may lead to more stable policies. When the medians of the two chambers diverge such that $\left[\min\left\{x_{m_1}, x_{m_2}\right\}, \max\left\{x_{m_1}, x_{m_2}\right\}\right]$ is a non-empty set, a set of policies will be stable in the presence of small electoral shocks which shift the chamber medians. Riker (1992)

[3] See Tsebelis and Money 1997 for models of inter-chamber reconciliation procedures.

espouses this stability argument as a rationale for bicameral institutions.[4] Also apparent from this illustration is that bicameralism requires compromise agreements between the majorities of each chamber. Policy outcomes will lie in the interval between the two chamber medians. This compromise effect lies at the heart of arguments about the presence of bicameralism in federal and consociational democracies (Lijphart 1984).

While theoretically compelling, the stability and compromise rationales depend on a degree of preference divergence across branches. Without a systematic difference between x_{m_1} and x_{m_2}, few compromises between the chambers are likely to be stable. Thus, if stability and compromise were the constitutional designer's objective, one would expect to see bicameralism operate in conjunction with different electoral rules for each chamber. In many cases, the electoral bases and procedures differ dramatically across chambers as in the U.S. or Germany. However, many systems have chambers with 'congruent' preferences (Lijphart 1984) such as those which prevail in the American state legislatures, especially following Baker v. Carr which eliminated many malapportioned upper chambers. Even allowing for idiosyncratic differences in chamber medians, unicameralism and congruent bicameralism should produce nearly identical results. While short term policies would fluctuate based on the preferences of these two medians, long run policies would locate at the expected median – the same outcome which occurs in a unicameral legislature.

One objection to this purely preference based model of bicameralism is that it ignores the role that political parties might play in the policymaking process (e.g. Cox

[4] More specifically, Riker argues that multicameralism allows for simple majority rule when an issue is one-dimensional and a median-voter equilibrium exists, but discourages decisions for multidimensional issues – where an equilibrium is unlikely to exist.

and McCubbins 2003, and Chiou and Rothenberg 2003). Cox and McCubbins suggest a model of partisan gatekeeping which produces a unicameral gridlock interval between the ideal point of the median member of the majority party and the chamber median. Therefore, if we let x_{Ji} be the ideal point of the median member of the maJority party of chamber *i*, the gridlock interval within chamber *i* is $\left[\min\left\{x_{Ji}, x_{mi}\right\}, \max\left\{x_{Ji}, x_{mi}\right\}\right]$. Since policy change requires that *q* not fall in either gridlock interval, the bicameral gridlock interval is simply the union of both chamber intervals and the non-partisan gridlock interval or $\left[\min\left\{x_{J1}, x_{J2}, x_{m_1}, x_{m_2}\right\}, \max\left\{x_{J1}, x_{J2}, x_{m_1}, x_{m_2}\right\}\right]$. Clearly, this partisan gridlock interval will be largest when the majority party member of one chamber lies to the right of the median while the other lies to the left. Generally, this will occur when the different parties control the different chambers.

The spatial model can also incorporate a number of features that are often associated with bicameralism such as supermajority requirements for one of the chambers. Now assume that chamber 2 requires $k > \frac{n_2 + 1}{2}$ to pass new legislation. This requirement now makes members k and $n_2 - k$ pivotal for changes to the status quo. Therefore, the gridlock interval is $\left[\min\left\{x_{m_1}, x_{n_2 - k}\right\}, \max\left\{x_{m_1}, x_k\right\}\right]$. It is easy to see that supermajoritarianism will increase the gridlock interval. However, in cases where the two chambers are reasonably congruent, supermajoritarianism will cause m_1 to no longer be pivotal, making one chamber, in some sense, redundant. Perhaps more importantly, this analysis shows that the key features of bicameralism, stability and compromise, can

be obtained by unicameral legislatures with suitably chosen supermajority procedures. The spatial model provides no rationale for choosing one institution over the other.

2.1 Spatial Models of Malapportionment

Given that our review of spatial models suggests that bicameralism should matter only when the chambers are apportioned differently, the obvious question is: under what circumstances would malapportionment be a reasonable constitutional design. Such an answer is provided in a recent paper by Crémer and Palfrey (1999). They consider a model where the citizens of various jurisdictions must decide on a level of centralization and representation at a constitutional phase, taking into full account what policy outcomes will result from the constitutional choice.

Centralization is modeled as the extent to which the policy outcome varies across jurisdiction. With complete centralization, the policy outcome in each jurisdiction is identical whereas with decentralization each jurisdiction sets its own policy. Since Crémer and Palfrey assume that there is incomplete information about voter preferences, risk averse voters will prefer some centralization in order to reduce variation in policy outcomes. When selecting the type of representation, voters choose the weights that final outcome will place on the outcome of district elections. In the case of *population representation*, the weights are proportional to district population. In *unit representation*, each district receives the same weight, regardless of population.

Crémer and Palfrey show that:

- Voters with extreme policy preferences (relative to the expected median of the centralized polity) prefer completely decentralized policymaking. The greater

opportunity to get the policy they want from their district outweighs the variance reduction afforded by centralization.

- Moderate voters (those close to expected median) are unanimously opposed to population representation for any level of centralization. This is because the unit rule uniquely minimizes the variation in centralized policy.
- Given high levels of centralization, extreme voters from large districts will prefer some population representation. This increases their voting weight in the centralized legislature which move policy back towards their ideal point.
- Conversely, as long as the level of centralization is sufficiently low, moderate voters from small districts will prefer population representation because this reduces the influence of extreme small districts on the centralized component of policy. This is the functional equivalent of ceding additional sovereignty to the center.

Given these preferences, they examine the voting equilibria in the constitutional stage. If a majority rule equilibrium exists[5], they show that it involves representation based solely on the unit principle. However, if the level of centralization is fixed and representation is voted on separately, the "conditional" voting equilibrium generates representation which is a mix between the population and unit principles. The rationale is that if centralization is fixed, extreme voters from large districts and moderate voters from small districts will vote in favor of positive levels of population representation.

[5] In this context a majority rule equilibrium is a combination of centralization and representation for which no other combination is preferred by a majority.

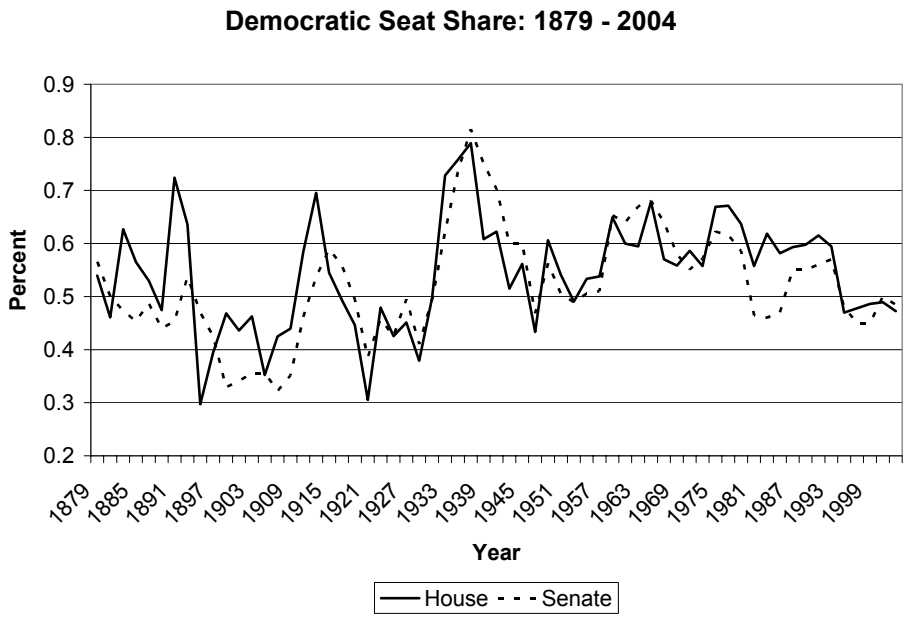
The Crémer-Palfrey model provides a reasonable micro-foundation for endogenously malapportioned legislatures. However, it falls short of a rationale for bicameralism because it "black boxes" the legislative institutions that make centralized policy. Thus, it is plausible that a malapportioned unicameral legislature could provide the representational foundation for greater centralization just as well as two chambers based on different representational principles.

2.2 Evidence

The key prediction of the unidimensional spatial models of policymaking is that bicameralism matters only when preferences of each chamber are dissimilar. In the context of American politics, there have been important periods in which preferences diverged dramatically across chambers. For example, the antebellum "balance rule" pairing the admission of slave and free states contributed to the Senate being significantly more pro-slavery than the House (Weingast 1998). After the war, the admission of low-population Republican states in the West gave the Republicans a significantly larger advantage in the Senate (Weingast and Stewart 1992).[6] Generally, however, the chambers have been quite congruent in their preferences. Figure 1 shows the percentage of seats in both chambers held by Democrats since the restoration of the two-party system at the end of Reconstruction.

[6] McCarty, Poole, and Rosenthal (2000) find, however, that the substantive effect of the Republican "rotten boroughs" is small and short-lived.

Figure 1

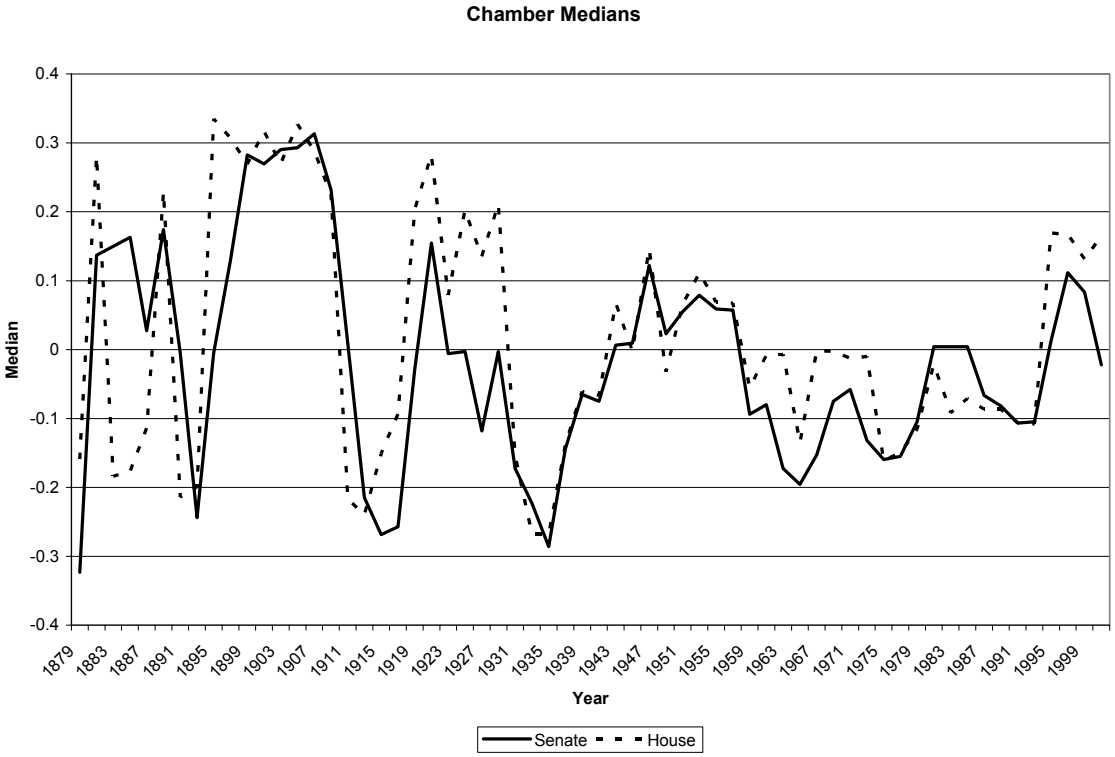


There are only two periods in which the seat shares diverge significantly for an extended period of time. The first is the aforementioned post-Reconstruction Republican bias in the Senate. The second is that caused by Republican control of the Senate following Ronald Reagan's election in 1980. However, congruency was almost completely restored after the 1986 election when most of the Republican freshman class was defeated.

If we look at measures of the median preferences of both chambers, we find almost the same pattern. Figure 2 plots the 1st dimension, common space–adjusted DW-NOMINATE score for each chamber's median.[7]

[7] For a discussion of common space-adjusted DW-NOMINATE scores, see McCarty, Poole, and Rosenthal 1997 and Poole 1998. The first dimension captures each legislator's position on a liberal-conservative scale which runs roughly from -1 (very liberal) to 1 (very conservative).

Figure 2

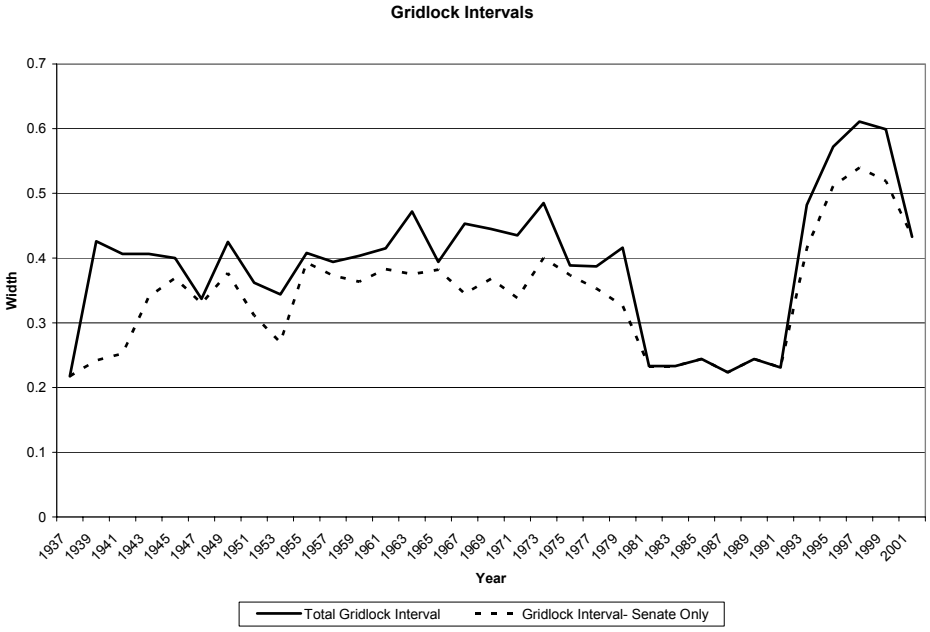


Based on preference measures, there are three additional periods of incongruence caused by more conservative Houses during the 1920s, 1950-1960s and following the 1994 ascendancy of the Republicans to the majority. The conservative bias of the House in the 1920s is accounted for by the number of progressive Republicans in the Senate. During the 1950s and 1960s, southern Democrats caused the House to be more conservative than the Senate. Similarly, the large number of conservatives who entered the House in 1994 explains the contemporary difference.

Given Krehbiel's arguments about the U.S., perhaps the relevant effect of bicameralism should be measured in term of the contribution of the House to the gridlock interval. The House will only have a positive contribution to gridlock so long as its

override pivots are more extreme than those of the Senate. In Figure 3, the solid line plot the gridlock interval from 1937 to 2001 using common space-adjusted DW-NOMINATE scores. The dotted-line shows what the width of the gridlock interval would have been in the absence of the House. Thus, clearly the House generally makes a small contribution to gridlock except in the 1980s. However, most of the variation in the gridlock interval is due to the Senate preferences.

Figure 3

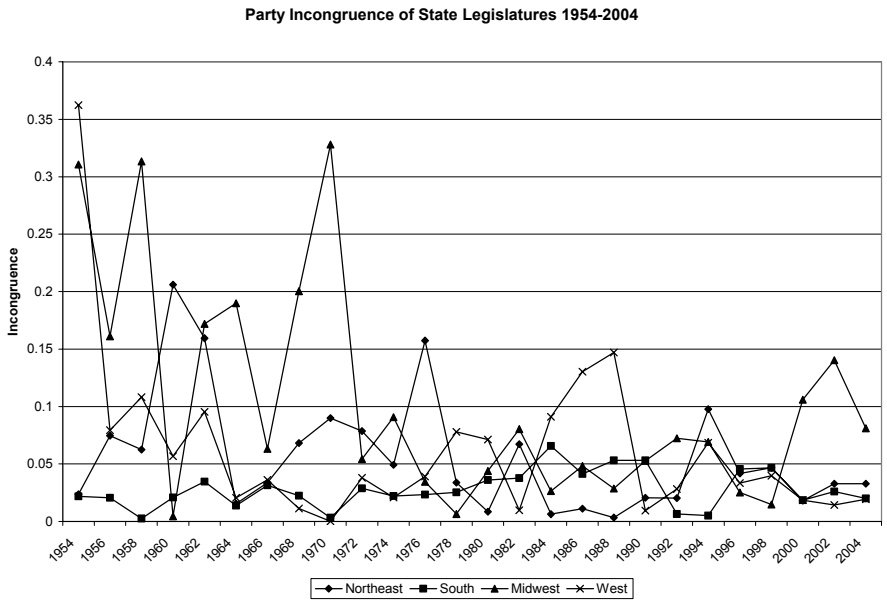


The two series are correlated at the .9 level. If we computed the gridlock interval in the absence of the Senate, the House gridlock interval correlates with the actual interval at only the .25 level. Thus, the pivotal politics model predicts that the effects of bicameralism at the national level should be small.

Now we consider the implications for U.S. state legislatures. Not surprisingly, state legislatures in the U.S. are quite congruent as well. In figure 3, we plot a measure of *partisan incongruence* for each region in each year since 1954. This measure is simply

$$PI = \left| \frac{\%Dems\ Lower\ House}{\%Dems\ Upper\ House} - 1 \right|$$

Thus, it takes on a value of 0 when the partisan composition is identical across chambers. Before Baker v. Carr, Republicans were often overrepresented in upper houses outside the South. However, after the implementation of one person-one vote, there is no systematic tendency for partisan incongruence.



Unfortunately, we lack measures of preference estimates at the replicate our analysis of the national level, but it seems likely that the implications for bicameralism will be the same.

While inter-chamber differences are small, this does not preclude the possibility that variation in these differences has important consequences for policy. However, few studies have looked at the effect of inter-chamber differences. Binder (1999, 2003) finds that the differences in chamber preferences are negatively correlated with her measure of legislative production in the post-War II period. In her 1999 paper, she measures

"bicameral differences" as the differences in chamber medians using W-NOMINATE scores. However, these scores are not generally comparable across chambers. Her measure correlates only weakly with those derived from scores that facilitate inter-chamber comparisons. In her 2003 book, Binder uses a new measure of bicameral differences based on agreement scores on conference reports. However, there is some circularity in the argument that legislative production is higher when the House and Senate vote similarly on conference reports. In addition conference reports are a highly selected sample since a mere twenty percent of bills go to conference (Longley and Oleszek 1989).

Chiou and Rothenberg (2003) also test several gridlock models fully incorporating bicameralism and partisan effects. They find very little evidence of effects attributable solely to bicameralism. Looking at the state level, Rogers (2003) looks at the effects on legislative productivity of moving from a bicameral legislature to a unicameral one, and vice versa. Unfortunately, he is able to examine only four cases and finds mixed evidence across the cases. Thus, the question of the importance of inter-chamber differences in U.S. policymaking remains somewhat contested.

3. Multidimensional Spatial Models

Some authors have stressed the role of bicameralism in ameliorating the intransitivity of majority rule (McKelvey 1976, Schofield 1978). These authors have focused on the question of whether or not it can produce a core or reduce the size of the

uncovered set in the absence of a Condorcet winner in a unicameral legislature.[8] Cox and McKelvey (1984) demonstrate that the necessary condition for the existence of a core in a multicameral legislature is the incongruence of the median preferences across chambers. In a unidimensional setting, the core will exist and will be the interval connecting the medians of the two chambers – the same as the gridlock interval we extracted from the Pivotal Politics model. Hammond and Miller (1987) extended this line of analysis and deduced the necessary conditions for the core in two-dimensions. They define a bicameral median as a line which divides the legislature such that a majority of the members of both chambers lie on either side of the line (including the line itself). They show that the core exists if only one bicameral median line exists. Typically, this condition will not be met if there is preference congruence between the chambers. Furthermore, Tsebelis (1993) proves the generic non-existence of the core when the policy space is larger than two dimensions. Because the conditions for bicameralism to generate a core are so demanding, Tsebelis focuses on the weaker solution concept of the uncovered set. Unlike the bicameral core, the bicameral uncovered set is guaranteed to exist. He shows that the bicameral uncovered set is always at least as big as the unicameral uncovered set.

3.1 Evidence

Heller (1997) uses the multidimensional spatial model to explore differences in fiscal policy between unicameral and bicameral systems. He argues that the gridlock

[8] The core is the set of alternatives that cannot by some other alternative given the voting rule. The uncovered set is based on the covering relation: some alternative *y* "covers" *x* if *y* defeats *x* according to the voting rule and if the set of points that defeat *y* is strictly smaller than the set of points that defeat *x*. The uncovered set is the set of points are not covered by some other alternative.

caused by bicameralism is often overcome by higher levels of government spending. He tests this claim on 17 parliamentary systems from 1965 to 1990 and finds that bicameralism is associated with higher annual government deficits budget deficits. However, his study has two important limitations. First, he does not disaggregate annual deficits into their expenditure and revenue components. Thus, his claim that bicameralism causes excessive spending growth cannot be tested against the alternative theories that bicameral gridlock constrains revenue. Second, the implication of his model that the effect of bicameralism should be greater, the less congruent the chambers is not tested. In his 2001 article, Heller supplements the multidimensional model with partisan incentives for logrolling. He concludes that bicameral systems where the chambers have similar partisan compositions should generate high levels of logrolling and therefore spend more and produce larger deficits. He tests this prediction on nine bicameral parliamentary governments and finds that deficits and expenditures are negatively correlated with a number of measures of partisan differences across chambers.

Given the problems of testing multidimensional models on observational data, Bottom et al (2000) use laboratory experiments test the existence of a bicameral core. Their results provide support the stability-inducing properties of bicameralism, but the external validity of such experiments is hard to substantiate.[9]

4. Bicameralism and Distributive Politics

[9] There are two major difficulties in testing social choice models in the laboratory. The first is that, while social choice models are institution free, experiments must have protocols for proposal making and voting. The second problem is that it is difficult to know whether or not laboratory conditions (such as congruence) match real world conditions.

Given its historical rationale as an institution to provide benefits for specified classes and groups, a natural question to ask is whether bicameralism is an effective way of engineering particular distributive outcomes.

A number of distributive implications for bicameralism and related institutional arrangements can be derived from the legislative "divide-the-dollar" bargaining games pioneered by Baron and Ferejohn (1989). Before discussing specific models addressing bicameralism, we review the basic framework.

Assume that a legislature with N (an odd number) members must allocate one unit of resources (i.e., a dollar). Baron and Ferejohn consider bargaining protocol with a random recognition rule under which at the beginning of each period one of the players is selected to make a proposal. Let p_i be the probability that legislator i is selected to make the proposal, and we assume that this probability of recognition is constant over time. We will focus on the "closed rule" version of the model where the proposer makes a take-it-leave-it offer for the current legislative session. The proposer in each period makes an offer $(x_1, x_2, ..., x_N)$ such that x_i is the share for player i and we require $\sum_{i=1}^{N} x_i = 1$. If a simple majority, $n = \frac{N+1}{2}$, vote for the proposal it passes, the benefits are allocated, and the game ends. If this proposal is rejected, a new proposer is chosen at the beginning of the next session. All players discount payoffs secured in future sessions by a factor δ.

This game has lots of subgame perfect equilibria. In fact, for sufficiently large N and δ, there is a subgame perfect equilibrium that can support any division of the dollar. Thus, Baron and Ferejohn and subsequent authors generally limit their analyses to stationary equilibria. A stationary equilibrium to this game is one in which:

1. A proposer proposes the same division every time she is recognized regardless of the history of the game.
2. Members vote only on the basis of the current proposal and expectations about future proposals. Because of assumption 1, future proposals will have the same distribution of outcomes in each period.

Let $v_i(h_t)$ be the expected utility for player *i* for the bargaining subgame beginning in time *t* given some history of play, h_t. This is known as legislator *i*'s *continuation value*. Given the assumption of stationarity, continuation values are independent of the history of play so that $v_i(h_t) = v_i$ for all h_t, including the initial node h_0. Therefore, the continuation value of each player is exactly the expected utility of the game. Finally, we will focus only on equilibria in which voters do not choose weakly dominated strategies in the voting stage. Therefore, a voter will accept any proposal that provides at least as much as the discounted continuation value. Therefore, any voter who receives a share $x_i \geq \delta v_i$ will vote in favor of the proposal while any voter receiving less than δv_i will vote against.[10] Thus, the proposer will allocate δv_i to the *n* members with the lowest continuation values.

As a benchmark for comparison with the models that we discuss below, consider the case where all members have the same recognition probability so that $p_i = \frac{1}{N}$ for all

[10] The requirement that legislators vote in favor of the proposal when indifferent is a requirement of subgame perfection in this model.

i. In this case, the unique expected payoffs from the stationary subgame perfect equilibrium are $v_i = \frac{1}{N}$. Thus, the dollar is split evenly in expectation.

4.1 Concurrent and Supermajoritarianism

McCarty (2000) considers an extension of the Baron-Ferejohn model to study the distributional effects of concurrent majorities and a number of other features associated with bicameralism. He assumes that there are two chambers, 1 and 2, with sizes $m_1 + m_2 = N$. A proposal must receive at least k_i in chambers $i = 1, 2$ to pass. In each period, a proposer is selected at random where each member of chamber *i* is selected with probability p_i. Thus, the proposal probabilities are constant within chambers, but may vary across chambers. This may reflect constitutional provisions that give certain chambers an advantage in initiating certain types of legislation. McCarty derives the ratio of the expected payoffs for a member of chamber 1 to a member chamber 2, $r_{12} = \frac{v_1}{v_2}$, as a function of the key parameters k_i, m_i, and the chamber-specific time discount factor δ_i. His model predicts that

$$r_{12} = \frac{p_1\left(1 - \delta_2 \frac{k_2}{m_2}\right)}{p_2\left(1 - \delta_1 \frac{k_1}{m_1}\right)}$$

From this equation a number of implications about bicameralism can be derived. For our purposes, the most important is that the size of the chamber, m_i, does not have an effect independent of the chamber's majority requirement k_i. If $\frac{k_1}{m_1} = \frac{k_2}{m_2}$ (as would be

the case if both chambers were majoritarian), the relative payoffs depend only on the allocation of proposal power and the discount factors. If both chambers are co-equal in their ability to initiate legislation and discount the future equally, the requirement of concurrent majorities does not have distributive implications. Therefore, the fact that upper chambers are generally smaller does not make it more powerful. This prediction stands in direct contrast to "power indices" such as those of Shapley and Shubik (1954). Such indices are based on the assumption that all winning coalitions are equally likely, therefore members of the smaller chamber are more likely to be included. In the McCarty model, legislative proposers choose majorities in each chamber to minimize the total costs. Thus, competition to be included in the majority coalition for the chamber eliminates any small chamber advantage.

While his model predicts that concurrent majoritarianism does not have distributive consequences, a chamber's use of supermajority requirements such as the U.S. Senate's cloture provision benefits its members. In this sense, the model's results are very similar to those of Diermeier and Myerson (1999), who argue that, in a bicameral system, each chamber would like to introduce at least as many internal veto points as the other chamber. It is also consistent with our argument we derived from from the pivotal politics model that supermajoritarianism is more consequential than concurrent majorities.

Secondly, note that the relative payoffs of chamber 1 to chamber 2 are increasing in p_1 and decreasing in p_2. Thus, constitutional procedures that give different chambers differential rights to initiate legislation have distributional consequences.

Finally, consider the implications of time discounting. *Ceteris paribus*, the chamber whose members have the highest discount factors get more of the benefits. Since one would naturally assume a correlation between the discount factor and term length, a chamber whose members are elected for longer terms should get more of the dollar.

A limitation of McCarty's model is that it implicitly assumes that legislators represent disjoint constituencies whereas in actual bicameral systems voters are typically represented on both levels. Ansolabehere, Snyder, and Ting (2003) (which we discuss in more detail in a later section) develop a distributive model of bicameralism which incorporates dual representation. Consistent with McCarty, they find that, absent malapportionment or supermajoritarianism, per capita benefits are equal for all voters.

4.2 Bicameral Pork

Sequential choice models can also be used to make predictions about the extent to which bicameral legislatures will be more or less fiscally prudent than unicameral legislatures. In this section, we extend the models of Baron and Ferejohn (1989) and McCarty (2000) to determine which system is most likely to pass legislation whose total costs exceed total benefits.

Consider a set of possible spending proposals with varying levels of aggregate benefit B and total cost T. Following the same closed rule described in the previous section, a proposer is selected in each period to propose an allocation of B under closed rule. If the proposal passes, the benefits are allocated according to the proposal and each legislator pays the same per capita tax, $t \equiv \frac{T}{N}$. If the proposal fails, no benefits are

allocated, discounting occurs with a common factor δ, and a new proposer is selected in the next period.

As above assume that there are two chambers with memberships m_1 and m_2 where $m_1 + m_2 = N$. Further, we assume that k_1 and k_2 votes are required in each chamber for passage. To keep notation simpler, $q_i = \frac{k_i}{m_i}$ be the required proportion of votes for passage in each chamber. Again we focus on symmetric stationary equilibria and eliminate weakly dominated strategies. Therefore, a member of chamber *i* will vote in favor of any proposal for which the net benefits must exceed the discounted continuation value i.e. $x_i - t \geq \delta v_i$.

As a benchmark for comparison, consider a unicameral legislature requiring $k_1 + k_2$ of N votes. This is simply a fusion of the two chambers and their voting rules. A direct application of Baron and Ferejohn (1989) shows that any project such that

$$\frac{B}{T} > \frac{(1-\delta)(k_1 + k_2)}{N - \delta(k_1 + k_2)}$$

will be enacted in a unicameral chamber. Note that this critical benefit-cost ratio is less than 1 since $N > k_1 + k_2$. Thus, the unicameral legislature enact many inefficient programs where $B < T$.

Now we consider whether bicameralism increases or decreases the tendency to enact inefficient projects. For a proposal to pass, a proposer from chamber 1 must obtain $k_1 - 1$ other votes from chamber 1 (she will vote for her own proposal) and k_2 votes from chamber 2. A proposer from chamber 2 has to build the analogous coalition. Since each vote costs $\delta v_i + t$, the net benefits of proposing are

$$z_1 = B - (k_1 - 1)(\delta v_1 + t) - k_2(\delta v_2 + t) - t \quad (1)$$

$$z_2 = B - k_1(\delta v_1 + t) - (k_2 - 1)(\delta v_2 + t) - t \quad (2)$$

for proposers from chambers 1 and 2 respectively.

Now we can compute the continuation values for members of each chamber. Assuming that proposers randomize across members when indifferent, we can show that

$$v_1 = \frac{1}{N}(z_1 + \phi_1 \delta v_1) - \left(1 - \frac{\phi_1}{N}\right)t \quad (3)$$

$$v_2 = \frac{1}{N}(z_2 + \phi_2 \delta v_1) - \left(1 - \frac{\phi_2}{N}\right)t \quad (4)$$

where $\phi_1 = k_1 - 1 + \frac{m_2}{m_1}k_1$ and $\phi_2 = k_2 - 1 + \frac{m_1}{m_2}k_2$ are the probabilities that each member of chamber 1 (2) is selected. Note that simple algebra reveals that $\phi_i = q_i N - 1$.

From these equations, it can be verified that

$$[1 - \delta q_1]v_1 - [1 - \delta q_2]v_2 = (q_1 - q_2)t$$

and

$$m_1 v_1 + m_2 v_2 = B - T$$

The key for determining whether or not a proposal will pass is to verify that it is rational for the proposer to make a proposal. This rationality condition is $z_i \geq \delta v_i$ for *i*=1,2. Otherwise, the proposer would do better by not making a proposal.

Consider the case where both chambers use the same voting rule so that $q_1 = q_2$. Then the only solution to these equations (1) to (4) is $v_1 = v_2 = \frac{B - T}{N}$ which implies that $z_i \geq \delta v_i$ if and only if

$$\frac{B}{T} > \frac{(1-\delta)(k_1 + k_2)}{N - \delta(k_1 + k_2)}$$

This is exactly the same threshold as the unicameral case. Thus, if both chambers have the same recognition probabilities and voting rules, there is no difference between bicameralism and unicameralism when it comes to the pork barrel. This contradicts the predictions that Heller (1997) derived from the multi-dimensional spatial model.

A full analysis of the bicameral pork game is beyond the scope of this chapter. However, this sketch suggests that, as we saw in the purely distributive game, any effect of bicameralism must depend on voting rules that vary across chambers, asymmetric recognition probabilities, or as we discuss in the next section, malapportionment.

4.3 Malapportionment

Distributive legislative models also speak directly to the effects of malapportionment. As we discussed above, the unique stationary subgame perfect equilibrium of the Baron-Ferejohn model predicts that if all legislators have the same proposal power, their ex ante payoffs will be identical. Since legislative payoffs are equal, the per capita payoffs to constituents will be much higher in districts with fewer voters. Thus, malapportionment will lead to skewed distributions of benefits.

While the malapportionment result from the Baron-Ferejohn model is somewhat mechanical, a recent model of Ansolabehere, Snyder, and Ting (2003) produces a richer set of implications of malapportionment. In their basic model,

- The lower chamber (House) represents districts with equal population and the upper chamber (Senate) represents states containing different numbers of districts. Each district has one representative as does each state.
- Public expenditures are allocated to the district level and legislators are responsive to their median voters. Thus, House members seek to maximize the benefits going to her district while a senator is assumed to maximize the benefits going to the median district in her state.
- Both chambers vote by majority rule with all proposals emanating from the House.

Each period begins with a House member selected at random to propose a division of the dollar which is voted on by the House and Senate. If the proposal obtains majority support in both chambers, it passes and the game ends. If not, the game moves to the next period and a new proposer is selected from the House.

The authors show that all symmetric[11], stationary, subgame perfect Nash equilibria the expected payoffs to all House members are identical, regardless of the size of their state. Since all districts are equal population, per capita benefit levels are constant despite malapportionment in the Senate.

However, if the game is modified so that senators may make proposals, there is a small state advantage attributable to malapportioned proposal rights.

4.4 Evidence

[11] Symmetry here implies that all house members from states of the same size are treated symmetrically. The authors indicate that there are other payoff distributions sustainable when this assumption is dropped.

Our review of the distributive models suggests that the effects of bicameralism should be primarily associated with supermajoritarianism and malapportionment. While there is little empirical work on the distributive effects of supermajoritarianism, there is a rich empirical literature on malapportionment.

Before the Supreme Court ruled that malapportioned state legislatures were unconstitutional, scholars (i.e., Adrian 1960, Dye 1966, Jewell 1962) were extremely interested in the implications of malapportionment. This research emphasized its implications for levels of party competition, inequitable distribution of state funding, and the failure to adopt certain social policies (Lee and Oppenheimer 1999, 4). There continues to be a debate about the consequences of eliminating malapportionment in the states, though recent research has found large effects on the allocation of state spending (Ansolabehere, Gerber, and Snyder 2002).

Work on the effects of malapportionment on distributive policy has focused on the small-state bias created by the representation of states in the Senate. Lee and Oppenheimer (1999, 162) find that, based on the 1990's apportionment, 31 states are overrepresented due to equal representation of the states, while 14 states were underrepresented and 5 received an approximately proportional amount. Atlas, et al. (1995) find a significant positive relationship between a state's US Senate representation per capita and the state's net receipts from federal expenditure.

Lee and Oppenheimer (1999, 174) consider the impact of Senate malapportionment on both discretionary and non-discretionary fund allocations. They find that states who are overrepresented receive disproportionate allocations of both

discretionary funding and non-discretionary funding. These relationships are consistent across policy areas.

Thies (1998), in a comparative case study of agricultural spending, finds compelling evidence that rural overrepresentation in the U.S. Senate blunted retrenchment in agricultural spending compared to Japan where both chambers became controlled by urban interests simultaneously in the 1970s when the Liberal Democratic Party became a predominately urban party.

5. Informational Explanations

Recognizing that existing theoretical arguments on behalf of bicameralism lacked much bite when the chambers have similar distributions of preferences, Rogers (2001) attempts to provide an informational rationale for bicameralism. His model is based on the interaction of three actors: chambers 1 and 2 and a conference committee (C). This legislature must choose between policies *A* and *B*, or not to act (e.g. policy ϕ). All actors share the same state contingent preferences such that they all prefer policy *A* (*B*) in state *A* (*B*) to the null policy which is preferred to policy *A* (*B*) in state *B* (*A*). Each chamber receives a signal $s \in \{A, B\}$ about the state of the world. The signal is correct with probability $q_i > \frac{1}{2}$ for $i \in \{1, 2, C\}$. We will refer to q_i as player *i*'s signal quality. Assume that each player receives 1 for the correct policy, -1 for the incorrect policy, and 0 from the default outcome.

The sequence of the game is as follows. In state 1, chamber 1 proposes one of the policies *A* or *B*. In response, chamber 2 may either accept chamber 1's choice, amend it and send it back (i.e. propose the other policy), amend the bill and propose the formation

of a conference committee to reconcile the differences, or reject the bill outright leading to policy ϕ. Rogers shows that each of the outcomes may be achieved as part of a perfect Bayesian equilibrium.

As a benchmark, note that a unicameral legislature with signal quality q_u receives a payoff of $2q_u - 1$. Rogers compares this outcome to the outcome when chamber 2 with signal quality q_2 and the possible use of a conference committee with quality q_c. Not surprisingly, the aggregate utility must be weakly increasing. After all, the lowest quality chamber has a incentive to at least defer to the higher quality chamber. And generally, the signals can be pooled since both chambers have an incentive to reveal their information truthfully. The only case where the payoffs of bicameralism and unicameralism are the same is when the second chamber has a much lower quality signal and the cost of using the conference procedure are large.

While suggestive, Rogers' model is somewhat restrictive and it is unclear how well it would generalize. First of all, each chamber is modeled as a unitary actor with a fixed signal quality. Thus, it does not address whether bicameralism is preferred to reforms within the unicameral legislature that enhance its signal quality. For example, its not clear that beneficial effects of the conference procedure could be replicated with the unicameral legislature. Secondly, it does not address whether it would be more sensible to simply increase the size of a unicameral legislature rather than add a second body.

To move towards asking the question in these ways, we sketch some implications from models of voting under incomplete information and common values (the so-called "Condorcet jury problem"). These models seem to suggest a much more circumscribed informational benefit of bicameralism.

5.1 Non-Strategic Jury Theorem

Consider *n* legislators who must decide whether to choose policy 0 or policy 1. They all have a common preference for choosing the correct policy. They each get an independent signal $s \in \{0,1\}$ about which policy is the common preference. We assume that each player's signal is correct with probability π.[12] The probability of making a correct decision under majority rule is therefore

$$P(n,\pi) = \sum_{j=\frac{n+1}{2}}^{n} \binom{n}{j} \pi^j (1-\pi)^{n-j}$$

Note that $P(n,\pi)$ is increasing in both of its arguments.

Now consider implementing bicameralism by dividing the *n* legislators into two chambers with m_1 and m_2 members where $m_1 + m_2 = n+1$.[13] We assume that each chamber votes via majority rule. We will designate policy 0 as the default policy which is to be adopted if the chambers do not agree. Then the probability of a correct choice is

$$\Pr\{state=1\} P(m_1,\pi) P(m_2,\pi) + \Pr\{state=0\}\left[1-\left(1-P(m_1,\pi)\right)\left(1-P(m_2,\pi)\right)\right]$$

Since $1 > P(n,\pi) > P(m_i,\pi)$, $P(n,\pi) > P(m_1,\pi) P(m_2,\pi)$, the bicameral system does worse in state 1. In state 0, bicameralism is more likely produce the correct decision since deadlock produces the favorable result. Thus, superiority of bicameralism would

[12] Allowing the signal quality to vary across individuals is unlikely to change our analysis so long as signal quality does not vary systematically across chambers in the bicameral case.

[13] The fundamental methodological problem in the comparative study of bicameralism is that it is impossible to divide an odd-numbered legislature into two odd-numbered chambers. Perhaps this suggests the importance of tricameralism.

depend entirely on which outcome is designated as the default. Of course, if they had this information ex ante, they wouldn't need to vote!

Another problem for bicameralism is that it will never be the *ex post* best decision rule. Under unicameral majority rule, all legislators would agree *ex post* that it is best to implement the majority's preference. However, under bicameralism, all legislators would like to reverse any decision that disagreed with the majority of all votes cast.

Thus, decision-theoretic voting models do not support the conclusion that bicameralism serves an informational function.

5.2 Strategic Jury Models

Of course, a critical objection to the analysis of the previous section is that the legislators were non-strategic in that they voted based on their private information rather voting in the way they would if they were pivotal. In the bicameral context, this would imply that legislators should condition their vote based on their beliefs about the state of the world when they would provide the tie-breaking vote in their chamber and their expectations about the other chamber's decision.

A full analysis of strategic voting with incomplete information under bicameralism is beyond the scope of this essay. However, there are strong reasons to believe that bicameralism would provide no advantages over unicameralism. Austen-Smith and Banks (1996) show that, for a given legislature, priors, and signal quality, there is an optimal q-rule which fully aggregates all information and makes the optimal decision given this information. Thus, a unicameral legislature using the optimal voting rule would do at least as well as any bicameral arrangement.

5.3 Endogenous Information Acquisition

While the arguments of the preceding section suggest that the requirement of concurrent majorities is unlikely to aggregate information better than simple majority rule, it may still be the case that bicameralism affects the incentives of legislators to acquire information and develop legislative expertise. If information conveys a legislative advantage, bicameralism might induce inter-chamber competition in information acquisition. On the other hand, if information is a public good, bicameralism might induce more free-riding.

The only work on this question is Rogers (1998), who develops a game-theoretic model of the decision of each chamber to become informed about the consequences of pending legislation. The game is three periods: one for the acquisition of information and the following two for the proposal of legislation. In Period 0, each chamber, *h* and *s*, decides whether or not to become informed at costs f_h and f_s. In Period 1, each chamber decides whether to introduce legislation. If a single chamber introduces a bill, the other chamber may update their information (if the first mover is informed, while the follower is not). Following this, the second chamber considers the legislation and payoffs are awarded.

In the perfect Bayesian equilibrium of this game, the chamber with the lower information costs generally obtains a first mover advantage as the second chamber free rides off its information. This effect is enhanced when the two chambers have similar policy preferences. To test these hypotheses, Rogers employs a dataset of all legislation adopted by both chambers in 33 state legislatures. Arguing that the lower chambers have lower information costs because of their larger sizes, Rogers regresses the percentage of

legislation initiated by the lower chamber on the explanatory variables on the relative size of the lower chamber and a dummy variable for cases where a single party controlled both chambers by a 2/3s vote. He finds that both of these key variables are strongly correlated with the percentage of lower chamber introduced legislation.

While these results are supportive of the idea that bicameralism affects the information environment of the legislature, the model is not conducive to an explicit comparison of bicameralism and unicameralism. Thus, it remains unclear whether intercameral competition over the agenda will dominate free-riding sufficiently to provide an informational rational for bicameralism.

6. **Conclusions**

In this essay, we have considered a number of arguments in favor of bicameralism as an organizing principal for modern legislatures. When viewed through the tools of contemporary legislative analysis – spatial, multilateral bargaining, and informational models – the case for bicameralism seems less than overwhelming. Even in models where bicameralism might have an effect, we find that the necessary conditions for such an effect are empirically rare. Further, much of the empirical evidence of the policy effects bicameralism is either weak or attributable to either malapportionment or supermajoritarianism, outcomes that could theoretically be produced in unicameral legislatures.

The role of bicameralism in modern legislatures is of more than simple academic interest. During the past year, many proposals for the post-Hussein constitution of Iraq have identified bicameralism as an important ingredient in building a stable democracy

in a nation beset with strong religious and ethic cleavages.[14] While clearly some form of federalism and perhaps over-representation of ethic and religious groups will be a vital ingredient in a democratic Iraq, our review questions whether bicameralism is a necessary or even desirable addition to the mix.

[14] These proposals and the positions of different Iraqi groups is discussed in Public International Law and Policy Group (2003).

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