Value of Bicameralism in a Repeated Voting Model*

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Abstract

This paper investigates the role of bicameral system in alternatively elected two-chamber legislature model. In the model, the chamber elected in the previous period is given the power to veto the decision by the chamber elected in the current period. It is shown that the bicameralism is more likely to be beneficial when (i) the desirable policyis less likely to move, or (ii) the non-desirable policy is more likely to attain majority in current election.

Key words: Bicameralism, Markov process

1. Introduction

The origins of bicameral institutions date back to medieval Europe where they were associated with separate representation of different estates of the realm. In our time, however, such political/social estates are almost disappearing from all over the world and equality of votes are being regarded as one of the basic common values shared between democratised nations. Our main interest in this paper is to investigate how bicameralism can be (cannot be) beneficial in our modernized society where equality of status of citizens is the basic discipline in designing political institutions.

If the institution of the second chamber is very similar to that of the first chamber (in terms of election systems, deliberation processes, powers in legislature, etc.), then the realized decisions would be the same between the two chambers.[1] Conversely, it should be that institutions are considerably different between the two chambers in situations where the realized decisions of two chambers are different, thereby bicameralism can be beneficial.

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1) In recent Japan, discussions on the Houseof Councillors (upper house) reform have gathered momentum, and some people insist that the upper house should be demolished since it tends to be a duplicate of the Houseof Representatives (lower house). We should note, however, that election systems are fairly different between two chambers.

In this paper we pay our attention to the difference in *election years* of the two chambers. Specifically, we build the two-chamber system model in which each chamber is elected in alternate years[2] and policy changes from the *status quo* policy require approvals of both chambers. In such setups, final outcome in the current year (i.e., whether to change policy from the status quo or not) depends not only on the votes of current year election, but also on the votes of previous year election. This system may seem "anti-democratic" in a sense, since the proposal of policy change by the current chamber can sometimes be rejected by the veto of the public opinion in the past. We investigate the effect of such an "anti-democratic" stickiness of policyin legislative processes.

If the desirable policy, unseen to the people, is drawn independently over time, then such stickiness of policy always leads to the inefficiency: veto of the chamber of previous-year election is nothing more than a harmful interference. On the other hand, if the desirable policy today highly depends on the desirable policy last year, policy stickiness can have a positive effect: veto of the chamber of previous election applies the brakes to the runaway of the current election chamber. In this paper we follow the latter story and show that the bicameralism can be beneficial. Condition under which bicameralism is more desirable than unicameralism is given by the Markov transition probability of the desirable policy (denoted by p) and the probability that the *non*-desirable policy attains majority in the current-year election (denoted by q). It is shown that the bicameralism is more likely to be beneficial when (i) p is small (that is, the desirable policyis less likely to move) or (ii) q is large (that is, the non-desirable policy is more likely to attain majority in current election).

We briefly review other studies dealing with the impacts and the consequences of bicameralism in legislative processes. Levmore [4] states that federalism and bicameralism are strongly linked in that all federations have a bicameral legislature and discusses why one would want the second chamber in federal nations.[3] Diermeier and Myerson [1] investigate how different constitutional features effect the internal organization of legislatures. Muthoo and Shepsle [6] survey conventional accounts for bicameralism in more detail, and study a theoretical model in which a random proposer proposes in take-it-or-leave-it format in each chambers. Testa [7] studies the impact of bicameralism on the level of corruption of elected officials. Insights found in these papers are different from ours and grasp other important aspects of bicameralism that are not treated (explicitly at least) in the present paper. Empirical

2) The main point of this assumption is that two chambers are elected in different timings. For example, the Japanese lower house is elected every four years while reelection of the upper house is conducted every three years. The lower house also has the possibility of dissolution.

3) Federal nations with bicameralism include Australia, Canada, the United States, India, Malaysia, Brazil, Switzerland, South Africa and Germany. In those countries, the institutional asymmetry between two chambers is strongly related to the federalism. In those countries, upper house is seen as the representative of *states* where each state is usually given the same number of seats, and lower house is seen as the representative of *people* where seats are basically based on population.

studiesonthe impactof bicameralism include König [3], Druckman and Thies [2] among others.

Furthermore, other political institutions also have aspects of the policy stickiness that have features in common with the bicameral institutions studied in the paper. A typical example of such institutions would be referenda. Moser [5] points out that referenda in addition to a bicameral parliament lead to very stable policy. In the paperI expressly address the impactof the bicameral institutions, but I conjecture that the analysis in the paper also contributes to the understanding the other political institutions which provide with policy stickiness.

The rest of the paper is organized as follows. Section 2 describes the model. Section 3 provides the main result of the paper. Section 4 contains a summary and some concluding remarks.

2. Model

There is a pair of alternatives, $z \in \{A; B\}$, such that one of these alternatives is unequivocally better for all individuals in a group. There are two possible states of the world $s \in \{A; B\}$ that are unknown to the individuals *ex ante*. The group as a whole prefers to select alternative A when the state is A, and alternative B when the state is B; that is, the preference is represented by

$$u\,(\mathrm{A} \mid \mathrm{A}) = u\,(\mathrm{B} \mid \mathrm{B}) = 1 \text{ and } u\,(\mathrm{A} \mid \mathrm{B}) = u\,(\mathrm{B} \mid \mathrm{A}) = 0,$$

where the first argument of u describes selected alternative z and the second describes the state s.

Let s_t denote the state in period t and assume that s_t follows a Markov process with transition probability p: For $t = 1, 2, ...,$

$$\Pr[s_{t+1} = A|s_t = A] = \Pr[s_{t+1} = B|s_t = B] = 1 - p,$$
$$\Pr[s_{t+1} = A|s_t = A] = \Pr[s_{t+1} = B|s_t = B] = p,$$

with p satisfying $0 < p < 1/2$. The initial distribution is symmetric so that $\Pr[s_1 = A] = \Pr[s_1 = B] = 1/2$.

The election and legislative system is formulated as follows. There are two chambers, each of which we name by C_o and C_e, respectively. The chamber C_o is elected in the odd periods $t = 1, 3, 5, \ldots$, while the chamber C_e is elected in the even periods $t = 2, 4, 6, \ldots$. Each chamber works for two periods and the change from *status quo alternative* requires the approvals of both chambers; that is, the alternative selected in the current period, z_t, is determined as[4)]

$$z_t = \begin{cases} A & \text{if } C_o = C_e = A \\ B & \text{if } C_o = C_e = B \\ z_{t-1} & \text{otherwise.} \end{cases}$$

We assume that, in each period t, *true* state alternative s_t will get the majority of the current election C_i^t with probability $1-q$, where $0 < q < 1/2$:

$$\Pr[C_i^t = A \mid s_t = A] = \Pr[C_i^t = B \mid s_t = B] = 1-q$$
$$\Pr[C_i^t = B \mid s_t = A] = \Pr[C_i^t = A \mid s_t = B] = q,$$

where $i = o$ if t is an odd number and $i = e$ if t is an even number.[5)]

3. Main Result

There are three state-variables in this environment; the state s_t, the status quo alternative z_t, and the incumbent chamber C_i^t. As two alternatives, A and B, are symmetric, we can identify the situation $(s_t, z_t, C_i^t) = (A, A, A)$ with the situation $(s_t, z_t, C_i^t) = (B, B, B)$, and so on. We define v_j as the discounted average payoffs (with discountfactor δ) for situations j = 1, 2, 3, 4 as in Table 1.

Table 1:

j	$(s_{t-1}, z_{t-1}, C_i^{t-1})$
1	$(A, A, A), (B, B, B)$
2	$(A, A, B), (B, B, A)$
3	$(A, B, A), (B, A, B)$
4	$(A, B, B), (B, A, A)$

To see how the discounted average payoffs can be calculated, let us suppose as an example that the situation was $(s_{t-1}, z_{t-1}, C_i^{t-1}) = (A, A, A)$ at the end of the previous period $t-1$. Then there will be four possibilities of (s_t, z_t, C_i^t) : (A,A,A), (A,A,B), (B,A,B), and (B,A,A), each of which will be explained below in due order.

With probability $1-p$, the current state will be the same as in the previous period ($s_t = s_{t-1} = A$). Given that the current state is A, the current election will choose $C_i^t = A$ (choose $C_i^t = B$) with probability $1-q$ (probability q, respectively). In both cases, the status quo policy $z_{t-1} = A$

4) For the first period $t = 1$, we assume that C_o works as the unicameral chamber; that is, $z_1 = C_o^1$.

5) In the paper we assume that politicians never change their positions once elected and that membersof the chambersdo not act strategicallybut simply supporta particular policy.

will be maintained in period t, since the old chamber $C_i^{t-1} = A$ will never approve the policy change from A to B in any way. In this case the policy $z_t = A$ is the "correct" policy as $s_t = A$. Thus the nation attains the payoff of 1 with probability $1-p$, and the situation will go to $(s_t, z_t, C_i^t) = (A,A,A)$ with probability $(1-p)(1-q)$, and to $(s_t, z_t, C_i^t) = (A,A,B)$ with probability $(1-p)q$.

With probability p, on the other hand, the current state will be different from the previous period ($s_t = B \neq s_{t-1}$). Given that the current state is B, the current election will choose $C_i^t = B$ (choose $C_i^t = A$) with probability $1-q$ (probability q, respectively). In both cases the status quo policy $z_{t-1} = A$ will be maintained, but such a policy is "wrong" since we have $s_t = B$, and therefore the nation will attain payoff of 0 in period t. The situation will go to $(s_t, z_t, C_i^t) = (B,A,B)$ with probability $p(1-q)$, and to $(s_t, z_t, C_i^t) = (B,A,A)$ with probability pq.

Finally we have the expression of v_1 as follows:[6]

$$v_1 = (1-\delta)(1-p) + \delta\{(1-p)(1-q)v_1 + (1-p)qv_2 + p(1-q)v_3 + pqv_4\},$$

where the first term corresponds to the current payoff of 1 (with probability$1-p$), and the second term describes four possibilities of the situation (s_t, z_t, C_i^t) at the end of period t.

In a similar manner, we have that v_2, v_3, and v_4 satisfy the following expressions:

$$\begin{aligned} v_2 &= (1-\delta)(1-q) + \delta\{(1-q)v_1 + qv_4\} \\ v_3 &= (1-\delta)(1-q) + \delta\{(1-q)v_1 + qv_4\} \\ v_4 &= (1-\delta)p + \delta\{p(1-q)v_1 + pqv_2 + (1-p)(1-q)v_3 + (1-p)qv_4\}, \end{aligned}$$

which can be solved (together with the expression of v_1) for v_1 and v_4 as

$$\begin{aligned} v_1 &= \frac{1-p+\delta\{p-pq-(1-2p)q^2\} - \delta^2 q(1-q)(1+q)(1-2p)}{1+\delta p - \delta^2 q(1-q)(1-2p)} \\ v_4 &= \frac{p+\delta(1-q)(1-p-q+2pq) + \delta^2 q(1-q)^2(1-2p)}{1+\delta p - \delta^2 q(1-q)(1-2p)} \end{aligned} \tag{1}$$

Here we attain the following result on the value of bicameralism.

Theorem. *Suppose that p and q satisfy the inequality*

6) We could define the *total* discounted sum of expected utility flows from all future periods,

$v'_1 = (1-p) + \delta\{(1-p)(1-q)v'_1 + \ldots\}$,

rather than the discounted *average* payoff, v_1. This definition would be a more standard formulation in certain models, but in the paper I calculate the *average* payoffs, v_j, for the sake of convenience in taking the limit of $\delta \to 1$.

$$q(1-q) > \frac{p}{1-2p}\,. \tag{2}$$

Then there exists a δ^* *such that for any* $\delta \in [\delta^*, 1)$, *the average expected payoff of bicameralism is greater than that of unicameralism.*

First we should note that the condition (2) is more likely to be satisfied when (i) p becomes smaller forafixed q, and (ii) q becomes larger forafixed p. The left-hand side of (2) is the variance of the error in current election. When q is larger so that the variance of the current election increases, the value of bicameralism increases as the veto of the previous election chamber would apply the brakes to the runaway of current election chamber. On the other hand, the right-hand side of the inequality (2) is a decreasing function of the probability ratio that the next state st+1 will still remain to be the same as in the current state st;that is, we can rewrite the right-hand side of (2) as

$$\frac{p}{1-2p} = \frac{1}{l-1},$$

where $l = (1-p)/p$. If the likelihood ratio l increases so that the next state s_{t+1} is more likely to be the same as in the current state s_t, then the value of bicameralism increases due to the similar arguments as for the left-hand side of (2). In anyway, the value of bicameralism stems from the effect that the previous election chamber can apply the brakes to the runaway of current election, and when the inequality (2) is satisfied, such positive effect dominates the negative effect of bicameralism that the veto of the previous election chamber may frustrate the appropriate policy change proposed by the current election chamber.[7)]

Proof of the Theorem. First we see that the average expected payoff when the unicameral system is adopted, is $1-q$: In each period the alternative selected by the chamber z_t can be the true state s_t with probability $1-q$.

Next we note that in the end of period 1, *the status quo* policy z_1 and the incumbent chamber C_o^1 is always the same as the first chamber C_o^1 works as the unicameral chamberin period 1 (see footnote 4). Hence, in the end of period 1, the state-variable is either $j = 1$ or $j = 4$, depending on whether the first election gave the majority to the true state s_1 (in which case $j = 1$) or to the wrong state (in which case $j = 4$). Thus, from the standpoint in the end of period 1, the average expected payoff from the bicameral system V can be written as

$$V = (1-q)v_1 + qv_4.$$

7) From inequality (2), we see that if $p > 1/6$ the bicameralism can never be beneficial for any value of q, as the left-hand side $q(1-q)$ cannot exceed 1/4.

At this point, we should note that v_1 and v_4 converge to the same value when we take the limit of $\delta \to 1$: From (1), we have

$$v_1;\ v_4 \to \frac{1-(1-p)q-(1-2p)q^2(1-q)}{1+p-(1-2p)q(1-q)} \qquad (\delta \to 1),$$

and therefore

$$V \to \frac{1-(1-p)q-(1-2p)q^2(1-q)}{1+p-(1-2p)q(1-q)} \qquad (\delta \to 1)$$

Comparing this limit value of bicameralism with respect to the value of unicameralism, we have

$$\frac{1-(1-p)q-(1-2p)q^2(1-q)}{1+p-(1-2p)q(1-q)} > 1-q \quad \Leftrightarrow \quad q(1-q) > \frac{p}{1-2p},$$

which is equivalent to inequality (2). Thus, in the limit of $\delta \to 1$, inequality (2) is the sufficient and necessary condition under which the value of bicameralismis greater than that of unicameralism.

As V is an increasing function of δ, we have that there exists a δ^* such that $V > (1-q)$ for any $\delta \in (\delta^*, 1)$, as long as the inequality (2) is satisfied. □

4. Concluding Remarks

A simple model of repeated voting with overlapping bicameral chambers has been investigated in which the bicameral system is more desirable than the unicameral system under a simple inequality condition (2). This result proposes that the bicameral legislature is desirable for such policies in which the public opinion is more vulnerable to the drift than it should be. Such policies would include constitutional revision, revision of fundamental laws, and treaty ratification.

The desirability of bicameralism derived in this paper can be understood as that of the stickiness in some policyissues. As long as the stickiness is concerned, we have several other ways, such as supermajority rule, for introducing such stickiness to legislative processes. Existing literature in political science argues, however, that the supermajority rule encourages more wasteful rent-seeking and corruption than does bicameralism and this would be one of the reasons why bicameralism is preferred over supermajority rule in reality (e.g., Levmore [4]). Comparison between bicameralism and supermajority rule in one consistent model in our paper calls for further research.

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