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The Dynamics of Parliamentary Bargaining and the Vote of Confidence*

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I develop a dynamic model of parliamentary policymaking in which three parties bargain over two-dimensional policies and transferable benefits. The model captures an important aspect of parliamentary systems: a failure of critical legislation leads to government dissolution. Policies are continuing, so the policy outcome in a period becomes the status quo for the next. I find a Markov perfect equilibrium in undominated strategies for sufficiently patient political parties. In the equilibrium, once a government forms, it is never dissolved. The policy dynamics under the consensus coalition and minimal winning coalitions exhibit strong persistence and Pareto-efficiency among governmental parties. By contrast, under minority governments, the policy outcome oscillates between two points that do not belong to the Pareto set. In the government formation processes, only minimal winning coalitions are formed with positive probability, and a party that is disadvantaged by the status quo policy is likely to be included in the government.

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I. Introduction

In parliamentary democracies, survival of governments relies on the confidence of a majority in parliament. This defining feature of parliamentarism distinguishes strategic situation of policymaking in parliamentary democracies from that in presidential-congressional democracies. Specifically, a government in the former

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systems can fall prior to a required election either through the vote of confidence or through the vote of no confidence. This study investigates how this institutional feature shapes policymaking by analyzing a dynamic model that takes the possibility of government dissolution into account.

The most prominent observation about parliamentary democracies is that elections rarely produce a party that holds a majority of seats in parliament. Political parties then need to make a coalition in order to adopt some policy other than the current status quo. Thus, bargaining games with more than two agents (e.g. Baron and Ferejohn, 1989; Banks and Duggan, 2000, 2006) are needed to model policymaking in parliamentary democracies. However, the confidence vote procedure provides political agents with distinct incentives in bargaining, which is not reflected in most of the existing models. In congressional systems, the consequence of a failure in important legislation is merely that the current status quo policy will remain in effect at least by the next legislative session. By contrast, rejecting a critical bill in parliamentary systems may result in a more serious situation. Provided that the vote of confidence is attached to the bill, the current government must resign if it fails to pass, which opens an opportunity to form a new government.

As such, strategic incentives of political parties in parliamentary systems differ from those in congressional systems. Most significantly, bargaining over policies would be a function of parties' expectation about which government would be formed if the current one were dissolved. If government positions are valuable for parties, members of the incumbent government may be willing to concede their policy preference in order to maintain their status as governmental parties. On the contrary, an opposition party may not easily accept policy proposals from the government to take an opportunity to be a member of the future government.

On the other hand, once a government falls, making a new government also relies on the coalition bargaining game among political parties. In parliamentary democracies, the executive mostly controls the legislative agenda. Thus, being a member of the government is instrumentally valuable even for political parties that are motivated solely by policy concerns. If parties cannot commit policy programs at the beginning of a new government, what parties do in government formation processes depends on their expectation about policymaking under alternative governments. Thus, the values of different governments are endogenous in the sense that they are derived from the policies that would be made once a government is invested. In sum, bargaining over government positions and bargaining over policies are necessarily interactive.

This article pursues to deepen our understanding of political bargaining in parliamentary systems. To do so, I develop a dynamic model in which three political parties bargain over policies and governments. In the model, policymaking and government-making may alternate over time and affect each other.

Government formation determines what parties are included in the government. Once a government forms, there begins bargaining over policies, and a failure of passing a policy leads to a government dissolution, which reflects the vote of confidence procedure. Moreover, I consider another important aspect of policymaking: endogeneous status quo. I assume once a policy is adopted, it remains in effect until another replaces it, which is indeed true in most policy areas. Under such an environment, policymaking in the current period affects not only the immediate payoffs for parties but also the strategic situation in the future and so the future payoffs. Moreover, since parties' policy choices may vary with the status quo, the value of each government also may vary with the status quo. Then, the optimal play in the government formation stage depends upon the status quo, which, in turn, will enter strategic considerations of policymakers. These complex incentives of political parties due to the vote of confidence and the endogeneity of status quo are both captured by the model in this paper.

I analyze the model for a Markov perfect equilibrium in undominated strategies. I show the existence of a fully characterized equilibrium for the game with patient players. In the equilibrium, every government is stable; once formed, no government is dissolved. In the government formation stage, no delay occurs, and only minimal winning governments are formed. Which minimal winning coalition is more likely to be formed depends on the status quo policy. If one party is disadvantaged by the status quo policy relative to another, then the former is more likely to be a member of the government than the latter. The dynamics of policy outcomes in the equilibrium varies across different types of governments, but the sequence of policy outcomes under each government is quite simple in the long run. The consensus government always implements a single policy, the average of the ideal policies of all parliamentary parties. The sequence of policy outcomes under any minimal winning coalition converges, within one period, to a single point, the midpoint of the contract curve for the governmental parties. On the other hand, the policy dynamics under minority governments shows inefficiency due to intertemporal tradeoffs in the governmental party's strategic consideration.

The environment of policymaking in my model is most similar to those in the model by Baron and Diermeier (2001), Baron et al. (2012), and Fong (2006). They consider bargaining over two-dimensional policies with side payment as I do in this paper. Baron and Diermeier (2001) analyze a single-period game, Baron et al. (2012) study a two-period game with endogenous status quo, and Fong (2006) examines an infinite period game with endogenous status quo. The critical difference of my model from theirs is that neither of those previous models incorporates the vote of confidence. Thus, comparing their results to mine may provide some institutional implications of having the parliamentary government structure.

The notable difference of my results from the existing findings is stability and efficiency of policymaking. Baron et al. (2012) and Fong (2006) both find that the dynamic nature of policymaking induces minimal winning coalitions to recurrently implement policies outside the set of (stage game) Pareto optimal policies. In my model, every majority coalition government chooses the efficient policy that maximizes the sum of the government members' utilities. My findings suggest that the vote of confidence procedure may enable parliamentary parties to negotiate efficiently in equilibrium.

There are other important studies that are related to this paper. Earlier theoretical models approach bargaining under parlimentarism by analyzing one stage models with the assumptions of either purely office motivated parties (Riker, 1962), purely policy motivated parties (Schofield, 1993a, b, 1995), or mixed motivated parties (Austen-Smith and Banks, 1988; Baron and Diermeier, 2001; Sened, 1996). Beyond the static approach, Baron (1991) and Kalandrakis (2015) study government formation by developing infinite-horizon games where bargaining over governments is repeated if the agreement is not reached in a given period. In all of these models, a government is interpreted as either an agreed upon policy, or a distribution of a fixed prize, or both. By contrast, in this study a government is a distribution of policymaking power, and policies and distributions of benefits are decided after a government is formed. Thus, in contrast to the above studies, I consider an environment where policy commitment is impossible at the time of investiture of governments.

Baron (1998) and Diermeier and Feddersen (1998) shed the commitment assumption and study the effects of the vote of confidence as I do in this study. Diermeier and Feddersen (1998) develop a finite-period game where bargaining alternates between government formation and policymaking. They deal with a distributive setting and find that the vote of confidence procedure creates cohesive voting among the government members and allows the government collectively to capture more of the distributive benefits from the bargaining process. Baron (1998) extends this framework to an infinite horizon and finds similar results. Both studies assume that a status quo is randomly drawn in each period while my model assumes that the chosen policy in a period becomes the status quo in the next period. Thus, while they investigate how a random event affects stability of coalition governments, I incorporate the dynamic property of policymaking.

Austen-Smith and Banks (1990) and Laver and Shepsle (1990, 1996) also drop the assumption of policy commitment. In their studies, a government is an allocation of different cabinet positions to political parties, and a party that holds a particular cabinet position is regarded as a dictator of policymaking in the corresponding policy area. As a result, they find that policy outcomes generically are not in the Pareto set for the governmental parties. By contrast, I abstract away from the qualitative differences between government positions and require an enacted policy to be subject to an agreement in each period. Thus, unlike Austen-Smith and Banks (1990) and Laver and Shepsle (1990, 1996), I implicitly assume that the collective government or parliament is able to monitor cabinet ministers so that legislation in all jurisdictions can be negotiated at the same time.

This study also contributes to the literature of dynamic legislative bargaining with endogenous status quo policies, which has been growing remarkably. Assuming that policies continue, quite a few studies investigate various aspects of dynamic bargaining (Baron, 1996; Battaglini and Coate, 2008; Cho, 2014, 2017; Diermeier and Fong, 2011; Duggan and Kalandrakis, 2012; Fong, 2006; Jeon and Hwang, 2022; Kalandrakis, 2004, 2010; Nunnari, 2021; Penn, 2009). My model again departs from these studies by including the vote of confidence procedure. Under this institutional feature, a vote for a policy is at the same time a vote for a current government. Thus, while bargainers compare a currently proposed policy to continuing the same game with a status quo in the existing models, they compare a policy proposal under a current government to dissolving a government in my model.

The rest of this paper is organized as follows. Section 2 develops the model. Section 3 presents the findings from the analysis of the model followed by a concluding section. Formal proofs are contained in the Appendix.

II. Model

2.1. The Game

I consider an infinite period bargaining game where the players are three political parties in a parliament, $P = \{1,2,3\}$. The collection of all subsets of P is denoted by 2^P, and the collection of all parliamentary coalitions is $\Omega = 2^P \setminus \{\emptyset\}$.

An outcome of the game at $t = 1,2,\dots$ is a pair (x^t, g^t), where x^t is a public policy and $g^t = (g_1^t, g_2^t, g_3^t)$ is a distribution of non-policy benefits. The set of public policies is a two-dimensional disk $X = \{x \in \mathbb{R}^2 \mid \|x\| \leq d\}$. Let $G \geq 0$ be the size of total non-policy benefits. Let $\mathcal{G} = \{g \in \mathbb{R}^3 \mid \sum_{i \in P} g_i = G\}$ be the set of all distributions of G. Notice that g_i may be a negative number. Each $g \in G$ may be interpreted as (re)allocation of patronage positions or side payment using resources that are considered as private goods from the parties' perspective.

Each party i is endowed with an ideal policy $\tilde{x}^i \in X$ and a policy utility function $u_i : X \to \mathbb{R}$ given by $u_i(x) = -\|x - \tilde{x}^i\|^2$. We focus on symmetric preferences assuming that the ideal points of the parties form a unit equilateral triangle; for all distinct $i, j \in P, \|\tilde{x}^i - \tilde{x}^j\| = 1$. The locations of ideal points in the policy space are normalized so that the centroid of the triangle is the origin; $\frac{1}{3}\sum_{i \in P} \tilde{x}^i = (0,0)$. We assume $d > \frac{\sqrt{3}}{3}$; the policy space is large relative to the distances between parties.[1] Each party i's stage utility from an outcome $(x^t, g^t) \in X \times \mathcal{G}$ is $u_i(x^t) + g_i^t$.

The sequence of bargaining in a given period t depends on the *state* in the period, denoted by s^t. A state consists of two components: a status quo policy and a current government (including a state with no government). Let $S = X \times 2^P$ be the set of all possible states. A period t is called a *policy period with status quo x and government* C if $s^t = (x, C)$ for a nonempty C, and the bargaining in period t takes place as follows. First, each party in the current government $(i \in C)$ is selected as a proposer with probability $\frac{1}{|C|}$. That is, proposal power is monopolized by the government and is equally distributed among the members of the government. Second, the selected party proposes a policy and a distribution of G, say $(y, g) \in X \times \mathcal{G}$. Third, all parties simultaneously vote to either accept or reject the proposal. For a proposal to pass, the following conditions must be satisfied; (1) it must obtain a majority of votes in parliament (votes by at least two parties); (2) all parties in C must accept the proposal; (3) if $g_i < 0$, then i must accept the proposal. If proposal (y, g) passes, then the outcome at t is (y, g) and the next period becomes a policy period with status quo y and government C, i.e., $s^{t+1} = (y, C)$. Otherwise, the outcome at t is $(x, (0,0,0))$ and the government falls, and hence the next period becomes an *organization period with status quo* x; that is, $s^{t+1} = (x, \emptyset)$.

It is worthwhile to elaborate on the three conditions for a proposal to pass. With the assumption that no party holds a majority of seats in parliament, the first condition follows from the majority voting rule that is prevalent in almost all parliamentary democracies. The rationale for the second condition is that a governmental party can always voluntarily resign. If there is a serious disagreement on policy programs among members of the government and, as a result, a governmental party prefers dissolving the current government to keeping it, the government will fall by resignation of the discontented member. Since all proposals in the model are interpreted as critical bills with which the confidence motion is attached, we consider rejection by a government party as resignation that leads to a dissolution of the government. The third condition is reasonable because a negative transfer to a party is possible only by extracting some private goods from the party, which must be agreed by the party.[2]

In any organization period t, parties bargain over compositions of the

[1] This assumption guarantees that all parties' ideal points are in the interior of the policy space. Our findings will be unchanged if we assume the policy space X is an arbitrary convex, compact set in $\mathbb{R}^2$ that contains the disk $\{x \in \mathbb{R}^2 \,|\, \|x\| \le d\}$. However, letting X be a disk substantially shortens the presentation and the proofs of the results.

[2] Without this condition, a majority government would be able to be infinitely better off by decreasing the non-governmental party's share with no lower bound, and thus there would be no optimal polcymaking choice.

government, i.e., proposal power in the next policy period. The bargaining is described as follows. First, each party is selected as the *formateur* with probability $\frac{1}{3}$. Second, the selected formateur proposes a government $C \in \Omega$. Third, all parties simultaneously vote to either accept or reject the proposed government. If at least two parties in the parliament and all parties in the proposed government accept the proposal, then the government is formed and the next period becomes a policy period, i.e., $s^{t+1} = (x, C)$. Otherwise, the next period remains an organization period with the same status quo, i.e., $s^{t+1} = (x, \emptyset)$. No policy-making activity occurs in an organization period, and therefore, $(x^t, g^t) = (x, (0,0,0))$. The initial state $s^1 \in S$ is exogenously determined before the game begins.

The payoff for party i from the sequence of outcomes (x^t, g^t) is

$$(1-\delta)\sum_{t=1}^{\infty} \delta^{t-1}[u_i(x^t) + g_i^t],$$

where $\delta \in (0,1)$ is a common discount factor.

2.2. Strategies and Equilibrium Concept

I analyze the game for *Markov perfect equilibria in undominated strategies*. A Markov strategy is a strategy that prescribes the same action in any pair of periods t and t' if the states of both periods are identical and previous actions within the periods are identical. In other words, each player's action in any period t depends only on s^t and the event that occurred at t. That is, in Markov strategies, each party's proposal depends only on the current status quo policy and the current government (including the case of no government), and each party's vote depends only on the status quo, the government, and the current proposal. This type of equilibria may have a focal quality due to the simplicity.

Formally, a Markov strategy for party i is a pair (π_i, A_i) where π_i is a proposal strategy and A_i is a voting strategy. Let $\Theta = (X \times \mathcal{G}) \cup \Omega$, and let $\mathcal{P}(\Theta)$ be the set of probability measures on Θ. Generally, a proposal strategy for i is a mapping $\pi_i : S \to \mathcal{P}(\Theta)$. Without delving into measurability issues, it is sufficient for the purpose of my analysis to assume that π_i has finite support for every state. Then, for each $s \in S$ and each $\theta \in \Theta$, let $\pi_i(\theta \mid s)$ denote the probability that party i proposes θ conditional on the party being selected at state s. For any subset $\Theta' \subseteq \Theta$, let $\pi_i(\Theta' \mid s) = \sum_{\theta \in \Theta'} \pi_i(\theta \mid s)$ be the probability that i's proposal at state s belongs to Θ'. Of course, parties propose governments in organization periods and policies in policy periods. Thus, we need the restriction that, for all $x \in X, \pi_i(\Omega \mid x, \emptyset) = 1$ and if $C \neq \emptyset$, then $\pi_i(X \times \mathcal{G} \mid x, C) = 1$. A voting strategy for party i is an acceptance correspondence $A_i = S \to \Theta$. For each $s \in S$, $A_i(s)$

consists of proposals party i would accept if proposed at state s. Acceptance sets are acceptable governments in organization periods and acceptable policies in policy periods. Thus, it must be that, for all $x \in X, A_i(x,\emptyset) \subseteq \Omega$, and if $C \neq \emptyset$, then $A_i(x,C) \subseteq X \times \mathcal{G}$. A profile of Markov strategies of the game is denoted by $\sigma = (\pi_i, A_i)_{i \in P}$. Given each party's voting strategy A_i in profile σ, the set of proposals that would pass in parliament if proposed at each state s is well defined, and it is denoted by $A^\sigma(s)$.[3]

For each state $s \in S$, a strategy profile σ generates a probability distribution on the sequences of outcomes from any period given that the current state is s. With this, each party has the *ex ante* expected payoff conditional on the current state being s. I refer to it as the *continuation value* for party i at s in σ and denote it by $v_i^\sigma(s)$. Given that proposal strategies have finite support, the continuation values at policymaking states satisfy the following. For every $i \in P$, every $x \in X$ and every $C \in \Omega$,

$$v_i^\sigma(x,C) = \frac{1}{|C|}\sum_{j \in C}\sum_{(y,g)\in A^\sigma(x,C)} \pi_j(y,g \mid x,C)[(1-\delta)(u_i(y)+g_i)+\delta v_i^\sigma(y,C)] \tag{1}$$

$$+\left[1-\frac{1}{|C|}\sum_{j\in C}\pi_j(A^\sigma(x,C) \mid x,C)\right][(1-\delta)u_i(x)+\delta v_i^\sigma(x,\emptyset)]. \tag{2}$$

The expression (1) represents the case in which a proposal passes in parliament, and, thus, party i receives payoff from the proposal in the current period and the continuation payoff from the same government with the proposal being the status quo in the next period. The expression (2) represents the case of rejected proposals in which party i receives payoff from the status quo x in the current period, and the next period becomes an organization period.

In an organization period with status quo x, the current payoff for party i is $u_i(x)$ since there is no policymaking activity. If a proposed government is formed, then party i receives $v_i^\sigma(x,C)$ in the next period. If a proposed government is rejected in the parliament, then it receives the continuation payoff $v_i^\sigma(x,\emptyset)$ at the same organization state in the next period. Hence, for every $i \in P$ and every $x \in X$,

$$v_i^\sigma(x,\emptyset) = (1-\delta)u_i(x) + \frac{1}{3}\delta\sum_{j\in P}\sum_{C\in A^\sigma(x,\emptyset)}\pi_j(C \mid x,\emptyset)v_i^\sigma(x,C) \tag{3}$$

[3] From the voting rule we specified, A^σ is formally written as follows: (1) For all $x \in X$, for all $C \in \Omega$, and for all $(y,g) \in X \times \mathcal{G}, (y,g) \in A^\sigma(x,C)$ if and only if $|\{i \in P \mid (y,g) \in A_i(x,C)\}| \geq 2$ and $C \cup \{i \in P \mid g_i < 0\} \subseteq \{i \in P \mid (y,g) \in A_i(x,C)\}$. (2) For all $x \in X, C \in A^\sigma(x,\emptyset)$ if and only if $|\{i \in P \mid C \in A_i(x,\emptyset)\}| \geq 2$ and $C \subseteq \{i \in P \mid C \in A_i(x,\emptyset)\}$.

$$+\delta\left[1-\frac{1}{3}\sum_{j\in P}\pi_j(A^{\sigma}(x,\emptyset)\,|\,x,\emptyset)\right]v_i^{\sigma}(x,\emptyset).$$

I now discuss the conditions for a strategy profile to be an equilibrium, beginning with optimal voting strategies. For each state $s=(s_1,s_2)\in S$, let $R_i^{\sigma}(s)=(1-\delta)u_i(s_1)+\delta v_i^{\sigma}(s)$. Consider any policy period in which the status quo is x and the incumbent government is C. Suppose that a proposer proposes a policy y and a distribution of the benefit g. If the proposal is accepted in parliament, then the outcome in the current period will be (y,g), and since the incumbent government survives, the state of the next period will be (y,C). Thus, the expected payoff for party i is

$$(1-\delta)[u_i(y)+g_i]+\delta v_i^{\sigma}(y,C)=(1-\delta)g_i+R_i^{\sigma}(y,C). \tag{4}$$

If the proposal fails to pass, then the status quo x remains in effect in the current period and the benefits will not be distributed. Moreover, the government must be dissolved and thus the next period will be an organization period. Then the expected payoff for party i is

$$(1-\delta)u_i(x)+\delta v_i^{\sigma}(x,\emptyset)=R_i^{\sigma}(x,\emptyset), \tag{5}$$

which will be called party i's *reservation value*. Then, the party weakly prefers passing (y,g) to rejecting it if and only if

$$g_i\geq\frac{R_i^{\sigma}(x,\emptyset)-R_i^{\sigma}(y,C)}{1-\delta}. \tag{6}$$

In words, party i votes for the proposal when the side payment offered to the party is enough to guarantee its reservation payoff from the organization period with the status quo policy. Notice that if a party's value of the current government with the proposed policy, $R_i^{\sigma}(y,C)$, is greater than its reservation payoff from the organization period, $R_i^{\sigma}(x,\emptyset)$, then it is willing to accept a negative transfer.

We say a voting strategy A_i is *undominated at* (x,C) *in* σ if

$$A_i(x,C)=\left\{(y,g)\in X\times\mathcal{G}\;\middle|\; g_i\geq\frac{R_i^{\sigma}(x,\emptyset)-R_i^{\sigma}(y,C)}{1-\delta}\right\}. \tag{7}$$

The condition (7) is equivalent to the standard method of ruling out stage weakly dominated voting strategies with the additional assumption that indifferent parties accept proposals.

In any organization period with status quo x, if a proposed government C passes in parliament, party i expects to receive the payoff $(1-\delta)u_i(x)+\delta v_i^\sigma(x,C)$. If C is rejected by a parliamentary majority, party i's expected payoff is $(1-\delta)u_i(x)+\delta v_i^\sigma(x,\emptyset)$. We say a voting strategy A_i is *undominated at* $(x,\emptyset)$ *in* σ if

$$A_i(x,\emptyset)=\{C\in\Omega \mid v_i^\sigma(x,C)\geq v_i^\sigma(x,\emptyset)\}. \tag{8}$$

In words, in the bargaining of government-making, each party accepts a proposed government if and only if, given the status quo policy, it weakly prefers continuing the game under the proposed government to continuing the game with another round of government-making.

Next, I consider optimal proposal strategies. Let x be the status quo policy and C be the current government. Suppose a member of the government, say i, is selected as a proposer. If party i proposes any $(y,g)\in A^\sigma(x,C)$, the proposal will pass and the state of the next period will become (y,C). Hence, the expected payoff from proposing $(y,g)\in A^\sigma(x,C)$ is $(1-\delta)[u_i(y)+g_i]+\delta v_i^\sigma(y,C)$, which is equal to $(1-\delta)g_i+R_i^\sigma(y,C)$. If the party proposes any alternative that is not passable, the status quo policy is maintained and the next period will become an organization period. Then the expected payoff from proposing any $(y,g)\notin A^\sigma(x,C)$ is simply $R_i^\sigma(x,\emptyset)$. To maximize its expected payoff, party i would propose an alternative that maximizes $(1-\delta)g_i+R_i^\sigma(y,C)$ among the passable proposals if there is an alternative in $A^\sigma(x,C)$ that gives payoff greater than $R_i^\sigma(x,\emptyset)$. If all alternatives in $A^\sigma(x,C)$ give payoff less than $R_i^\sigma(x,\emptyset)$, the party would propose any alternative that will not pass in order to dissolve the government. And if the maximum payoff from the passable proposals is equal to $R_i^\sigma(x,\emptyset)$, the party would propose any maximizer of $(1-\delta)g_i+R_i^\sigma(y,C)$ among the passable proposals or any alternative that will not pass. Formally, let $\overline{A}_i^\sigma(x,C)=\arg\max_{(y,g)\in A^\sigma(x,C)}[(1-\delta)g_i+R_i^\sigma(y,C)]$ for each $(x,C)\in X\times\Omega$ and each $i\in P$. A proposal strategy π_i is said to be *sequentially rational at* (x,C) *in* σ if it satisfies the following: (1) if $\sup\{(1-\delta)g_i+R_i^\sigma(y,C) \mid (y,g)\in A^\sigma(x,C)\}>R_i^\sigma(x,\emptyset)$, then $\pi_i(\overline{A}_i^\sigma(x,C)\mid x,C)=1$; (2) if the inequality is reversed, then $\pi_i(A^\sigma(x,C)\mid x,C)=0$; and (3) if the two numbers are equal, then $\pi_i(\overline{A}_i^\sigma(x,C)\cup((X\times\mathcal{G})\setminus A^\sigma(x,C))\mid x,C)=1$.

Lastly, I discuss proposal strategies in organization periods. Suppose the status quo is x and party i is designated as the formateur. Regardless of its government proposal, party i will receive utility from x in the current period. If party i proposes a government C that is acceptable by a parliamentary majority and every member of C, then i will receive payoff $v_i^\sigma(x,C)$ in the next period. And if the party proposes a government that is not passable, then its expected payoff from the next period will be $v_i^\sigma(x,\emptyset)$. Then, the logic of maximization is the same as before. If there is any government that is passable and the value is greater than $v_i(x,\emptyset)$, the formateur will propose only the governments with the greatest $v_i(x,C)$ among acceptable governments. If the values of all acceptable governments are less than $v_i(x,\emptyset)$, the formateur prefers another round of government-making, so it will propose only the governments that cannot be accepted in parliament. Formally, a proposal strategy π_i is said to be *sequentially rational at* $(x,\emptyset)$ *in* σ if the following holds: (1) $\pi_i(A^\sigma(x,\emptyset)\setminus \arg\max_{C\in A^\sigma(x,\emptyset)} v_i^\sigma(x,C) \mid x,C)=0$; (2) if $\max\{v_i^\sigma(x,C) \mid C\in\Omega\} > v_i^\sigma(x,\emptyset)$, then $\pi_i(\arg\max_{C\in A^\sigma(x,\emptyset)} v_i^\sigma(x,C) \mid x,C)=1$; and (3) if the inequality is reversed, then $\pi_i(A^\sigma(x,\emptyset) \mid x,C)=0$. I define the solution concept as follows.

Definition 1 A profile of strategies $\sigma=(\pi_i,A_i)_{i\in P}$ is a *Markov perfect equilibrium in undominated strategies* (MPE) if, for every i and every $s\in S$, A_i is undominated at s in σ, and π_i is sequentially rational at s in σ.

2.3. Preliminary Analysis

In this section, I provide the essential logic of optimal policymaking strategies and define some additional notation, which helps to understand the results in the next section. Suppose a party makes a proposal that is accepted in parliament. When a policy proposal passes, there is a set of parties that accept the proposal, which we call a *policy coalition* following the terminology by Diermeier and Feddersen (1998). A policy coalition does not have to be identical to the current governing coalition. However, it must include the governing coalition to prevent any member of the government from resigning. Also, a policy coalition must be a majority coalition to pass the proposed policy. For each government coalition $C\in\Omega$, define the set of all possible policy coalitions by

$$\Omega(C)=\{D\in\Omega \mid C\subseteq D \ \text{ and } \ |D|\geq 2\}.$$

It is useful to understand parties' choices of policy proposals as a two-step decision making: choosing a policy coalition and choosing a policy. Consider the situation where the government coalition is C and the status quo policy is x. Suppose that proposal (y,g) by proposer i is accepted by policy coalition $D\in\Omega(C)$. Note that any party that is not in the policy coalition has a zero share of G. Thus, the proposer's share of G is $g_i=G-\sum_{j\in D\setminus\{i\}} g_j$. Then, the proposer's payoff is

$$(1-\delta)\left[G-\sum_{j\in D\setminus\{i\}} g_j\right]+R_i^\sigma(y,C). \tag{9}$$

Since party i maximizes its own payoff under the constraint that the members of the policy coalition accept the proposal, the condition in (6) must be binding. Thus, for every coalition partner $j \in D \setminus \{i\}$,

$$g_j = \frac{R_j^\sigma(x,\emptyset) - R_j^\sigma(y,C)}{1-\delta}. \tag{10}$$

That is, all members of the policy coalition except the proposer receives payoff $R_j^\sigma(x,\emptyset)$; their payoffs are equal to their reservation values. Substituting the right hand side of equation (10) for g_j in (9), we see that the proposer i's payoff is equal to

$$(1-\delta)G + \sum_{j \in D} R_j^\sigma(y,C) - \sum_{j \in D \setminus \{i\}} R_j^\sigma(x,\emptyset). \tag{11}$$

Then, the policy proposal must maximize the sum of (far-sighted) policy payoffs of all parties in the policy coalition. That is, in equilibrium,

$$y \in \arg\max_{z \in X} \sum_{j \in D} R_j^\sigma(z,C). \tag{12}$$

Thus, when $\sum_{j \in D} R_j^\sigma(z,C)$ has a unique maximizer for each $D \in \Omega(C)$, the policy proposal does not depend on who the proposer is if a same policy coalition is chosen.

Next, the proposer can choose any policy coalition D under the constraint that $D \in \Omega(C)$. Among the possible policy coalitions, the proposer chooses a coalition that maximizes the payoff specified in (11). Thus, in equilibrium, the policy coalition D must be such that

$$D \in \arg\max_{B \in \Omega(C)} \left[\max_{z \in X} \sum_{j \in B} R_j^\sigma(z,C) - \sum_{j \in B \setminus \{i\}} R_j^\sigma(x,\emptyset) \right]. \tag{13}$$

If D satisfies (13) and y satisfies (12), choosing policy coalition D and proposing y is at least as good as proposing any proposal in $A^\sigma(x,C)$. Then, the proposal strategy is sequentially rational at (x,C) in σ if the proposing party cannot increase its payoff by intentionally dissolving the government. That is,

$$(1-\delta)G + \sum_{j \in D} R_j^\sigma(y,C) - \sum_{j \in D \setminus \{i\}} R_j^\sigma(x,\emptyset) \geq R_i^\sigma(x,\emptyset), \tag{14}$$

which is equivalent to

$$(1-\delta)G+\sum_{j\in D} R_j^{\sigma}(y,C) \geq \sum_{j\in D} R_j^{\sigma}(x,\emptyset) . \tag{15}$$

Note that if there is at least one policy coalition such that the inequality (15) is satisfied for at least one policy, the government will never fall.

As I so far have discussed, once a proposer in a policy period chooses a policy coalition and a policy, then the proposal of transfers is determined by (10). Thus, it is convenient to describe proposal strategies so that a proposer proposes a policy coalition and a policy, letting side payments implicit. Thus, with an abuse of notation, I let $\pi_i(y,D \mid x,C)$ denote the probability that party i proposes policy y constructing policy coalition D when the status quo is x and the government is C.

Lastly, I define the concepts of transition probability and absorbing set. Given a strategy profile σ and a pair of states $s,s' \in S$, let $\zeta^{\sigma}(s' \mid s)$ denote the *transition probability from s to s' in σ*, which is the probability that the state in the next period is s' given that the current state is s. Also, for any subset $S' \subseteq S$, let $\zeta^{\sigma}(S' \mid s) = \sum_{s' \in S'} \zeta^{\sigma}(s' \mid s)$ be the probability that the state in the next period is in S' given that the current state is s. Notice that, due to the structure of the game, a policymaking state under a government C transits either to another policymaking state under the same government or to the government-making stage with the same policy for the case of government dissolution. A nonempty set $S' \subseteq S$ is called an *absorbing set of σ* if, for all $s \in S'$, $\zeta^{\sigma}(S' \mid s) = 1$. In words, once the game reaches any state in an absorbing set S', it never leaves S'. Obviously, there is at least one absorbing set for every strategy profile since S itself is an absorbing set. We say S' is an *irreducible absorbing set of σ* if it is an absorbing set of σ and there is no proper subset of S' that is an absorbing set of σ. The irreducible absorbing sets in equilibrium strategies characterize the longrun outcomes.

III. Results

In this section, I fully characterize an equilibrium of the game for high enough discount factor δ. In the next proposition, we present the equilibrium in terms of the longrun outcomes in it. For any coalition $C \in \Omega$, let $x^C = \frac{\sum_{i\in C} \tilde{x}^i}{|C|}$ be the average of all coalition members' ideal points. For any two-party coalition C, x^C is the midpoint of the two parties' ideal points, and x^P is the origin, the centroid of the triangle constituted by the three ideal points. Note that, for every coalition C, x^C is the unique maximizer of $\sum_{i \in C} u_i(x)$, i.e., the maximizer of the total (stage) policy utilities of the coalition. Given that we allow side payments in the bargaining,

x^C is the unique efficient policy among the parties in C. Also, for each distinct pair of parties $i, j \in P$, let $y^{ij}(\delta) = \frac{2(\tilde{x}^i + \tilde{x}^j)}{4-\delta(1+\delta)}$. The following proposition is the main result of this paper.

Proposition 1 *For some* $\overline{\delta} \in (0,1)$, *if* $\delta \geq \overline{\delta}$, *then there exists a Markov perfect equilibrium in undominated strategies* $\sigma = (\pi_i, A_i)_{i \in P}$ *that satisfies the following:*

1. *For every* $C \in \Omega$ *and every* $x \in X$, $\zeta^\sigma(x, \emptyset \mid x, C) = 0$.
2. *For every* $x \in X$, $\zeta^\sigma(x^P, P \mid x, P) = 1$.
3. *For every* $C \in \Omega$ *with* $|C| = 2$ *and every* $x \in X$, $\zeta^\sigma(x^C, C \mid x, C) = 1$.
4. *For every* $i \in P$, $\{j, k\} = P \setminus \{i\}$, *and every* $x \in X$, *either* $\zeta^\sigma(y^{ij}(\delta), \{i\} \mid x, \{i\}) = \zeta^\sigma(y^{ik}(\delta), \{i\} \mid x, \{i\}) = \frac{1}{2}$ *or* $\zeta^\sigma(x^P, \{i\} \mid x, \{i\}) = 1$.
5. *For every* $x \in X$, $\zeta^\sigma(x, \{1,2\} \mid x, \emptyset) + \zeta^\sigma(x, \{1,3\} \mid x, \emptyset) + \zeta^\sigma(x, \{2,3\} \mid x, \emptyset) = 1$.

I discuss the five characteristics of the equilibrium in Proposition 1. The first point states that there is no transition from any policy period to an organization period in the equilibrium. Thus, every government is stable. Once a government forms, it never fails to pass the vote of confidence.

The next three points in the proposition characterizes dynamics of policy outcomes in the equilibrium depending on the government type.

The second point is in regard to the consensus government. When all of the three paries are in the government, no matter what the status quo policy is, every party proposes x^P, the centroid of the triangle constituted by the three ideal points. Thus, the policy dynamics under the consensus government is extremely simple. Regardless of the initial status quo, the policy outcome converges to x^P within one period, and never changes from then.

Third, policymaking under minimal winning coalitions is also strongly persistent. When the government consists of two parties, each party proposes the midpoint of the ideal points of the governmental parties. Thus, each minimal winning coalition represents one policy.

Fourth, under each minority government, the policy outcome oscillates in a set of finite points. While policy coalitions are identical to governing coalitions under minimal winning coalitions and the consensus government, a minority government, in the equilibrium, makes a policy coalition with either one of the other parties or the consensus policy coalition, depending on the status quo policy. As such, the policy dynamics under minority governments is not as persistent as majority coalition governments.

The last point in Proposition 1 is in regard to what happens in organization periods. Any organization state is transient. Once an organization period reaches, the parties instantly agree on a future government. No delay occurs in the government formation processes. Moreover, only minimal winning governments are formed in any organization periods in the equilibrium.

In what follows, I discuss the properties of the MPE σ of Proposition 1 in more detail, specifying strategies of the parties under different types of governments and in government-making stages.

3.1. The Consensus Government

I first consider policymaking under the consensus government P. The equilibrium proposal strategy is such that every party proposes x^P regardless of the status quo policy: for every $i \in P$ and every $x \in X$, $\pi_i(x^P, P \mid x, P) = 1$. Recall that for a government to survive, none of its members should resign. Thus, unless the proposing party intends to dissolve the government, the only potential policy coalition for the consensus government is the governing coalition itself. The proposer then chooses the policy that maximizes the sum of policy payoffs, in terms of farsighted preferences $R_i^\sigma(\cdot, P)$, of the policy coalition members. Since each party's proposal does not depend on the status quo, the future stream of payoffs are simply from the constant sequence of policy x^P and divisions of fixed resources G. Thus, the sum of all parties' future payoffs does not depend on what policy is implemented in the current period. Then, the sum of the parties' farsighted utilities, which is an weighted average of the current payoffs and the future payoffs, is maximized at the point x^P that maximizes the sum of the parties' current payoffs.

As the consensus government implements x^P every time and distributes G with no waste, the sequence of outcomes under the consensus government generates the greatest total utilities for the parties. Then, the sum of the expected payoffs of all parties under the consensus government is obviously greater than the sum of the expected payoffs of all parties in any organization period. Hence, the government is stable and will never dissolve.

The policy dynamics under the consensus government is extremely simple. Once the game reaches state (x^P, P), it stays there forever. Thus, the singleton set $\{(x^P, P)\}$ is an irreducible absorbing set. Moreover, once the consensus government is formed, convergence to the absorbing state is obtained within one period. From then, only the distribution of G may vary across periods depending on the random recognition of the proposer. Finally, the sequence of outcomes generated by the consensus government is Pareto optimal. Since we allow side payment, the unique Pareto optimal policy sequence is the one in which x^P is chosen in every period. Hence, we may conclude that the consensus government is indeed consensual.

3.2. Minimal Winning Coalitions

Next, we discuss policymaking under any two party governments. Let $C = \{i, j\}$

and $k \in P \setminus C$. The equilibrium proposal strategies are such that, for every $x \in X$, $\pi_i(x^C, C \mid x, C) = \pi_j(x^C, C \mid x, C) = 1$. Thus, every government party in C chooses the governing coalition as the policy coalition and chooses the midpoint of the ideal points of the two parties.

The reason that x^C is the optimal choice given policy coalition C is the same as for the consensus government. Since the policymaking strategies of the government parties are invariable across different status quo policies, the future expected payoffs for the parties under the government, $v_i^\sigma(\cdot, C)$ and $v_j^\sigma(\cdot, C)$, are fixed. Thus, the sum of the farsighted payoffs for the minimal winning coalition, $R_i^\sigma(\cdot, C) + R_j^\sigma(\cdot, C)$, is maximized at x^C which maximizes the sum of the parties' current policy payoffs.

Each governmental party receives policy payoff $-\frac{1}{4}$ from the midpoint of their ideal points. Since G is distributed among the governmental parties, the sum of the governmental parties' payoffs is $G - \frac{1}{2}$. Since each governmental party is selected with equal probability in the minimal winning government, the expected payoffs of the two parties' being in the government are identical: $v_i^\sigma(x, C) = v_j^\sigma(x, C) = \frac{1}{2}(G - \frac{1}{2})$ for every x. The out-party k receives policy payoff $-\frac{3}{4}$ from policy x^C with no side payment in every period. Thus, $v_k^\sigma(x, C) = -\frac{3}{4}$.

As I discuss in detail later, once the game moves to an organization period, only minimal winning coalition governments are formed with positive probability, and each of the three minimal winning governments, {1, 2}, {1, 3}, {2, 3}, is formed with positive probability. Then, each party expects to receive payoff $\frac{1}{2}(G - \frac{1}{2})$ from forming the governments it belongs to and $-\frac{3}{4}$ from forming the government it does not belong to. As the expected payoff from being in an organization period is a weighted average of these two payoffs, staying in the current minimal winning government is clearly better than moving into a new government-making stage. The two governmental parties have no incentive to dissolve the government, and, thus, every minimal winning coalition government is stable.

The policy coalition of the minimal winning government would not necessarily be equal to the governing coalition as a proposing party could also include the out-party k as a partner of policymaking. However, in the equilibrium in Proposition 1, every proposer in minimal winning governments chooses the governing coalition as the policy coalition. This result is in contrast to the findings of previous models in which the vote of confidence procedure is not present.

In the equilibria of the models developed by Baron and Diermeier (2001), Baron, Diermeier, and Fong (2012), and Fong (2006), when the status quo is far from the center of the policy space, the proposing party chooses the consensus policy coalition. In Fong's dynamic setting, this leads to that the policy coalition oscillates over time between minimal winning coalitions and the consensus coalition. Moreover, the policy choice by each minimal winning coalition is not on the contract curve of its members. Thus, the policy outcome recurrently goes out of the triangle made by the three parties' ideal points.[4]

Such inefficiency never occurs in my equilibrium. The reason for the difference is as follows. In Fong's model, if the status quo is far from the center, then k's reservation value is low, so party i forms the consensus policy coalition and implements the centrist policy. After that, the status quo is moderate, and so i wants to form a two-party coalition, say $\{i, j\}$. Considering only the current period payoff, party i may prefer to implement the midpoint of the ideal points of i and j, which maximizes the sum of the two parties' stage utilities. However, for the future payoffs, it is beneficial for i and j to make their future coalition partner k's reservation value as low as possible. Thus there is an incentive to agree to implement a policy that is even farther from k's ideal point than the efficient policy between i and j is.

The critical distinction of my model from Fong's lies in that the reservation payoffs of parties in the policy-making stage come from the expected play in government-making stage due to the vote of confidence. When parties are very patient in my model, each party's expected payoff in an organization period depends almost entirely on the probability of its being in the future government, placing a negligible weight on the current policy. Then, parties play mixed strategies in the government formation stage so that every party's reservation value is equal, which I will explain in Section 3.4. Thus, unlike Fong's model, it is impossible for a minimal winning coalition to make the out-party's reservation payoff unilaterally low.

My result thus implies that the parliamentary structure of policy-making in which government dissolution is possible by a vote of confidence can prohibit inefficient policy dynamics that may occur otherwise.

3.3. Minority Governments

I now discuss policy-making under single party governments. Let $\{i\}$ be an arbitrary minority government and let $P = \{i, j, k\}$. The equilibrium proposal strategies satisfy the following. There exists $\underline{d} \in (\| y^{ij}(\delta) \|, d]$ such that:

1. If $\| x \| \le \underline{d}$, then $\pi_i(y^{ij}(\delta), \{i, j\} \mid x, \{i\}) = \pi_i(y^{ik}(\delta), \{i, k\} \mid x, \{i\}) = \frac{1}{2}$.
2. If $\| x \| > \underline{d}$, then $\pi_i(x^P, P \mid x, \{i\}) = 1$.

That is, the policy proposals vary across different status quo policies. On the one hand, when the status quo is relatively extreme (i.e., far from the centroid of the

[4] Also, in the two-period model by Baron, Diermeier, and Fong (2012), the policy outcome in the first period is outside the set of (stage) Pareto optimal policies.

stage Pareto set), the government chooses P as the policy coalition and then implements the centroid x^P as policy. On the other hand, when the status quo is relatively centrist, the government forms each minimal winning policy coalition with equal probability. When the policy coalition is $\{i, j\}$, the policy outcome is $y^{ij}(\delta)$; and when the policy coalition is $\{i, k\}$, the policy outcome is $y^{ik}(\delta)$.

The point $y^{ij}(\delta)$ is the policy that maximizes the sum of (far-sighted) policy payoffs for the policy coalition $\{i, j\}$ under the government $\{i\}$. Notice that $y^{ij}(\delta) = \frac{2(\tilde{x}^i + \tilde{x}^j)}{4-\delta(1+\delta)}$ is not the midpoint of the ideal points of i and j unless $\delta = 0$. The reason for this is that j is not always in the policy coalition under the government $\{i\}$. To see this, consider any centrist status quo policy x such that the governmental party i mixes between the two different minimal winning policy coalitions. When party i chooses j as its coalition partner, party j receives its reservation payoff $R_j^\sigma(x, \emptyset)$ as the proposer sets g_j so that party j is indifferent. On the other hand, when party i chooses k as its coalition party, party j gets no side payment and simply receives the farsighted payoff from the policy chosen by $\{i, k\}$, $R_j^\sigma(y^{ik}(\delta) \mid \{i\})$. Thus, the continuation value for party j at $(x, \{i\})$ is

$$v_j^\sigma(x, \{i\}) = \frac{1}{2}[R_j^\sigma(x, \emptyset) + R_j^\sigma(y^{ik}(\delta), \{i\})]. \tag{16}$$

Also, from (11), party i's payoff is $G + R_i^\sigma(y^{ij}(\delta), \{i\}) + R_j^\sigma(y^{ij}(\delta), \{i\}) - R_j^\sigma(x, \emptyset)$ when the policy coalition is $\{i, j\}$; and $G + R_i^\sigma(y^{ik}(\delta), \{i\}) + R_k^\sigma(y^{ik}(\delta), \{i\}) - R_k^\sigma(x, \emptyset)$ when the policy coalition is $\{i, k\}$. We thus have

$$\begin{aligned} v_i^\sigma(x, \{i\}) = G &+ \frac{1}{2}[R_i^\sigma(y^{ij}(\delta), \{i\}) + R_j^\sigma(y^{ij}(\delta), \{i\})] \\ &+ \frac{1}{2}[R_i^\sigma(y^{ik}(\delta), \{i\}) + R_k^\sigma(y^{ik}(\delta), \{i\})] - \frac{1}{2}[R_j^\sigma(x, \emptyset) + R_k^\sigma(x, \emptyset)]. \end{aligned} \tag{17}$$

Then, the sum of the continuation values for party i and j is

$$\begin{aligned} v_i^\sigma(x, \{i\}) + v_j^\sigma(x, \{i\}) = G &+ \frac{1}{2}[R_i^\sigma(y^{ij}(\delta), \{i\}) + R_j^\sigma(y^{ij}(\delta), \{i\})] \\ &\frac{1}{2}[R_i^\sigma(y^{ik}(\delta), \{i\}) + R_j^\sigma(y^{ik}(\delta), \{i\}) + R_k^\sigma(y^{ik}(\delta), \{i\})] - \frac{1}{2}R_k^\sigma(x, \emptyset). \end{aligned} \tag{18}$$

Notice that, in (18), only the term $-\frac{1}{2}R_k^\sigma(x, \emptyset)$ depends upon x. Then, maximizing the sum of the farsighted policy payoffs for parties i and j under government $\{i\}$, $R_i^\sigma(x, \{i\}) + R_j^\sigma(x, \{i\})$, is equivalent to solving

$$\max_{x\in X}(1-\delta)[u_i(x)+u_j(x)]-\frac{1}{2}\delta R_k^{\sigma}(x,\emptyset) . \tag{19}$$

The solution to the above problem is $y^{ij}(\delta)$, which I prove in the Appendix.

The minority governmental party can increase its future payoff by decreasing its potential coalition partner k's reservation payoff. This is the reason that the policy outcome does not lie in the stage Pareto set. The incentive to adopt an extreme policy is stronger as the future is more important. Observe that, as δ increases, $y^{ij}(\delta)$ moves farther from the ideal point of k keeping its distances from $\tilde{x}^i$ and $\tilde{x}^j$ equal to each other.[5]

The dynamics of policy outcomes is not so complicated. Note that $\underline{d}>\|y^{ij}(\delta)\|=\|y^{ik}(\delta)\|$. Hence, once $y^{ij}(\delta)$ or $y^{ik}(\delta)$ is implemented in a period, the outcome of the next period is each of the two policies with probability $\frac{1}{2}$, and the same dynamics is repeated in all subsequent periods. Thus, $\{y^{ij}(\delta),y^{ik}(\delta)\}$ is an irreducible absorbing set. If we begin with the status quo x with $\|x\|\leq\underline{d}$, the absorbing state is reached within one period. If the initial status quo x is far from the center of the policy space, the outcome in the first period is x^P. But then, the absorbing state is reached in the next period. In either case, the longrun distribution of the policy outcome places probability on each of $y^{ij}(\delta)$ and $y^{ik}(\delta)$.

Once a single minority government is formed, the governmental party does not have to worry about the other party's resignation. As such, a minority government has more discretionary power in choosing the policy coalition. That is, government i can choose party j or party k or both as its coalition partners. Instead of forming a stable coalition over time, minority governments rely on ad hoc policy coalitions in the equilibrium. This leads to an oscillation of policy outcomes and the overall inefficiency of policymaking. Hence, although minority governments are stable in the sense that they are never dissolved in equilibrium, policy choices under minority governments are not persistent in contrast to those under minimal winning and oversized governments.

3.4. Formation of Governments

I proceed to discuss government-making strategies in organization periods. In the equilibrium, each formateur i proposes only minimal winning governments that contain party i itself. That is, for every $x\in X$, $\pi_i(\{i,j\}\mid x,\emptyset)+\pi_i(\{i,k\}\mid x,\emptyset)=1$. Thus, only minimal winning coalitions are formed if the game reaches an organization period.

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[5] The distance between $y^{ij}(\delta)$ and the origin is increasing in δ and bounded by $\|\tilde{x}^i+\tilde{x}^j\|$. The assumption that the policy space is sufficiently large $(d>\frac{\sqrt{3}}{3})$ guarantees that $y^{ij}(\delta)\in X$.

Each party expects to receive payoff $\frac{1}{2}(G-\frac{1}{2})$ from the minimal winning governments it belongs to, as I explain in the previous section. Thus, party i is indifferent between governments $\{i,j\}$ and $\{i,k\}$. On the other hand, if party i is excluded from the government, then the party's payoff is $v_i^{\sigma}(x,\{j,k\})=-\frac{3}{4}$. In the equilibrium, all three minimal winning governments are formed with positive probability, which implies that each party has positive chance to be excluded from the government. Let $\mu(i\,|\,x)$ denote the probability that party i belongs to the future government at $(x,\emptyset)$ Then, if the game reaches an organization period, party i expects to receive payoff

$$\mu(i\,|\,x)\left[\frac{1}{2}\left(G-\frac{1}{2}\right)\right]+[1-\mu(i\,|\,x)]\left[-\frac{3}{4}\right] \tag{20}$$

in the next period. If a proposed government is rejected in the parliament, the parties need to stay in a government-making stage for another period. Since the same status quo x remains in effect in the organization period, party i's expected payoff in the beginning of an organization period is

$$v_i^{\sigma}(x,\emptyset)=(1-\delta)u_i(x)+\delta\left(\mu(i\,|\,x)\left[\frac{1}{2}\left(G-\frac{1}{2}\right)\right]+[1-\mu(i\,|\,x)]\left[-\frac{3}{4}\right]\right). \tag{21}$$

Since each party is excluded from the government with positive probability, (20) is less than $v_i(x,\{i,j\})=v_i(x,\{i,k\})=\frac{1}{2}(G-\frac{1}{2})$. Then, for sufficiently high δ, (21) is less than $\frac{1}{2}(G-\frac{1}{2})$ for any status quo policy x. Thus, each party prefers being a member of minimal winning governments to having one more round of government-making. Then each minimal winning government, if proposed, is accepted by its two members and never fails to form. Hence, there is no delay of government formation in the equilibrium.

Lastly, I need to show that each formateur prefers minimal winning governments that includes the formateur to any other governments that can be formed. The value of the consensus government is $\frac{1}{3}(G-1)$, which is clearly less than the value of minimal winning coalitions $\frac{1}{2}(G-\frac{1}{2})$. A minority government may be accepted in parliament for some status quo policies. However, for large enough δ, each formateur prefers minimal winning governments to the minority government of its own. The proof is provided in the Appendix, in which I derive the continuation values under minority governments. The main intuition is that, although a party monopolizes the proposal power under a minority government, the inefficiency of policy dynamics is costly enough for the value of the government to be lower than those of minimal winning governments. Hence, the government proposal strategies are sequentially rational.

Although there may be multiple equilibrium government proposal strategies, all of them generate the same payoffs. What is true in the equilibrium is that all parties' reservation values in each organization period are equal: for all $x \in X$, $R_1^\sigma(x,\emptyset) = R_2^\sigma(x,\emptyset) = R_3^\sigma(x,\emptyset)$. This is because, if the reservation values for the potential coalition partners differ, say that $R_j^\sigma(x,\emptyset) > R_k^\sigma(x,\emptyset)$, then the formateur i wants to form the government with only party k whose reservation value is the lower one.[6] Then, party k's probability of being in the government is greater than party j's at least by $\frac{1}{3}$. Notice that a party's reservation value in an organization period is a convex combination of the current policy payoff and the payoff expected from government-making strategies. Then, as δ is sufficiently large, party k's reservation value cannot be less than party j's. Thus, in the equilibrium, all parties' reservation values must be the same as they are very patient.

Then, a party that is disadvantaged by the status quo must be more likely to be included in the government than another party that is relatively advantaged by the status quo. Otherwise, their reservation values would not be identical. Thus, for all i, j, and all $x \in X$, $u_i(x) > u_j(x)$ if and only if $\mu(i \mid x) < \mu(j \mid x)$. This implies that the minimal winning government formed by the two most disadvantaged parties are the most likely government outcome.[7] However, as δ converges to one, the instant payoff from the status quo becomes negligible. Hence, with almost perfectly patient parties, all minimal winning coalitions are almost equally likely to be formed.

3.5. Patience of Parties

The equilibrium I have presented exists when the discount factor is sufficiently large. The role of patience of the players in the equilibrium is as follows.

A large discount factor guarantees that the equilibrium government-making strategies are mixed strategies that equalize the parties' reservation payoffs, as I explain in the previous section. The efficient policy dynamics under minimal winning coalitions could not be obtained without this. In the equilibrium, a minimal winning government always chooses the policy that maximizes the sum of the government members' utilities because each proposer does not have an incentive to include the out-party in the policy coalition. When the discount factor is low, then the out-party's reservation payoff places a large weight on the current status quo policy. Then, when the status quo is bad for the out-party, the party's

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[6] What is true generally in equilibrium is that for all i, j, $v_i^\sigma(x,\{i,j\}) = \frac{1}{2}[G - \frac{1}{2} + R_i^\sigma(x,\emptyset) - R_j^\sigma(x,\emptyset)]$. In the equilibrium I present in this paper, $v_i^\sigma(x,\{i,j\}) = \frac{1}{2}[G - \frac{1}{2}]$ because $R_i^\sigma(x,\emptyset) = R_j^\sigma(x,\emptyset)$.

[7] To see this, suppose $u_i(x) > u_j(x) > u_k(x)$. Then, since $\mu(j \mid x) > \mu(i \mid x)$, $\zeta^\sigma(x,\{j,k\} \mid x,\emptyset) > \zeta^\sigma(x,\{i,k\} \mid x,\emptyset)$. Since $\mu(k \mid x) > \mu(i \mid x)$, $\zeta^\sigma(x,\{j,k\} \mid x,\emptyset) > \zeta^\sigma(x,\{i,j\} \mid x,\emptyset)$. Thus, $\{j,k\}$ is the most likely government outcome.

reservation payoff is lower than the others even if it would be included in the future government for sure. As the status quo goes more extreme, the proposer wants to include the out-party in the policy coalition. Then, the proposer would change the policy coalition depending on the status quo. This creates an incentive for the proposer to choose the policy at which the out-party's payoff is low because the latter is a future coalition partner in policymaking. Then, the policy dynamics would not be persistent, nor efficient.

With patient parties, however, as the status quo goes extreme, all parties' reservation payoffs decrease with an equal rate. The dominant factor that determines the reservation value of each party is the probability of the party's being in the future government. On the one hand, there is the out-party's reservation payoff that reflects its chance to belong to the future government. On the other hand, there is the party's continuation payoff under the current government where it is permanently excluded in the equilibrium strategies. In order for the out-party to be included in the policy coalition, the difference between the two payoffs must be compensated by the transfer of G, which is not worth for the proposing party in the government.

As the non-policy benefit G is greater, the set of discount factors that support the characterized equilibrium enlarges. As G increases, the value of being in the government is greater and, thus, the probability of becoming a government member in the future gets important relative to the instant payoff from the status quo. Thus, with a larger size of G, the mixed government-making strategies and the persistent policymaking strategies under minimal winning coalitions can constitute an equilibrium even for a relatively low discount factor. Moreover, a large size of the non-policy benefit is not necessary but sufficient for the existence of the MPE in this model. That is, on the one hand, even if $G=0$, there exists an equilibrium with the characteristics in Proposition 1 for sufficiently large δ. The reason is that the government can create a surplus by choosing an efficient policy for the coalition members, as will be discussed in the concluding section. On the other hand, for any given positive δ, if G is sufficiently large, then the equilibrium in Proposition 1 exists.[8] The last finding is related to empirical observations in the literature that minimal winning governments prevail in political systems where office benefits are important (Strøm, 1990).

[8] I do not provide a separate proof of this statement. However, one can see the truth of it from that, for every $\delta \in (0,1)$, the conditions (27), (30), (31), and (38) in the Appendix hold true if G is sufficiently large and that no minority government is accepted if G is sufficiently large.

IV. Conclusion

The model in this paper reflects two important institutional characteristics in bargaining under parliamentary constitutions: the possibility of dissolution of governments and the effects of current policymaking on bargaining in the future. I have characterized a Markov perfect equilibrium in undominated strategies for sufficiently high discount factors. I find that all types of governments are stable and that, moreover, in the government formation game, delay can never occur. Different governments incur different streams of policy outcomes. The consensus government always chooses the same policy, which is the efficient policy among all members of parliament. Minimal winning coalitions adopt the midpoint of the contract curve for the governmental parties invariably over time. Under minority governments, the policy outcomes oscillate and inefficiency occurs.

One of the main differences of parliamentary constitutions from presidential-congressional ones is that the term of the government is not totally fixed. Potentially, the government can be unstable due to the vote of confidence. However, this study shows that the dynamics of political outcomes under parliamentarism may exhibit a strong stability. A coalition government can maximize the sum of its members' payoffs in every period, which guarantees that the longrun sequence of the outcomes is Pareto optimal among the governmental parties. Thus, each governmental party does not want to dissolve the current government worrying about the chance of being excluded from the next government. Moreover, a minimal winning coalition government cannot extract as much from a patient out-party as it could in congressional systems. The out-party that prefers to have a chance to be a member of the future government would not vote for the policies that it would support without the vote of confidence. This in turn weakens the governmental parties' incentive to choose extreme policies, and as a result, the dynamics of policy outcomes is efficient in equilibrium.

The strong stability results are not the consequence of the assumption that the resource G is not distributed in organization periods. This assumption obviously creates for all parties to avoid entering an organization period. However, even without the assumption, the strategies specified in Section 3 constitute an equilibrium when parties are very patient. Proposition 1 holds true with an alternative assumption that each party gets some fixed share $\overline{g}$ of G with $3\overline{g} \leq G$ in organization periods. Thus, a larger size of exogenous resources in policy periods than in organization periods is not the main factor that drives the stability results. With no strictly positive surplus directly from the resource G, the government still can produce a surplus through moving the policy to the efficient point for its members. This creates an incentive enough for the patient governmental parties not to dissolve the government.

The predictions of my model are not entirely consistent with empirical data. We sometimes observe dissolution of governments in parliamentary democracies. While my model assumes that the probabilities of parties' being the formateur are symmetric and fixed over time, those chances in the real world may depend on parties' electoral supports that vary over time. One may capture this feature by letting parties' recognition probabilities in organization periods follow a stochastic process. Then, when a government party expects its recognition probability in the next organization period to be very high, it has a greater incentive to dissolve the government than it would in the current model. However, this extension may not necessarily predict a government dissolution. A high probability to be the formateur in an organization period would be reflected by an increase in the party's reservation payoff and a decrease in the coalition partner's reservation payoff. As there is no lower bound of side payment in the model, this change in the reservation payoffs can be taken into account by the proposals in the current government without dissolving it. Thus, the assumption of symmetric recognition probabilities is not the main factor that drives the stability result. A drastic surge or decline in electoral supports would not lead to a government dissolution if parties have a common expectation about such a change. Perhaps a source of government dissolution might be parties' private information about the prospect of future elections as argued in a study of two-party cases (Smith, 2004).

Lastly, similar to many other previous theoretical models, my predictions follow Riker's (1962) 'size principle' in that only minimal winning governments are formed in the equilibrium. Empirical data in parliamentary democracies, however, show that other types of governments are recurrently formed. In Mitchell and Nyblade's (2008) data set that includes 406 governments formed from 1945 to 2000 in 17 West European countries, 178(43.6 %) are minimal winning governments, 141(34.7%) are minority governments, and 87(21.7%) are surplus governments. This well-known puzzle in cabinet formation outcomes in parliamentary system cannot be explained by a model like the one in this paper that assumes the government positions are always valuable. As Strøm (1990) suggests, being in the government may sometimes be electorally costly for political parties. The actual variations in government types might have to be examined by a model that includes an election stage taking account of parties' objective to succeed in future elections. Still, the dynamic model in this paper generates more nuanced testable implications than previous bargaining models in that it differentiates the chances of different minimal winning coalitions depending on the status quo.

A Appendix

Proof of Proposition 1

I first define a few functions that I will use to define the equilibrium strategies. For each $x \in X$, let $\overline{u}(x) = \frac{1}{3}\sum_{h\in P} u_h(x)$ and let $\overline{R}(x) = (1-\delta^2)\overline{u}(x) + \frac{1}{3}\delta^2(G-\frac{5}{4})$. For each $i \in P$, I define a function $\hat{R}_i : X \times \Omega \to \mathbb{R}$ as follows. First,

$$\hat{R}_i(x,P) = (1-\delta)u_i(x) + \frac{1}{3}\delta(G-1). \tag{22}$$

Second, for each $C \in \Omega$ with $|C| = 2$,

$$\hat{R}_i(x,C) = \begin{cases} (1-\delta)u_i(x) + \frac{1}{2}\delta(G-\frac{1}{2}) & \text{if } i \in C, \\ (1-\delta)u_i(x) - \frac{3}{4}\delta & \text{if } i \notin C. \end{cases} \tag{23}$$

For each distinct pair $i, j \in P$, let $y^{ij}(\delta) = \frac{2(\tilde{x}^i + \tilde{x}^j)}{4-\delta(1+\delta)}$. Let $\{i,j,k\} = P$, let

$$\tilde{R} = \frac{2(1-\delta)u_k(y^{ij}(\delta)) + \delta\overline{R}(y^{ij}(\delta))}{2-\delta}, \tag{24}$$

and let

$$D(x) = \overline{R}(x) - \tilde{R} - 3(1-\delta)[\overline{u}(x^P) - \overline{u}(y^{ij}(\delta))]. \tag{25}$$

Among the terms in the RHS of (25), only $\overline{R}(x)$ depends on x, and it depends on x only through $\overline{u}(x) = -\|x\|^2 - \frac{1}{3}$. Thus, $D(x)$ is strictly decreasing in $\|x\|$. Also, a little algebra can show that $D(y^{ij}(\delta))$ is equal to

$$\frac{1-\delta}{2-\delta}\left[2(1-\delta^2)\overline{u}(y^{ij}(\delta)) + \frac{2}{3}\delta^2\left(G-\frac{5}{4}\right) - 2u_k(y^{ij}(\delta)) - 3(2-\delta)[\overline{u}(x^P) - \overline{u}(y^{ij}(\delta))]\right] \tag{26}$$

Note that as $\delta \to 1$, $y^{ij}(\delta) \to \tilde{x}^i + \tilde{x}^j$. Then, $\overline{u}(y^{ij}(\delta)) \to \frac{2}{3}$ and $u_k(y^{ij}(\delta)) \to -\frac{4}{3}$. Therefore, the expression in the big square bracket in (26) approaches $\frac{2}{3}G + \frac{5}{6}$ as $\delta \to 1$. Hence, for sufficiently large δ,

$$D(y^{ij}(\delta)) \geq 0. \tag{27}$$

If $D(d,0) > 0$, then set $\underline{d} = d$. Otherwise, there is a unique number $a \in$

$(\| y^{ij}(\delta) \|, d]$ such that $D(a,0)=0$. In that case, set $\underline{d}=a$. Then, for each $i \in P$,

$$\hat{R}_i(x,\{i\}) = \begin{cases} (1-\delta)u_i(x) + \delta(G + 3\overline{u}(y^{ij}(\delta)) - \tilde{R} - \overline{R}(x)) & \text{if } \| x \| \le \underline{d}, \\ (1-\delta)u_i(x) + \delta(G + 3(1-\delta)\overline{u}(x^P) + 3\delta\overline{u}(y^{ij}(\delta)) - 2\overline{R}(x)) & \text{if } \| x \| > \underline{d}. \end{cases} \tag{28}$$

For any $j \in P \setminus \{i\}$,

$$\hat{R}_i(x,\{j\}) = \begin{cases} (1-\delta)u_i(x) + \frac{1}{2}\delta(\tilde{R} - \overline{R}(x)) & \text{if } \| x \| \le \underline{d}, \\ (1-\delta)u_i(x) + \delta\overline{R}(x) & \text{if } \| x \| > \underline{d}. \end{cases} \tag{29}$$

Notice that all functions defined above are exogenous to the players' strategies.

I now define a profile of Markov strategy $\sigma = (\pi_i, A_i)_{i \in P}$. With an abuse of notation, I use the following way to describe the parties' proposal strategies in policy periods. For an arbitrary $i \in P$, a status quo $x \in X$, a governing coalition $C \in \Omega$ with $i \in C$, a policy coalition $D \in \Omega(C)$, and policy y, notation $\pi_i(y, D \mid x, C)$ is used to mean $\pi_i(y, g \mid x, C)$ where $g \in \mathcal{G}$ is the unique distribution satisfying that $g_j = \frac{\overline{R}(x) - \hat{R}_j(y,C)}{1-\delta}$ for all $j \in D \setminus \{i\}$ and $g_k = 0$ for all $k \in P \setminus D$.

The policymaking stratgegis are as follows. Let i be an arbitrary party and let $P = \{i, j, k\}$. For every $x \in X$:

1. $\pi_i(x^P, P \mid x, P) = 1$.
2. For each $C \in \Omega$ with $i \in C$ and $|C| = 2$, $\pi_i(x^C, C \mid x, C) = 1$.
3. If $\| x \| \le \underline{d}$, then $\pi_i(y^{ij}(\delta), \{i,j\} \mid x, \{i\}) = \pi_i(y^{ik}(\delta), \{i,k\} \mid x, \{i\}) = \frac{1}{2}$; and if $\| x \| > \underline{d}$, then $\pi_i(x^P, P \mid x, \{i\}) = 1$.
4. For all $C \in \Omega$

$$A_i(x,C) = \left\{ (y,g) \in X \times \mathcal{G} \,\middle|\, g_i \ge \frac{\overline{R}(x) - \hat{R}_i(y,C)}{1-\delta} \right\}.$$

Observe that given the voting strategies in 4, all proposals in 1,2,3 above pass in parliament. Then, it is obvious that the strategies satisfy the first four properties in Proposition 1.

The government-making strategies are as follows. For every $x \in X$:

5 $\pi_i(\{i,j\} \mid x, \emptyset) = \frac{1}{2} + \frac{2(1-\delta^2)[u_k(x) - u_j(x)]}{\delta^2(G+1)}$. and $\pi_i(\{i,k\} \mid x, \emptyset) = \frac{1}{2} + \frac{2(1-\delta^2)[u_j(x) - u_k(x)]}{\delta^2(G+1)}$.

6 $A_i(x, \emptyset) = \{ C \in \Omega \mid \hat{R}_i(x,C) \ge \overline{R}(x) \}$.

In order for the formulas in 5 to be probabilities, it must be the case that

$$\frac{2(1-\delta^2)\max_{x\in X}[u_k(x)-u_j(x)]}{\delta^2(G+1)} \le \frac{1}{2},$$

Since $\max_{x\in X}[u_k(x)-u_j(x)] = 2d$, the above inequality is equivalent to

$$\delta^2 \ge \frac{8d}{G+8d+1}. \tag{30}$$

which, of course, holds for sufficiently large δ.

Also, notice that all parties propose only minimal winning coalitions in every organization period. Given the strategies, party i accepts a minimal winning coalition C with $i \in C$ if $\hat{R}_i(x,C) \ge \overline{R}(x) \ge 0$, which is equivalent to

$$(1-\delta)[u_i(x)-(1+\delta)\overline{u}(x)] + \frac{1}{12}\delta[(6-4\delta)G+5\delta-3] \ge 0. \tag{31}$$

As $\delta \to 1$, the LHS of (31) converges to $\frac{1}{6}(G+1)$. Thus, for sufficiently large δ, all minimal winning coalitions are accepted in organization periods at least by its two members and, thus, are successfully formed if proposed. Then, σ also satisfies the last property in Proposition 1.

I now will prove that σ is a Markov perfect equilibrium in undominated strategy.

I first compute the continuation values for parties under minimal winning governments. Let i be an arbitrary party and let $P=\{i,j,k\}$. Under the government $\{j,k\}$, the policy $x^{\{j,k\}}$ is implemented in every period and $g_i = 0$. Thus, $v_i^\sigma(x,\{j,k\}) = u_i(x^{\{j,k\}}) = -\frac{3}{4}$. Then, $R_i^\sigma(x,\{j,k\}) = \hat{R}_i(x,\{j,k\})$. Now consider $C=\{i,j\}$. Whoever is recognized as a proposer, the policy outcome is x^C and $g_i + g_j = G$ in every period. Thus, $v_i^\sigma(x,C)+v_j^\sigma(x,C) = G + u_i(x^C) + u_j(x^C)$ $= G - \frac{1}{2}$. Moreover, since $u_i(x^C) = u_j(x^C)$, the distribution of G in the proposal is symmetric, and each party is recognized with probability $\frac{1}{2}$, $v_i^\sigma(x,C) = v_j^\sigma(x,C)$. Therefore, $v_i^\sigma = \frac{1}{2}(G-\frac{1}{2})$, implying $R_i^\sigma(x,C) = (1-\delta)u_i(x) + \frac{1}{2}\delta(G-\frac{1}{2})$. We have shown that, for all $x \in X$ and C with $|C|=2$, $R_i^\sigma(x,C) = \hat{R}_i(x,C)$.

I now claim that, for all $i \in P$, $R_i^\sigma(x\,|\,\emptyset) = \overline{R}(x)$. Given the proposal strategies in organization periods, the probability that i belongs to the government is

$$\mu(i\,|\,x) = \frac{1}{3}[\pi_i(\{i,j\}\,|\,x,\emptyset) + \pi_i(\{i,k\}\,|\,x,\emptyset)] + \frac{1}{3}\pi_j(\{i,j\}\,|\,x,\emptyset) + \frac{1}{3}\pi_k(\{i,k\}\,|\,x,\emptyset)$$

$$=\frac{2}{3}+\frac{2(1-\delta^2)[\overline{u}(x)-u_i(x)]}{\delta^2(G+1)}.$$

Given the continuation values from the minimal winning government, we have

$$v_i^\sigma(x,\emptyset)=(1-\delta)u_i(x)+\delta\left[\mu(i\,|\,x)\frac{1}{2}\left(G-\frac{1}{2}\right)+[1-\mu(h\,|\,x)]\left(-\frac{3}{4}\right)\right].$$

Then, the reservation value is

$$\begin{aligned}R_i^\sigma(x,\emptyset)&=(1-\delta)u_i(x)+\delta v_i^\sigma(x\,|\,\emptyset)\\&=(1-\delta^2)u_i(x)+\delta^2\left(\left[\frac{2}{3}+\frac{2(1-\delta^2)[\overline{u}(x)-u_i(x)]}{\delta^2(G+1)}\right]\left[\frac{1}{2}\left(G-\frac{1}{2}\right)\right]\right.\\&\quad\left.+\left[\frac{1}{3}-\frac{2(1-\delta^2)[\overline{u}(x)-u_i(x)]}{\delta^2(G+1)}\right]\left[-\frac{3}{4}\right]\right)\\&=\overline{R}(x)\end{aligned}$$

as claimed.

Then, for all $x\in X$ and all minimal winning coalitions C, condition (7) is satisfied. So, A_i is undominated at (x,C) in σ. I now consider the sequential rationality of the proposal strategies under minimal winning governments. The discussions in Section 2.3 proves the following useful lemma.

Lemma 1 *Let* $\sigma=(\pi_i,A_i)_{i\in L}$ *and let* $C\in\Omega$ *be an arbitrary government. Assume that*

$$\max_{B\in\Omega(C)}\left(\max_{z\in X}\sum_{j\in B}R_j^\sigma(z,C)-\sum_{j\in B}R_j^\sigma(x,\emptyset)\right)\geq 0 \tag{32}$$

and that A_i *is undominated at* (x,C) *in* σ*. If, for every* $(y,D)\in X\times\Omega(C)$ *with* $\pi_i(y,D\,|\,x,C)>0$*,*

$$y\in\arg\max_{z\in X}\sum_{j\in D}R_j^\sigma(z,C). \tag{33}$$

and

$$D \in \arg\max_{B\in\Omega(C)}\left[\max_{z\in X}\sum_{j\in B} R_j^{\sigma}(z,C) - \sum_{j\in B\setminus\{i\}} R_j^{\sigma}(x,\emptyset)\right], \tag{34}$$

then π_i *is sequentially rational at* (x,C) *in* σ.

Let us show the sequential rationality of the proposal strategies under the minimal winning coalitions. Let $C=\{i,j\}$. Since $v_i^{\sigma}(x,C)+v_j^{\sigma}(x,C)=G-\frac{1}{2}$. Then, $R_i^{\sigma}(\cdot,C)+R_j^{\sigma}(\cdot,C)$ is maximized at x^C, the point that maximizes $u_i(\cdot)+u_j(\cdot)$. Thus, proposing x^C satisfies condition (33). Since $\Omega(C)=\{C,P\}$, I have to show that each government party prefers the policy coalition C to P. If any proposer proposes x^C with policy coalition C, the payoff is

$$(1-\delta)G + R_i^{\sigma}(x^C,C) + R_j^{\sigma}(x^C,C) - \overline{R}(x). \tag{35}$$

Since the continuation values do not depend on x, $\sum_{h\in P} R_h^{\sigma}(\cdot,C)$ is maximized at x^P. If the proposer proposes x^P with policy coalition P, then the payoff is

$$(1-\delta)G + \sum_{h\in P} R_h^{\sigma}(x^P,C) - 2\overline{R}(x). \tag{36}$$

Then, the strategy satisfies condition (34) if and only if

$$\overline{R}(x) \geq \sum_{h\in P} R_h^{\sigma}(x^P,C) - R_i^{\sigma}(x^C,C) - R_j^{\sigma}(x^C,C). \tag{37}$$

Given the continuation values of the parties, we have

$$\sum_{h\in P} v_h^{\sigma}(x^P,C) - v_i^{\sigma}(x^C,C) - v_j^{\sigma}(x^C,C) = -\frac{3}{4}.$$

Also, $\sum_{h\in P} u_h(x^P) - u_i(x^C) - u_j(x^C) = -\frac{1}{2}$. Then, the RHS of (37) is equal to $-\frac{1}{2}(1+\frac{1}{2}\delta)$. Then, the inequality in (37) is equivalent to

$$(1-\delta^2)\overline{u}(x) + \frac{1}{3}\delta^2\left(G-\frac{5}{4}\right) + \frac{1}{2}\left(1+\frac{1}{2}\delta\right) \geq 0. \tag{38}$$

Since $\overline{u}(x)$ is bounded below by $-d^2-\frac{1}{3}$, as $\delta\to 1$, the LHS of (38) converges to $\frac{1}{3}(G+1)$. Hence, for sufficiently high δ, the inequality (38) is true for every $x\in X$, which implies the proposal strategies are sequentially rational.

Next, I consider the strategies under the consensus government P. Whoever is the proposer, the policy is x^P in every period. This implies that $\sum_{h\in P} v_h^\sigma(x,P) = G + \sum_{h\in P} v_h(x^P) = G-1$ for every status quo $x \in X$. Since every parties' policy utility of x^P is equal and every party's probability of being the proposer is equal, $v_i^\sigma(x,P) = \frac{1}{3}(G+1)$. Then, $R_i^\sigma(x,P) = \hat{R}_i(x,P)$. Since we have shown that $R_i^\sigma(x,\emptyset) = \overline{R}(x)$, A_i is undominated at (x,P) in σ. Moreover, since $\sum_{h\in P} v_h^\sigma(z,P)$ does not depend on z, x^P is the solution to (33). Also, since P is the only available policy coalition, the proposal strategies are sequentially rational.

I now consider policymaking under minority governments Let the state be $(x,\{i\})$. First, assume $\| x \| \le \underline{d}$. If i chooses $\{i,j\}$ as the policy coalition party j's payoff is

$$\begin{aligned}(1-\delta)\left(u_j(y^{ij}(\delta)) + \frac{\overline{R}(x) - \hat{R}_j(y^{ij}(\delta)\{i\})}{1-\delta} \right) + \delta v_j^\sigma(y^{ij}(\delta),\{i\}) \\ = R_j^\sigma(y^{ij}(\delta),\{i\}) - \hat{R}_j(y^{ij}(\delta),\{i\}) + \overline{R}(x) .\end{aligned}$$

If party i chooses $\{i,k\}$, then j's payoff is simply $R_j^\sigma(y^{ik}(\delta),\{i\})$. Since i chooses each policy coalition with probability $\frac{1}{2}$, the continuation value is

$$v_j^\sigma(x,\{i\}) = \frac{1}{2}[R_j^\sigma(y^{ij}(\delta),\{i\}) - \hat{R}_j(y^{ij}(\delta),\{i\}) + \overline{R}(x) + R_j^\sigma(y^{ik}(\delta),\{i\})] . \quad (39)$$

Note that since $\| y^{ij}(\delta) \| = \| y^{ik}(\delta) \| \le \underline{d}$, (39) is true when $x = y^{ij}(\delta)$ and $x = y^{ik}(\delta)$.

Substituting $y^{ij}(\delta)$ for x in (39) and using the definition of $R_j^\sigma(\cdot,\{i\})$, we obtain

$$\begin{aligned}R_j^\sigma(y^{ij}(\delta),\{i\}) = (1-\delta)u_j(y^{ij}(\delta)) + \frac{1}{2}\delta[R_j^\sigma(y^{ij}(\delta),\{i\}) - \hat{R}_j(y^{ij}(\delta),\{i\}) \\ + \overline{R}(y^{ij}(\delta)) + R_j^\sigma(y^{ik}(\delta),\{i\})] . \quad (40)\end{aligned}$$

From (29), we have 1

$$\hat{R}_j(y^{ij}(\delta),\{i\}) = (1-\delta)u_j(y^{ij}(\delta)) + \frac{1}{2}\delta[\overline{R}(y^{ij}(\delta)) + \tilde{R}] . \quad (41)$$

Subtracting (41) from (40) and solving for $R_j^\sigma(y^{ij}(\delta),\{i\}) - \hat{R}_j(y^{ij}(\delta))$, we obtain

$$R_j^\sigma(y^{ij}(\delta),\{i\}) - \hat{R}_j(y^{ij}(\delta),\{i\}) = \frac{\delta[R_j^\sigma(y^{ik}(\delta),\{i\}) - \tilde{R}]}{2-\delta}. \tag{42}$$

Similarly, substituting $y^{ik}(\delta)$ for x in (39), we get

$$R_j^\sigma(y^{ik}(\delta),\{i\}) = (1-\delta)u_j(y^{ik}(\delta)) + \frac{1}{2}\delta[R_j^\sigma(y^{ij}(\delta),\{i\}) - \hat{R}_j(y^{ij}(\delta),\{i\}) + \overline{R}(y^{ik}(\delta)) + R_j^\sigma(y^{ik}(\delta),\{i\})]. \tag{43}$$

Also, using $u_k(y^{ij}(\delta)) = u_j(y^{ik}(\delta))$ and $\overline{R}(y^{ij}(\delta)) = \overline{R}(y^{ik}(\delta))$, we write (24) equivalently as

$$\tilde{R} = (1-\delta)u_j(y^{ik}(\delta)) + \frac{1}{2}\delta[\overline{R}(y^{ik}(\delta)) + \tilde{R}]. \tag{44}$$

Subtracting (44) from (43) and solving for $R_j^\sigma(y^{ik}(\delta)) - \tilde{R}$, we obtain

$$R_j^\sigma(y^{ik}(\delta),\{i\}) - \tilde{R} = \frac{\delta[R_j^\sigma(y^{ij}(\delta),\{i\}) - \hat{R}_j(y^{ij}(\delta),\{i\})]}{2-\delta}. \tag{45}$$

Since $\frac{\delta}{2-\delta} \neq 1$, (42) and (45) imply that $R_j^\sigma(y^{ij}(\delta),\{i\}) = \hat{R}_j(y^{ij}(\delta),\{i\})$ and $R_j^\sigma(y^{ik}(\delta),\{i\}) = \tilde{R}$.

Then, from (39), we conclude that, for all x with $\|x\| \leq \underline{d}$,

$$v_j^\sigma(x,\{i\}) = \frac{1}{2}[\tilde{R} + \overline{R}(x)], \tag{46}$$

which implies that $R_j^\sigma(x,\{i\}) = \hat{R}_j(x,\{i\})$.

Also, due to the symmetry, $R_j^\sigma(y^{ij}(\delta),\{i\}) = R_k^\sigma(y^{ik}(\delta),\{i\})$, $R_j^\sigma(y^{ik}(\delta),\{i\}) = R_k^\sigma(y^{ij}(\delta),\{i\})$ and $R_i^\sigma(y^{ij}(\delta),\{i\}) = R_i^\sigma(y^{ik}(\delta),\{i\})$. Then, from the strategies, we have

$$\sum_{h\in P} v_h^\sigma(x,\{i\}) = (1-\delta)G + \sum_{h\in P} R_h^\sigma(y^{ij}(\delta),\{i\}). \tag{47}$$

Substituting $y^{ij}(\delta)$ for x in (47) and using the definition of $R_h^\sigma(\cdot,\{i\})$, we obtain

$$\sum_{h\in P} R_h^\sigma(y^{ij}(\delta),\{i\}) = \delta G + \sum_{h\in P} u_h(y^{ij}(\delta)). \tag{48}$$

Substituting this into (47), we obtain

$$\sum_{h\in P} v_h^{\sigma}(x,\{i\}) = G + \sum_{h\in P} u_h(y^{ij}(\delta)). \tag{49}$$

Then, from (49) and from (46), we have

$$v_i^{\sigma}(x,\{i\}) = G + \sum_{h\in P} u_h(y^{ij}(\delta)) - \tilde{R} - \overline{R}(x). \tag{50}$$

Thus, for all x with $\| x \| \le d$, $R_i^{\sigma}(x,\{i\}) = \hat{R}_i(x,\{i\})$.

Now assume $\| x \| > \underline{d}$. Then, the policy coalition is P. Since $\| x^P \| \le \underline{d}$, $\hat{R}_j(x^P,\{i\}) = R_j^{\sigma}(x^P,\{i\})$. Then, $g_j = \frac{\overline{R}(x) - R_j^{\sigma}(x^P,\{i\})}{1-\delta}$. This is also true for k. Thus, we have

$$v_j^{\sigma}(x,\{i\}) = v_k^{\sigma}(x,\{i\}) = \overline{R}(x), \tag{51}$$

which implies $R_j^{\sigma}(x,\{i\}) = \hat{R}_j(x,\{i\})$ and $R_k^{\sigma}(x,\{i\}) = \hat{R}_k(x,\{i\})$.

We also have

$$\sum_{h\in P} v_h^{\sigma}(x,\{i\}) = (1-\delta)G + \sum_{h\in H} R_h^{\sigma}(x^P,\{i\}). \tag{52}$$

From (49)

$$\sum_{h\in P} R_h^{\sigma}(x^P,\{i\}) = (1-\delta)\sum_{h\in H} u_h(x^P) + \delta\left[G + \sum_{h\in P} u_h(y^{ij}(\delta))\right]. \tag{53}$$

Then, from (52), for every x with $x > \underline{d}$,

$$\sum_{h\in P} v_h^{\sigma}(x,\{i\}) = G + (1-\delta)\sum_{h\in P} u_h(x^P) + \delta\sum_{h\in P} u_h(y^{ij}(\delta)). \tag{54}$$

We then have

$$v_i^{\sigma}(x,\{i\}) = G + (1-\delta)\sum_{h\in P} u_h(x^P) + \delta\sum_{h\in P} u_h(y^{ij}(\delta)) - 2\overline{R}(x). \tag{55}$$

Hence, for all x with $\| x \| > \underline{d}$, $R_i^{\sigma}(x,\{i\}) = \hat{R}_i(x,\{i\})$. So, we have shown that, for all $x \in X$ and all $h \in P$, $R_h^{\sigma}(x,\{i\}) = \hat{R}_h(x,\{i\})$. Therefore, A_h is undominated at $(x,\{i\})$ in σ.

I will prove the sequential rationality of the proposal strategies under minority governments. First, I will show that $x^P \in \arg\max_{x\in X} \sum_{h\in P} R_h^\sigma(x,\{i\})$. Note that $\sum_{h\in P} u_h(x) = -3\|x\|^2 - 1$. Thus, on any subset $Y \subseteq X$, $\sum_{h\in P} u_h(x)$ is maximized when $\|x\|$ is minimized. This implies that $x^P \in \arg\max_{\|x\|\le \underline{d}} \sum_{h\in P} R_h^\sigma(x,\{i\})$. Take any x with $\|x\| > \underline{d}$. From (49) and (54),

$$\sum_{h\in P} v_h^\sigma(x^P,\{i\}) - \sum_{h\in P} v_h^\sigma(x,\{i\}) = (1-\delta)\left[\sum_{h\in P} u_h(y^{ij}(\delta)) - \sum_{h\in P} u_h(x^P)\right]$$

Then,

$$\begin{aligned}
&\sum_{h\in P} R_h^\sigma(x^P,\{i\}) - \sum_{h\in P} R_h^\sigma(x,\{i\}) \\
&\quad = (1-\delta)\left[\sum_{h\in P} u_h(x^P) - \sum_{h\in P} u_h(x) - \delta\left(\sum_{h\in P} u_h(x^P) - \sum_{h\in P} u_h(y^{ij}(\delta))\right)\right] \\
&\quad > 0,
\end{aligned}$$

where the last inequality use $\|x\| > \underline{d} \ge \|y^{ij}(\delta)\|$. Hence, $x^P \in \arg\max_{x\in X} \sum_{h\in P}$ $R_h^\sigma(x,\{i\})$.

I next show that $y^{ij}(\delta) \in \arg\max_{x\in X}(R_i^\sigma(x,\{i\}) + R_j^\sigma(x,\{i\})$. Take any x with $\|x\| \le \underline{d}$. Note that $v_k^\sigma(x,\{i\}) + v_j^\sigma(x,\{i\})$ Subtracting (46) from (49), we have

$$v_i^\sigma(x,\{i\}) + v_j^\sigma(x,\{i\}) = G + \sum_{h\in P} u_h(y^{ij}(\delta)) - \frac{1}{2}[\tilde{R} + \bar{R}(x)]. \tag{56}$$

Then,

$$\begin{aligned}
&R_i^\sigma(x,\{i\}) + R_j^\sigma(x,\{i\}) \\
&\quad = (1-\delta)[u_i(x) + u_j(x)] + \delta\left(G + \sum_{h\in P} u_h(y^{ij}(\delta)) - \frac{1}{2}[\tilde{R} + \bar{R}(x)]\right).
\end{aligned} \tag{57}$$

Note that, in the RHS of (57), only $[u_i(x) + u_j(x)]$ and $\bar{R}(x)$ depend on x. Then, maximizing $R_i^\sigma(x,\{i\}) + R_j^\sigma(x,\{i\})$ is equivalent to solving the problem

$$\max_{x\in X}\left[u_i(x) + u_j(x) - \frac{1}{6}\delta(1+\delta)\sum_{h\in P} u_h(x)\right] \text{ subject to } \|x\| \le \underline{d} \tag{58}$$

The objective function in the problem (58) is strictly concave. Applying the first order condition, we can easily see that the unique solution to the problem is $y^{ij}(\delta)=\frac{2(\tilde{x}^i+\tilde{x}^j)}{4-\delta(1+\delta)}$.

Take any x with $\|x\|>\underline{d}$. From (51) and (54),

$$v_i^{\sigma}(x,\{i\})+v_j^{\sigma}(x,\{i\})=G+(1-\delta)\sum_{h\in P}u_h(x^P)+\delta\sum_{h\in P}u_h(y^{ij}(\delta))-\bar{R}(x). \tag{59}$$

In the RHS, only $\bar{R}(x)$ depends on x. Subtracting (59) from (56), we obtain

$$\begin{aligned}&[v_i^{\sigma}(y^{ij}(\delta),\{i\})+v_j^{\sigma}(y^{ij}(\delta),\{i\})]-[v_i^{\sigma}(x,\{i\})+v_j^{\sigma}(x,\{i\})]\\&=(1-\delta)\left[\sum_{h\in P}u_h(y^{ij}(\delta))-\sum_{h\in P}u_h(x^P)\right]+\bar{R}(x)-\frac{1}{2}[\tilde{R}+\bar{R}(y^{ij}(\delta))]\end{aligned} \tag{60}$$

Observe that $\frac{1}{2}[\tilde{R}+\bar{R}(y^{ij}(\delta))]=\frac{(1-\delta)u_k(y^{ij}(\delta))+\bar{R}(y^{ij}(\delta))}{2-\delta}$. We then have

$$\begin{aligned}&\bar{R}(x)-\frac{1}{2}[\tilde{R}+\bar{R}(y^{ij}(\delta))]=(1-\delta^2)\left[\bar{u}(x)-\frac{\bar{u}(y^{ij}(\delta))}{2-\delta}\right]\\&-\frac{(1-\delta)u_k(y^{ij}(\delta))}{2-\delta}+\frac{\delta^2(1-\delta)}{3(2-\delta)}\left[G-\frac{5}{4}\right].\end{aligned} \tag{61}$$

Let $H(x)$ be the function we get when we divide (60) by $1-\delta$. That is,

$$\begin{aligned}&H(x)=3[\bar{u}(y^{ij}(\delta))-\bar{u}(x^P)]+(1+\delta)\left[\bar{u}(x)-\frac{\bar{u}(y^{ij}(\delta))}{2-\delta}\right]\\&-\frac{u_k(y^{ij}(\delta))}{2-\delta}+\frac{\delta^2}{3(2-\delta)}\left[G-\frac{5}{4}\right].\end{aligned} \tag{62}$$

Letting $L(x)=[u_i(y^{ij}(\delta))+u_j(y^{ij}(\delta))-u_i(x)-u_j(x)]+\delta H(x)$, we note that $R_i^{\sigma}(y^{ij}(\delta),\{i\})+R_j^{\sigma}(y^{ij}(\delta),\{i\})\geq R_i^{\sigma}(x,\{i\})+R_j^{\sigma}(x,\{i\})$ if and only if $L(x)\geq 0$.

Let $\hat{x}=\sqrt{3}d(\tilde{x}^i+\tilde{x}^j)$. This is the point that lies on the ray going through the midpoint of $\tilde{x}^i$ and $\tilde{x}^j$ and being on the boundary of the policy space X. For large enough δ, $u_i(x)+u_j(x)-(1+\delta)\bar{u}(x)$ is maximized at $\hat{x}$, implying that $L(x)$ is minimized at $\hat{x}$. Thus, if $L(\hat{x})\geq 0$, then, for all x with $\|x\|>\underline{d}$, $R_i^{\sigma}(y^{ij}(\delta),\{i\})+R_j^{\sigma}(y^{ij}(\delta),\{i\})\geq R_i^{\sigma}(x,\{i\})+R_j^{\sigma}(x,\{i\})$. Recall that $y^{ij}(\delta)\to\tilde{x}^i+\tilde{x}^j$ as $\delta\to 1$. Using this, we conclude that, as $\delta\to 1$. $L(\hat{x})$ approaches $\frac{1}{3}G+\frac{31}{12}$. Hence, for sufficiently large δ, $y^{ij}(\delta)\in\arg\max_{x\in X}(R_i^{\sigma}(x,\{i\})+(R_j^{\sigma}(x,\{i\})$.

I have shown that x^P satisfies (33) for policy coalition P and that $y^{ij}(\delta)$

satisfies (33) for policy coalition $\{i, j\}$. Due to symmetry, it is clear that $y^{ik}(\delta)$ satisfies the condition for policy coalition $\{i, k\}$. I also have to show that, for each x, the choice of the policy coalition satisfies (34). Take any $x \in X$. By choosing $\{i, j\}$, party i receives payoff $(1-\delta)G + R_i^\sigma(y^{ij}(\delta),\{i\}) + R_j^\sigma(y^{ij}(\delta),\{i\}) - \bar{R}(x)$, and by choosing P party i receives payoff $(1-\delta)G + \sum_{h\in H} R_i^\sigma(x^P,\{i\}) - 2\bar{R}(x)$. Thus, choosing $\{i, j\}$ is optimal if and only if

$$\begin{aligned}
\bar{R}(x) &\geq \sum_{h\in P} R_h^\sigma(x^P,\{i\}) - R_i^\sigma(y^{ij}(\delta),\{i\}) - R_j^\sigma(y^{ij}(\delta),\{i\}) \\
&= (1-\delta)\left[\sum_{h\in P} u_h(x^P) - \sum_{h\in P} u_h(y^{ij}(\delta))\right] + R_k^\sigma(y^{ij}(\delta),\{i\}) \\
&= 3(1-\delta)\,[\bar{u}(x^P) - \bar{u}(y^{ij}(\delta))] + \tilde{R}\,.
\end{aligned}$$

Observing the formula in (25), we see that the above weak inequality is true if and only if $D(x) \geq 0$. By construction, if $\|x\| \leq \underline{d}$, then $D(x) \geq 0$, and if $\|x\| > \underline{d}$, then $D(x) < 0$. Therefore, the proposal strategies under minority governments are sequentially rational.

Lastly, I show the optimality of government-making strategies. We have proven that, for all $i \in P$, all $x \in X$ and all $C \in \Omega$, $R_i^\sigma(x,C) = \hat{R}_i(x,C)$ and $R_i^\sigma(x,\emptyset) = \bar{R}(x)$. Then, each $A_i(x,\emptyset)$ consists of the governments C such that $R_i^\sigma(x,C) \geq R_i^\sigma(x,\emptyset)$, which is equivalent to $v_i^\sigma(x,C) \geq v_i^\sigma(x,\emptyset)$. Thus, A_i is undominated.

Next, I will prove that the proposal strategies at $(x,\emptyset)$ is sequentially rational. We know that $v_i^\sigma(x,\{i,j\}) = v_i^\sigma(x,\{i,k\}) = \frac{1}{2}(G-\frac{1}{2})$. We need to show that this is greater than or equal to the continuation value of every government that can be accepted at $(x,\emptyset)$. Let $C = \{i, j\}$. It is easy to see that $v_i^\sigma(x,C) > \frac{1}{3}(G+1) = v_i^\sigma(x,P)$ and $v_i^\sigma(x,C) > -\frac{3}{4} = v_i^\sigma(x,\{j,k\})$. Also $\frac{1}{2}(G-\frac{1}{2}) > \tilde{R}$ and, for large enough δ, $\frac{1}{2}(G-\frac{1}{2}) > \bar{R}(x)$. Then, $v_i^\sigma(x,C) > v_i^\sigma(x,\{j\})$ and $v_i^\sigma(x,C) > v_i^\sigma(x,\{k\})$.

The only remaining case is the minority government $\{i\}$. Note that both $\tilde{R}$ and $\bar{R}(x)$ converges to $\frac{1}{3}(G-\frac{5}{4})$ as $\delta \to 1$. Then, from (28), $R_i^\sigma(x,\{i\}) \to \frac{1}{3}(G-\frac{7}{4})$. Then, for sufficiently large δ, $R_i^\sigma(x,C) > R_i^\sigma(x,\{i\})$, which is equivalent to $v_i^\sigma(x,C) > v_i^\sigma(x,\{i\})$. This completes the proof. ■

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의회협상의 동학과 정부 신임 투표*

조 석 주**

초 록 이 연구는 세 개의 정당이 2차원의 정책과 이전 가능한 비정책 이익의 분배를 의회에서 협상하는 동적 모형을 분석한다. 모형은 주요 입법이 부결되면 정부가 해산되는 의회제의 핵심 특징을 반영하고 있다. 또한 모형에서 정책은 지속적인 프로그램으로 간주되어 현 시기에 채택된 정책은 다음 시기 협상의 디폴트 정책이 된다. 이 논문은 모형의 분석을 통하여 정당이 미래를 충분히 중요시하는 경우에 존재하는 마르코프 완전 균형을 찾는다. 이 균형에서는 정부가 한 번 수립되면 해산되지 않는다. 또합의 정부와 최소 승리 연합정부들은 각각 지속적으로 하나의 정책을 선택하고, 그 정책은 정부에 참여하는 정당들 간에 파레토 효율적이다. 반면 소수 정부는 장기적으로 두 개의 정책을 번갈아가며 선택하며, 그 정책들은 파레토 효율적이지 않다. 정부 형성 협상에서는 항상 최소 승리 연합정부가 수립되고, 현 정책에서 상대적으로 낮은 효용을 얻는 정당일수록 연합정부에 포함될 확률이 높아진다.

핵심 주제어: 동적 협상, 정부신임투표, 의회제, 정부형성

경제학문헌목록 주제분류: C73, D72, D78

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