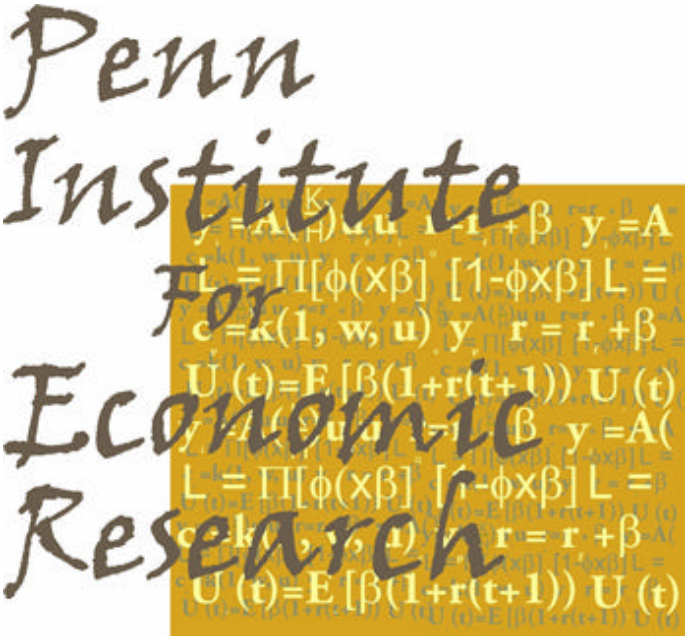

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"Bicameralism and Government Formation"
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Bicameralism and Government Formation*

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ABSTRACT

In this paper we present a structural approach to the study of government formation in multi-party parliamentary democracies. The approach is based on the estimation of a stochastic bargaining model which we use to investigate the effects of specific institutional features of parliamentary democracy on the formation and stability of coalition governments. We then apply our methodology to estimate the effects of governmental bicameralism. Our main findings are that eliminating bicameralism does not affect government durability, but does have a significant effect on the composition of governments leading to smaller coalitions. These results are due to an equilibrium replacement effect: removing bicameralism affects the relative durability of coalitions of different sizes which in turn induces changes in the coalitions that are chosen in equilibrium.

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1 Introduction

The distinctive characteristic of parliamentary democracies is that the executive derives its mandate from and is politically responsible to the legislature. This has two consequences. First, unless one party wins a majority of seats – a rare case in electoral systems with proportional representation – the government is not determined by an election alone, but is the result of an elaborate bargaining process among the parties represented in the parliament. Second, parliamentary governments may lose the confidence of the parliament at any time, which leads to their immediate termination. Thus, historically, two questions have dominated the study of coalition government. Which governments will form ("government type")? And how long will they last ("government stability")?

Until the 1990s, research on coalition government largely focused on the preference and seat distributions of the represented parties as explanatory variables.[1] Since then a series of contributions introduced an institutionalist perspective into the study of coalition government (Baron 1989, Laver and Shepsle 1990, Strom 1990), which emphasized the importance of government formation and termination rules and procedures (especially those prescribed by each country's constitution) for explaining cross-country and cross-temporal variation in government type and stability.[2]

A focus on constitutional features has two advantages. First, in contrast to other institutional characteristics (e.g., the numbers of parties), constitutional features can be considered exogenous during the formation and life-time of a specific cabinet. Second, such focus has direct practical implications as it could provide a methodology for constitutional design and reform (Skach 2005).

Institutionalist models of coalition government view governing coalitions as equilibria

[1] See Laver and Schofield (1990) for a comprehensive review of these approaches.

[2] See Diermeier and Krehbiel (2003) for a detailed discussion of the methodological aspects of institutionalism, and Diermeier (2006) for a review of institutionalist approaches in the study of coalition formation.

of an underlying political bargaining process that needs to be sustained over time as the bargaining environment (e.g., each party's outside options) changes (Diermeier and Merlo 2000, Diermeier and Stevenson 2000, Lupia and Strom 1995). The general task is to develop a multi-stage bargaining approach with an explicitly modeled stochastic process to capture the changing political environment that may lead to cabinet termination.

A first step in this direction is the Diermeier-Merlo model (Diermeier and Merlo 2000). Bargaining is assumed to be multi-state efficient proto-coalition bargaining (Baron and Diermeier 2001) with random shocks to both electoral prospects and to the parties' reservation values that in equilibrium may terminate the current government. Diermeier and Merlo show that in such a model formateurs may optimally choose both minority and super-majority cabinets, even if the chosen government is expected to terminate early. It follows that government types and their respective stability are jointly determined in equilibrium.

This equilibrium-based approach has important methodological consequences. For example, much of the empirical literature on cabinet stability (whether institutionalist or not) has relied on reduced-form regression models, i.e., a suitably defined stochastic process with sets of covariates that influence termination probabilities. Since Strom (1985), all these models have contained institutional characteristics, both of the polity (e.g., constitutional features) and of the cabinet (e.g., its majority status). But this approach is at odds with models where cabinet type and stability are jointly determined in equilibrium, since cabinet-specific features can no longer be interpreted as exogenous independent variables in a standard regression model.

In a recent paper, we proposed a structural estimation approach to resolve these problems (Diermeier, Eraslan, and Merlo 2003, henceforth, DEM). In this paper, we apply the DEM framework to the question of constitutional design discussed above. By specifying a formal model of cabinet formation we can interpret the data (type of government, duration etc.) as equilibrium phenomena. Once the model is fully specified and its parameters estimated, we

can then change key features of the model that formally represent constitutional characteristics and generate simulated data which can be compared to the original data to quantify the effects of proposed or actual constitutional changes. To demonstrate our approach we focus on a specific case of constitutional design: bicameralism.

Bicameralism is one of the most salient constitutional features. It can be found in approximately one third of all legislatures (Tsebelis and Money 1997). Despite its prominent historical role in constitutional development (e.g., Finer 1997), bicameralism has rarely been the focus of research in formal comparative politics. Consequently, its effects on policy processes and outcomes are not well understood.

Almost all of the existing studies of bicameralism focus on *legislative* bicameralism (i.e., a constitutional arrangement where the legislative function is distributed among two chambers).[3] Our focus, however, is on *governmental* bicameralism (i.e., a constitutional arrangement where two chambers share the right to appoint and remove members of the executive). In parliamentary democracies, an emphasis on government formation (rather than the legislative process) is justified because stable governments are able to virtually dominate the legislative process, leaving the legislative opposition with little influence over policy outcomes. In parliamentary systems, governmental bicameralism is present whenever the governing coalition has to maintain the confidence of both chambers of parliament to stay in power. Henceforth, we refer to this constitutional feature as "dual responsibility." In Western Europe, Italy, Belgium (until 1995), and Sweden (until 1970) are the only three countries with dual responsibility.[4]

[3]Recent examples include Diermeier and Myerson (1999), who show how bicameralism can affect the internal organization of legislatures, and Tsebelis and Money (1997), who explore the consequences of inter-chamber committees on legislative output.

[4]In the case of bicameral parliaments without dual responsibility (like, for example, Germany), the upper chamber only plays a legislative role, but does not participate either in the appointment or the dismissal of the executive.

There is little existing empirical or theoretical work that has investigated the consequences of dual responsibility on the composition and the duration of coalition governments. The few studies that investigated the link between bicameralism and coalition governments have focused primarily on legislative bicameralism (Druckman and Thies 2002, Lijphart 1984, Sjölin 1993, Tsebelis 2000, 2002). The two main theoretical conclusions that emerge from these studies are that, *ceteris paribus*, bicameralism decreases government duration (Tsebelis 2000) and increases the size of government coalitions (Lijphart 1984, Sjölin 1993). The first conclusion follows from Tsebelis's work on veto players (Tsebelis 2002). The basic idea is that government formation and policy can be characterized by the number of veto players and their associated win-sets. In the case of dual responsibility, this implies that when the agreement of two chambers (i.e., two veto players) is required to change the *status quo,* the resulting government would be relatively more unstable. The Lijphart-Sjölin conjecture, on the other hand, suggests that formateurs will anticipate this effect and therefore form super-majority coalitions. In a recent empirical study of government formation and duration in West European bicameral parliamentary democracies, Druckman and Thies (2002) found that governments that control a majority of seats in both chambers last substantially longer than those who lack majority status in one of the chambers, but found little evidence that governments add parties that generate "oversized" coalitions in the lower chamber in order to ensure a majority in the upper chamber.[5]

To investigate these issues findings, we apply the structural approach developed in DEM to the issue of constitutional reform. Specifically, we estimate our structural model using data on Belgian governments over the period 1945-1995. We then use the estimated model to assess the consequences of the Belgian constitutional reform that eliminated dual responsibility in 1995 and provide an equilibrium interpretation of our findings within the context

[5]Note that Druckman and Thies (2002) do not estimate the effect of bicameralism (i.e. the constitutional feature *per se*) on government formation and duration. Rather, they are mainly interested in assessing how majority status in the upper chamber of a bicameral parliament affects government duration.

of our bargaining model. Finally, we investigate whether the model's predictions generalize beyond the Belgian case.

The investigation of dual responsibility is important beyond its immediate application to constitutional debates in the respective countries. In particular, it allows us to investigate the validity of some basic beliefs about the logic of government formation. As mentioned above, one of the more common beliefs about government formation is that minimal winning governments are the "normal" outcome of government formation and that minority or super-majority governments constitute an "anomaly" that needs to be explained. Institutionalist accounts (e.g., Strom 1990) have further suggested some constitutional features that may prevent the formation of minimal winning governments. But this implies that in the absence of such factors (i.e., in the typical case) we should expect minimal winning governments to form. Calls for institutional reform in Belgium, Sweden, and more recently, Italy were guided by a similar concern: dual responsibility, it was believed, encourages super-majority governments. Removing dual responsibility thus would lead to the "typical" case: minimal winning governments.

Note, however, that these intuitions are derived in the absence of a theoretical model. The key methodological insight is that we need to account for the equilibrium response of strategic party leaders in evaluating issues of constitutional design or reform. Changing the rules of government formation changes the incentives for strategic players and therefore the predicted equilibria. For example, while *potential* governments may last longer under one set of rules, this does not necessarily imply that *actual* governments will be more durable, since government formation is the outcome of a strategic bargaining and selection process. Similarly, changes in expected cabinet duration change the incentives for formateurs to select minority governments.

These issues are of general concern in all cases of government formation and duration, whether government formation is governed by dual responsibility or not. The advantage

of using dual responsibility as our test case is that we can model the underlying incentives explicitly and derive potentially counter-intuitive empirical consequences due to changing incentives. For example, the theoretical model shows that formateurs face a fundamental trade-off between control (their share of the benefits from holding office) and durability (the size of the total benefits from holding office). The key insight is that if *all potential* governments are expected to be more stable, formateurs will switch from proposing more inclusive governments (e.g., super-majority governments) to less inclusive governments (e.g., minority governments). Minimal winning governments will form when the incentives between durability and control are balanced. However, in general there is no reason to expect that this equilibrium replacement effect will stop at minimal winning coalitions. Rather, we may observe an "over-shooting" effect where formateurs now prefer minority governments. On average, the choice of a less stable type of government may cancel (or even outweigh) the fact that conditional on type (potential) cabinets become more stable under single responsibility. Therefore, unless the strategic incentives of party leaders are accounted for, a well-intended constitutional reform may lead to unanticipated consequences such as a sharp increase in minority cabinets.

Our approach is able to formally identify and quantify such effects. First, our analysis predicts that abolishing dual responsibility would have virtually no effect on the average duration of governments, while at the same time producing a sizeable impact on their composition. According to our analysis, eliminating government responsibility to the upper chamber would significantly reduce the occurrence of surplus governments and increase the occurrence of minority governments. Second, the effects predicted by the model are not only consistent with the estimated case of Belgium, but can also explain the puzzling findings following the 1970 Swedish constitutional reform, where the average duration of governments remained essentially unchanged, while the fraction of minority governments doubled. Finally, the model can also account for the pattern of government types as well as other important

features of the data for the case of Denmark.

2 Model

We apply the DEM framework to the case of government formation with dual responsibility.[6] Let $N = \{1, ..., n\}$ denote the set of parties represented in the parliament and let $\pi^C \in \Pi^C = \{(\pi_1^C, ..., \pi_n^C) : \pi_i^C \in (0,1), \sum_{i \in N} \pi_i^C = 1\}$ denote the vector of the parties' relative shares in parliamentary chamber $C \in \{H, S\}$, where H denotes the "House" (lower chamber) and S denotes the "Senate" (upper chamber).[7]

Each party $i \in N$ has linear von Neumann-Morgenstern preferences over the benefits from holding office $x_i \in I\!R_+$ and the composition of the government coalition $G \subseteq N$,

$$U_i(x_i, G) = x_i + u_i^G, \tag{1}$$

where

$$u_i^G = \begin{cases} \varepsilon_i^G & \text{if} \quad i \in G, \\ \eta_i^G & \text{if} \quad i \notin G, \end{cases} \tag{2}$$

$\varepsilon_i^G > \eta_i^G$, $\varepsilon_i^G, \eta_i^G \in I\!R$. This specification captures the intuition that parties care both about the benefits from being in the government coalition and the identity of their coalition partners. Note that rather than deriving preferences over coalition partners from a spatial model we directly specify preferences over possible coalition partners.[8] Equation (2) also implies that, *ceteris paribus*, parties always prefer to be included in the government coalition. We let $\beta \in (0,1)$ denote a common discount factor.

Our analysis begins at the time when a new government has to be formed, with $\overline{T}$ denoting the *time horizon* to the next scheduled election which terminates the current government.

[6] For a detailed exposition of the DEM framework, see Diermeier, Eraslan, and Merlo (2003).

[7] The shares are determined by the outcome of a general election which is not modeled here.

[8] For a richer, spatial model of government formation where government policies are endogenously determined, see Diermeier and Merlo (2000).

Government duration will depend on various economic and political context variables (Warwick 1994, Merlo 1997, 1998). We capture all these possible influences through a state variable s which evolves over time according to an independently and identically distributed (i.i.d.) stochastic process σ with state space Σ and probability distribution function $F_\sigma(\cdot)$.

At the beginning of the government formation process, the head of state chooses a *formateur* party $k \in N$. We assume that the choice of a formateur is non-partisan and the head of state is non-strategic. In particular, each party $i \in N$ is selected to be a formateur with probability

$$p_i(\pi^H, \pi^S, \Bbbk_{-1}) = \begin{cases} 1 & \text{if } \pi_i^H > 0.5 \text{ or } \pi_i^S > 0.5 \text{ and } \pi_j^H \leq 0.5, \forall j \in N, \\ \frac{\exp(\alpha_0 \pi_i^H + \alpha_1 I_i)}{\sum_{j \in N} \exp(\alpha_0 \pi_j^H + \alpha_1 I_j)} & \text{if } \pi_j^C \leq 0.5, \forall j \in N, \text{ for } C = H, S, \\ 0 & \text{if } \exists\ j \neq i : \pi_j^C > 0.5, \text{ for } C = H \text{ or } C = S, \end{cases} \tag{3}$$

where $\Bbbk_{-1} \in N$ denotes the party of the former prime minister, and I_i is a dummy variable that takes the value 1 if $\Bbbk_{-1} = i$ and zero otherwise. This specification captures the intuition that although relatively larger parties may be more likely to be selected as a formateur than relatively smaller parties, there may be an incumbency bias.[9]

In contrast to other coalition bargaining models (e.g., Baron 1989), we use proto-coalition bargaining (Baron and Diermeier 2001, Diermeier and Merlo 2000). In proto-coalition bargaining the formateurs choose a *proto-coalition* D, a non-empty subset of parties represented in either of the two chambers.[10] Let $\pi^D \equiv (\sum_{i \in D} \pi_i^H, \sum_{i \in D} \pi_i^S)$ denote the *size* of proto-coalition D. Intuitively, a proto-coalition is a set of parties that agree to *talk* to each other about forming a government together. The proto-coalition bargains over the formation of a new government, which determines the allocation of government portfolios among the coalition members, $x^D = (x_i^D)_{i \in D} \in I\!R_+^{|D|}$. Following Merlo (1997), we assume that cabinet

[9] Nost constitutions are silent with respect to the rules for selecting a formateur. Diermeier and Merlo (2004) show that the chosen specification is a good approximation for actual formateur selection.

[10] We assume that proto-coalitions always include the formateur.

portfolios generate a (perfectly divisible) unit level of surplus in every period a government is in power and we let $T^D \in [0, \overline{T}]$ denote the duration of a government formed by proto-coalition D.

Government duration is modeled as a random variable T^D that depends on various institutional factors Q (e.g., whether the government has dual responsibility), the relative size of the government coalition, the time horizon to the next election, the state of the political and economic system at the time a government forms, and political and economic events occurring while a government is in power (e.g., King et al. 1990, Merlo 1998, Warwick 1994). Hence, T^D can be represented as a random variable with density function $f(t^D|s, \overline{T}, Q, \pi^D)$ over the support $[0, \overline{T}]$.[11]

Given the current state s and the vector of (time-invariant) characteristics $(\overline{T}, Q, \pi^D)$, let $y^D(s, \overline{T}, Q, \pi^D) \equiv E[T^D|s, \overline{T}, Q, \pi^D]$ denote the *cake* to be divided among the members of the proto-coalition D if they agree to form a government in that state. In other words, $y^D(\cdot) \in (0, \overline{T})$ represents the total expected office benefits from forming a government in state s. Given proto-coalition D, for any state s, let

$$X^D(s, \overline{T}, Q, \pi^D) \equiv \left\{ x^D \in I\!R_+^{|D|} : \sum_{i \in D} x_i^D \leq y^D(s; \overline{T}, Q, \pi^D) \right\} \tag{4}$$

denote the set of feasible payoff vectors to be allocated in that state, where x_i^D is the amount of cake awarded by coalition D to party $i \in D$.

The proto-coalition bargaining game proceeds as follows. Given state s, the formateur chooses either to pass or to propose an allocation $x^D \in X^D(s, \overline{T}, Q, \pi^D)$. If $\Bbbk$ proposes an allocation, all the other parties in the proto-coalition sequentially respond by either accepting or rejecting the proposal until either some party has rejected the offer or all parties in D have accepted it. If the proposal is unanimously accepted by the parties in the proto-coalition, a government is inaugurated and the game ends. If no proposal is offered and accepted by all

[11] Here, we treat government dissolution as exogenous. For a theoretical model where the decision of dissolving a government is endogenous, see Diermeier and Merlo (2000).

parties in the proto-coalition, state s' is realized according to the stochastic process σ and party $i \in D$ is selected to make a government proposal with probability

$$\widetilde{p}_i(\pi^H, \pi^S, D) = \begin{cases} 1 & \text{if } \pi_i^H > 0.5 \text{ or } \pi_i^S > 0.5 \text{ and } \pi_j^H \leq 0.5, \forall j \in D, \\ \frac{\exp(\alpha_2 \pi_i^H)}{\sum_{j \in D} \exp(\alpha_2 \pi_j^H)} & \text{if } \pi_j^C \leq 0.5, \forall j \in N, \text{ for } C = H, S, \\ 0 & \text{if } \exists\ j \neq i : \pi_j^C > 0.5, \text{ for } C = H \text{ or } C = S. \end{cases} \tag{5}$$

Let $\ell \in D$ denote the identity of the proposer. The bargaining process continues until some proposed allocation is unanimously accepted by the parties in the proto-coalition.

An outcome of this bargaining game therefore is defined as a stopping time $\tau^D = 0, 1, ...$ and a $|D|$–dimensional random vector χ^D which satisfies $\chi^D \in X^D(\sigma_{\tau^D}, \overline{T}, Q, \pi^D)$ if $\tau^D < +\infty$ and $\chi^D = 0$ otherwise. Given a realization of σ, τ^D denotes the period in which a proposal is accepted by proto-coalition D, and χ^D denotes the proposed allocation that is accepted in state σ_{τ^D}. Define $\beta^\infty \equiv 0$. Then an outcome (τ^D, χ^D) implies a von Neumann-Morgenstern payoff to each party $i \in D$ equal to $E[\beta^{\tau^D} \chi_i^D] + \varepsilon_i^D$, and a payoff to each party $j \in N \backslash D$ equal to η_j^D. For any formateur $\Bbbk \in N$, each potential proto-coalition $D \in \Delta_\Bbbk$ is therefore associated with an expected payoff

$$W_\Bbbk(D, \overline{T}, Q, \pi^D) = E[\beta^{\tau^D} \chi_i^D] + \varepsilon_\Bbbk^D. \tag{6}$$

Hence, party $\Bbbk$ chooses the proto-coalition to solve

$$\max_{D \in \Delta_\Bbbk} W_\Bbbk(D, \overline{T}, Q, \pi^D). \tag{7}$$

Let $D_\Bbbk \in \Delta_\Bbbk$ denote the solution to this maximization problem.

2.1 Equilibrium Characterization

The characterization of the equilibrium of this model relies on the general results for stochastic bargaining games contained in Merlo and Wilson (1995, 1998). First, the equilibrium agreement rule possesses a *reservation property*: in any state s, coalition D agrees in that state if and only if $y^D(s, \overline{T}, Q, \pi^D) \geq y^*(D, \overline{T}, Q, \pi^D)$, where $y^*(\cdot)$ solves

$$y^*(D, \overline{T}, Q, \pi^D) = \beta \int \max\{y^D(s', \overline{T}, Q, \pi^D),\ y^*(D, \overline{T}, Q, \pi^D)\} dF_\sigma(s'). \tag{8}$$

Hence, delays can occur in equilibrium. During proto-coalition bargaining, the reservation property implies a trade-off between delay in the formation process and expected duration. Intuitively, coalitions may want to wait for a favorable state of the world that is associated with a longer expected government duration and hence a larger cake. On the other hand, the presence of discounting makes delay costly. In equilibrium, agreement is reached when these opposite incentives are balanced. Notice that the role of delays is to "screen out" relatively unstable governments. How much screening occurs in equilibrium depends on how impatient parties are (measured by β), their institutional environment (summarized by Q), the length of the time horizon to the next scheduled election (given by $\overline{T}$), the size and composition of the proto-coalition (equal to π^D and D, respectively), and the uncertainty about the future (summarized by the stochastic process σ).

Second, the equilibrium of the bargaining game satisfies the *separation principle* (Merlo and Wilson 1998): any equilibrium payoff vector must be Pareto efficient, and the set of states where parties agree must be independent of the proposer's identity. This implies that in the proto-coalition bargaining stage, distribution and efficiency considerations are independent and delays are optimal from the point of view of the parties in the proto-coalition. In particular, perpetual disagreement is never an equilibrium, and for any possible proto-coalition, agreement is reached within a finite amount of time. Hence, for any $D \in \Delta_{\Bbbk}$, if D is chosen as the proto-coalition, then D forms the government.

Third, for any formateur $\Bbbk \in N$ and for any potential proto-coalition $D \in \Delta_{\Bbbk}$, the ex-ante expected equilibrium payoff to party $\Bbbk$ is given by

$$W_{\Bbbk}(D, \overline{T}, Q, \pi^D) = \left(\frac{1 - \beta(1 - \widetilde{p}_{\Bbbk}(\pi^H, \pi^S, D))}{\beta} \right) y^*(D, \overline{T}, Q, \pi^D) + \varepsilon^D_{\Bbbk}. \tag{9}$$

Hence, we obtain that for any formateur $\Bbbk \in N$, the equilibrium proto-coalition choice $D_{\Bbbk} \in \Delta_{\Bbbk}$ is given by

$$D_{\Bbbk} = \arg\max_{D \in \Delta_{\Bbbk}} \left(\frac{1 - \beta(1 - \widetilde{p}_{\Bbbk}(\pi^H, \pi^S, D))}{\beta} \right) y^*(D, \overline{T}, Q, \pi^D) + \varepsilon^D_{\Bbbk}, \tag{10}$$

and $D_{\Bbbk}$ forms the government (that is, $G = D_{\Bbbk}$).

When choosing a government coalition, a formateur faces a trade-off between "control" (i.e., its own share of the cake) and "durability" (i.e., the overall size of the cake). That is, on the one hand, relatively larger coalitions may be associated with longer expected durations and hence relatively larger cakes. On the other hand, because of proto-coalition bargaining, by including additional parties in its coalition the formateur party would receive a smaller share of the cake. The equilibrium coalition choice depends on the terms of this trade-off, which in turn, given the institutional environment Q, depend on the relative desirability of the different options $y^*(\cdot)$, the degree of impatience of the formateur β, its relative "bargaining power" $\widetilde{p}_{\Bbbk}(\cdot)$, and the formateur's tastes for its coalition partners $\varepsilon_{\Bbbk}^{D}$.

2.2 An Example

To illustrate some of the properties of the equilibrium, we present a simple example. Suppose there are three parties, $N = \{1, 2, 3\}$ with $\pi^H = (1/5, 1/5, 3/5)$ and $\pi^S = (1/5, 3/5, 1/5)$, and party 1 is the formateur. For each possible proto-coalition $D \in \Delta_1 = \{\{1\}, \{1, 2\}, \{1, 3\}, \{1, 2, 3\}\}$, if agreement is not reached on the formateur's proposal, the probability that party 1 is selected to make the next proposal is given by $\widetilde{p}_1 = 1/|D|$. Let $\varepsilon_1^{\{1\}} = \varepsilon_1^{\{1,2\}} = 1/2$ and $\varepsilon_1^{\{1,3\}} = \varepsilon_1^{\{1,2,3\}} = 0$. Note that coalition $\{1\}$ has minority status in both chambers, coalitions $\{1, 2\}$ and $\{1, 3\}$ have minority status in one chamber but are minimum winning majority coalitions in the other chamber, and coalition $\{1, 2, 3\}$ is a surplus majority coalition in both chambers.

The time horizon to the next election is five periods, $\overline{T} = 5$. There are two possible states of the world, $\Sigma = \{b, g\}$. Each state is realized with equal probability, $\Pr(\sigma = b) = \Pr(\sigma = g) = 1/2$. Consider an institutional environment with dual responsibility and suppose that if $s = b$, then governments that have minority status in both chambers are expected to last one period, governments that have minority status in one chamber but majority status in the other chamber are expected to last two periods, and governments

that have majority status in both chambers are expected to last three periods: that is, $y^{\{1\}}(b) = 1$ and $y^{\{1,2\}}(b) = y^{\{1,3\}}(b) = 2$ and $y^{\{1,2,3\}}(b) = 3$. If, on the other hand, $s = g$, then each government's expected duration is increased by one period: that is, $y^{\{1\}}(g) = 2$, $y^{\{1,2\}}(g) = y^{\{1,3\}}(g) = 3$, and $y^{\{1,2,3\}}(g) = 4$. This specification is intended to capture an environment where both a government's majority status and the state of the world affect the expected stability of coalition governments.

We begin by analyzing the outcome of proto-coalition bargaining under *dual responsibility* for every possible proto-coalition $D \in \Delta_1$. Consider first the case where $D = \{1\}$. Using equation (8) above, it is easy to verify that if $\beta \leq 2/3$, then $y^*(\{1\}) = 3\beta/2 \leq y^{\{1\}}(b)$, which implies that delays never occur. If, on the other hand, $\beta > 2/3$, then $y^*(\{1\}) = 2\beta/(2-\beta) > y^{\{1\}}(b)$, which implies that delays occur when $s = b$. Hence, using equation (9) above, the equilibrium payoff to party 1 from choosing proto-coalition $\{1\}$ is equal to

$$W_1(\{1\}) = \begin{cases} 2 & \text{if} \quad \beta \leq \frac{2}{3}, \\ \frac{2}{2-\beta} + \frac{1}{2} & \text{if} \quad \beta > \frac{2}{3}. \end{cases}$$

All other equilibrium payoffs for the remaining proto-coalitions can be calculated in a similar fashion. They are represented in Figure 1.

Hence, the equilibrium proto-coalition choice of the formateur party 1 is given by[12]

$$D_1 = \begin{cases} \{1,2,3\} & \text{if} \quad \beta \in (0, 0.46), \\ \{1,2\} & \text{if} \quad \beta \in (0.46, 0.74), \\ \{1\} & \text{if} \quad \beta \in (0.74, 1). \end{cases}$$

Note that a relatively high degree of impatience would induce the formateur to choose a surplus coalition that would immediately agree to form the government.[13] On average, surplus governments would therefore be observed to last 3.5 periods. For intermediate levels of impatience, on the other hand, the formateur would choose a coalition that has minority

[12] Since ties are zero probability events, we are ignoring here the event of a tie between two alternatives.

[13] Notice that when $D = \{1,2,3\}$ and $\beta \in (0, 0.46)$ agreement occurs in both states of the world.

status in one chamber but is a minimum winning majority coalition in the other chamber. Even in this case, however, the process of government formation would involve no delay and would produce governments that would last, on average, 2.5 periods.[14] Finally, for sufficiently low degrees of impatience, the formateur would choose a coalition that has minority status in both chambers. This government would continue negotiating until the "good" state of the world is realized. Thus, it would last, on average, 2 periods.

The example illustrates the two equilibrium selection effects captured by our model. First, when $\beta > 2/3$, the least durable minority governments (that is, minority governments that come to power in a "bad" state of the world) are "screened out" in equilibrium and would never form. This is a consequence of efficient proto-coalition bargaining. Second, when $\beta \in (0.46, 0.74)$, although a more durable option is always available (that is, a coalition with majority status in both chambers), the formateur chooses a proto-coalition with a smaller expected duration (and no majority status in one of the two chambers) because that increases its share of office benefits. This is an example of the fundamental trade-off described above between "durability" (i.e., larger coalitions are typically more durable and hence are associated with larger cakes) and "control" (i.e., larger coalitions imply smaller shares of the cake for each coalition member) which drives the equilibrium selection of government coalitions subject to institutional constraints. Of course, both effects may work in consort. When β is relatively high (i.e., $\beta \in (0.74, 1)$), because short-lived minority governments are screened out in equilibrium, a minority proto-coalition becomes relatively more attractive compared to proto-coalitions with (at least partial) majority status.

To understand the role played by dual responsibility on the equilibrium selection of government coalitions, consider now a different institutional environment with *single responsibility* such that $y^{\{1\}}(b) = y^{\{1,2\}}(b) = 2$, $y^{\{1,3\}}(b) = y^{\{1,2,3\}}(b) = 3$, $y^{\{1\}}(g) = y^{\{1,2\}}(g) = 3$, and

[14] Notice that $\{1, 3\}$ is never chosen in equilibrium because its expected duration conditional on the state of the world is identical to the one of $\{1, 2\}$, but party 1's preferences induce it to prefer $\{1, 2\}$.

$y^{\{1,3\}}(g) = y^{\{1,2,3\}}(g) = 4$, while holding everything else constant. Since the seat shares in the Senate are no longer relevant to determine the majority status of government coalitions, coalitions $\{1\}$ and $\{1,2\}$ are now both minority coalitions, while coalitions $\{1,3\}$ and $\{1,2,3\}$ are both majority coalitions. Relative to the previous case, it is now "as if" all coalitions have majority status in the Senate. Hence, for example, $\{1,2,3\}$ now simply corresponds to a surplus majority coalition. As in the case of dual responsibility, this specification is intended to capture an environment that is consistent with some basic empirical regularities about coalition duration. For example, surplus majority coalitions do not necessarily last longer than minimal winning coalitions. Also, without dual responsibility the expected duration of each possible coalition is likely to be longer (Tsebelis 2000).

As above, we can calculate the formateur's payoff for every proto-coalition and hence her equilibrium proto-coalition choice which is given by

$$D_1 = \begin{cases} \{1,3\} & \text{if} \quad \beta \in (0, 0.29), \\ \{1\} & \text{if} \quad \beta \in (0.29, 1). \end{cases}$$

Figure 2 summarizes these results.

Notice that in this case, the surplus coalition $\{1,2,3\}$ is never an equilibrium proto-coalition choice of the formateur party 1 for any value of β. This follows from the fact that without dual responsibility, adding party 2 to the coalition does not increase expected duration, but (because of proto-coalition bargaining) it decreases the formateur's share of office benefits. Hence, $\{1,2,3\}$ is dominated by $\{1,3\}$. For a similar reason $\{1,2\}$ is never selected, since in the absence of dual responsibility both $\{1,2\}$ and $\{1\}$ are minority coalitions. Note also, that the range of values of β where the minority option $\{1\}$ is chosen in equilibrium is larger. Hence, in this example, removing dual responsibility significantly reduces the occurrence of surplus governments and increases the occurrence of minority governments.

Turning our attention to government duration, note that in the case where $\beta < 0.29$, i.e., where a majority government is optimal, there is no proto-coalition "screening." That is,

$\{1,3\}$ would be observed to last 3.5 periods on average. For $\beta > 0.8$, minority governments are optimal with proto-coalition screening, resulting in an average duration of 3 periods. For $\beta \in (0.29, 0.8)$, minority governments are also optimal, but it is not worthwhile for the formateur to delay government formation, thus resulting in an average duration of 2.5 periods.

The example allows us to examine how changes in the constitution (here government formation rules) can change the equilibrium responses of strategic actors that manifest themselves in observed behavior. From Figure 3 we can see how both observed government duration and observed frequency of coalition types change in response to eliminating dual responsibility .

Depending on the parameters of the model, eliminating dual responsibility can either have *no effect* on government duration (e.g., for $\beta < 0.29$), it can *increase* government duration (e.g., for $\beta > 0.46$), or it can even *decrease* government duration (e.g., for $\beta \in (0.29, 0.46)$). Note that in this case the formateur would a minority government, which is optimal under single responsibility, compared to a surplus coalition $\{1,2,3\}$ which would have been chosen under dual responsibility. At least three important insights are illustrated by this last case. First, (observed average) government type and (observed average) government duration are jointly determined in equilibrium. Second, minimal winning coalitions are not the "natural" outcome of coalition bargaining games. Rather, they only emerge if the incentives between maximizing the share of the pie and the total size of the pie are balanced. Specifically, if we change constitutions to eliminate super-majority governments we may "over-shoot" and, rather than increasing the share of minimal winning coalitions, increase the share of minority governments. Third, while conditional on government type conditional on government type duration may increase if we abandon dual responsibility, observed average duration may stay constant or even decrease. This is due to the fact that under new incentives different types of governments may become optimal. We refer to the insight as the *equilibrium replacement*

effect.

Together these insights suggest that to explain coalition formation a simple veto player approach, as suggested for example in Tsebelis (2000), is not sufficient since it cannot account for equilibrium replacement effects. Moreover, the dynamic aspects of cabinet government (e.g., its stability) are critical to understand which government types will form. The example illustrates that our model is capable of providing an account of cabinet formation that integrates selection of cabinet type and government duration in an equilibrium model. However, the example also shows that the predictions of the model critically depend on the values of the model's parameters (e.g., the value of β). In order to assess quantitatively the effects that removing dual responsibility would have on the formation and dissolution of coalition governments, we need to specify and estimate a structural model.

3 Data and Estimation

Our sample consists of 34 governments in Belgium over the period 1945–1995. An observation in the sample is defined by the identity of the formateur party, $\mathbb{k}$, the composition of the proto-coalition, $D_{\mathbb{k}}$, the duration of the negotiation over the formation of a new government (i.e., the number of attempts), $\tau^{D_{\mathbb{k}}}$, the sequence of proposers (one for each attempt) if the formateur does not succeed to form the government at the first attempt, $\ell_2, ..., \ell_{\tau^{D_{\mathbb{k}}}}$, and the duration of the government following that negotiation (i.e., the number of days the government remains in power), $t^{D_{\mathbb{k}}}$. For each element in the sample we also observe the time horizon to the next scheduled election, $\overline{T}$, the set of parties represented in the parliament, N, the vector of their relative seat shares, π^H and π^S, and the party of the former prime minister, $\mathbb{k}_{-1}$.

Keesings Record of World Events (1944–present) was used to collect information on the number of attempts for each government formation, the identity of the proposer on each attempt, the time horizon to the next election, and the duration of the government following each negotiation. The list of parties represented in the parliament and their shares of

parliamentary seats at the time of each negotiation over the formation of a new government was taken from Mackie and Rose (1990) and, for later years in the sample, from Keesings, the *European Journal of Political Research*, and the *Lijphart Elections Archives*.

Descriptive statistics of all variables are reported in Table 1, where $MINORITY$ is a dummy variable that takes the value one if the government coalition is a minority coalition in the House (i.e., it controls less than 50% of the parliamentary seats) and zero otherwise; $MAJORITY$ is a dummy variable that takes the value one if the government coalition is a majority coalition in the House (i.e., it controls at least 50% of the parliamentary seats) and zero otherwise; $MINWIN$ is a dummy variable that takes the value one if the government coalition is a minimum winning majority coalition in the House (i.e., removing any of the parties from the coalition would always result in a minority coalition); $SURPLUS$ is a dummy variable that takes the value one if the government coalition is a surplus majority coalition in the House (i.e., it is possible to remove at least one party from the coalition without resulting in a minority coalition) and zero otherwise; and $MAJSENATE$ is a dummy variable that takes the value one if the government coalition is a majority coalition in the Senate and zero otherwise.

We now use the equilibrium characterization of the bargaining model described in Section 2 to derive the likelihood function of our structural model. The contribution to the likelihood function of each observation in the sample is equal to the probability of observing the vector of (endogenous) events $(\Bbbk, D_{\Bbbk}, \tau^{D_{\Bbbk}}, \ell_2, ..., \ell_{\tau^{D_{\Bbbk}}}, t^{D_{\Bbbk}})$ conditional on the vector of (exogenous) characteristics $Z = (\overline{T}, Q, N, \pi, \Bbbk_{-1})$, given the vector of the model's parameters $\theta = (\alpha_0, \alpha_1, \alpha_2, \beta, \rho, F_y, F_T)$, where $F_y(y^D|\overline{T}, Q, \pi^D)$ denote the conditional distribution of cakes with conditional density $f_y(\cdot|\cdot)$ defined over the support $[0, \overline{y}]$ and $F_T(t^D|y^D; \overline{T}, Q, \pi^D)$ denotes the conditional distribution of government durations with conditional density $f_T(\cdot|\cdot)$ defined over the support $[0, \overline{T}]$, where $\overline{y} < \overline{T}$ is the upper bound on the expectations over government duration and $F_T(\cdot|\cdot)$ satisfies the restriction $E[T^D|y^D; \overline{T}, Q, \pi^D] = y^D$.[15] Under

[15]Note that $F_y(y^D|\overline{T}, Q, \pi^D)$ and $F_T(t^D|y^D; \overline{T}, Q, \pi^D)$ imply a distribution of T^D conditional on

the assumption that $\varepsilon_{\mathbb{k}}^{D}$, for all $D \in \Delta_{\mathbb{k}}$, are independently and identically distributed according to a type I extreme value distribution with standard deviation ρ (McFadden 1973, Rust 1987) and using the methodological approach developed in DEM, this probability can be written as

$$\begin{aligned}\Pr(\mathbb{k}, D_{\mathbb{k}}, \tau^{D_{\mathbb{k}}}, \ell_2, ..., \ell_{\tau^{D_{\mathbb{k}}}}, t^{D_{\mathbb{k}}} | Z; \theta) \;=\; & \Pr(\mathbb{k}|Z;\theta) \times \\ & \Pr(D_{\mathbb{k}}|\mathbb{k}, Z;\theta) \times \\ & \Pr(\tau^{D_{\mathbb{k}}}|D_{\mathbb{k}}, \mathbb{k}, Z;\theta) \times \\ & \Pr(\ell_2, ..., \ell_{\tau^{D_{\mathbb{k}}}}|\tau^{D_{\mathbb{k}}}, D_{\mathbb{k}}, \mathbb{k}, Z;\theta) \times \\ & \Pr(t^{D_{\mathbb{k}}}|\tau^{D_{\mathbb{k}}}, D_{\mathbb{k}}, \mathbb{k}, Z;\theta), \end{aligned} \tag{11}$$

where

$$\Pr(\mathbb{k}|Z;\theta) = p_{\mathbb{k}}(\pi, \mathbb{k}_{-1}; \alpha_0, \alpha_1),$$

$$\Pr(D_{\mathbb{k}}|\mathbb{k}, Z;\theta) = \frac{\exp\left(\frac{[1-\beta(1-\widetilde{p}_{\mathbb{k}}(\pi, D_{\mathbb{k}}; \alpha_3))]y^*(D_{\mathbb{k}}, \overline{T}, Q, \pi^{D_{\mathbb{k}}})}{\beta\rho}\right)}{\sum_{D\in\Delta_{\mathbb{k}}} \exp\left(\frac{[1-\beta(1-\widetilde{p}_{\mathbb{k}}(\pi, D; \alpha_3))]y^*(D, \overline{T}, Q, \pi^{D})}{\beta\rho}\right)},$$

$$\Pr(\tau^{D_{\mathbb{k}}}|D_{\mathbb{k}}, \mathbb{k}, Z;\theta) = \left[F_y(y^*(D_{\mathbb{k}}, \overline{T}, Q, \pi^{D_{\mathbb{k}}})|\overline{T}, Q, \pi^{D_{\mathbb{k}}})\right]^{\tau^{D_{\mathbb{k}}}-1} \left[1 - F_y(y^*(D_{\mathbb{k}}, \overline{T}, Q, \pi^{D_{\mathbb{k}}})|\overline{T}, Q, \pi^{D_{\mathbb{k}}})\right],$$

$$\Pr(\ell_2, ..., \ell_{\tau^{D_{\mathbb{k}}}}|\tau^{D_{\mathbb{k}}}, D_{\mathbb{k}}, \mathbb{k}, Z;\theta) = \prod_{j=2}^{\tau^{D_{\mathbb{k}}}} \widetilde{p}_{\ell_j}(\pi, D_{\mathbb{k}}; \alpha_2),$$

and

$$\Pr(t^{D_{\mathbb{k}}}|\tau^{D_{\mathbb{k}}}, D_{\mathbb{k}}, \mathbb{k}, Z;\theta) = \frac{\int_{y^*(.)}^{\overline{y}} f_T(t^{D_{\mathbb{k}}}|y^{D_{\mathbb{k}}}; \overline{T}, Q, \pi^{D_{\mathbb{k}}}) dF_y(y^{D_{\mathbb{k}}}|\overline{T}, Q, \pi^{D_{\mathbb{k}}})}{1 - F_y(y^*(D_{\mathbb{k}}, \overline{T}, Q, \pi^{D_{\mathbb{k}}})|\overline{T}, Q, \pi^{D_{\mathbb{k}}})}.$$

The log-likelihood function is obtained by summing the logs of (11) over all the elements in the sample.

The next step consists of choosing flexible parametric functional forms for $F_y(\cdot|\cdot)$ and $F_T(\cdot|\cdot)$. We assume that $F_y(\cdot|\cdot)$ and $F_T(\cdot|\cdot)$ belong to the family of beta distributions.[16] In

$(\overline{T}, Q, \pi^{D})$.

[16] The family of beta distributions is the most flexible family of parametric distributions for continuous random variables with a finite support (e.g., Johnson and Kotz 1970; vol. 1, pp. 37-56). Some amount of

particular, we let

$$f_y(y^D|\overline{T},Q,\pi^D)=\gamma(\overline{T},Q,\pi^D)\left[\frac{[y^D]^{\gamma(\overline{T},Q,\pi^D)-1}}{[\overline{y}(\overline{T},Q)]^{\gamma(\overline{T},Q,\pi^D)}}\right], \tag{12}$$

$y^D\in[0,\overline{y}(\overline{T},Q)]$, where

$$\begin{aligned}\gamma(\overline{T},Q,\pi^D) &= \exp((\gamma_0+\gamma_1\pi_D^H)MINORITY+\\ &\quad (\gamma_2+\gamma_3\pi_D^H)MINWIN+\\ &\quad (\gamma_4+\gamma_5\pi_D^H)SURPLUS+\\ &\quad \gamma_6 MAJSENATE+\\ &\quad \gamma_7\overline{T}),\end{aligned} \tag{13}$$

and

$$\overline{y}(\overline{T},Q)=\frac{\exp(\lambda)}{1+\exp(\lambda)}\overline{T}. \tag{14}$$

Note that in (13) we use the compact notation π_D^H to denote $\sum_{i\in D}\pi_i^H$. Furthermore, we let

$$f_T(t^D|y^D;\overline{T},Q,\pi^D)=\frac{1}{B\left(\frac{\delta(\overline{T},Q,\pi^D)y^D}{\overline{T}-y^D},\delta(\overline{T},Q,\pi^D)\right)}\left[\frac{[t^D]^{\frac{\delta(\overline{T},Q,\pi^D)y^D}{\overline{T}-y^D}-1}[\overline{T}-t^D]^{\delta(\overline{T},Q,\pi^D)-1}}{[\overline{T}]^{\frac{\delta(\overline{T},Q,\pi^D)y^D}{\overline{T}-y^D}+\delta(\overline{T},Q,\pi^D)-1}}\right], \tag{15}$$

$t^D\in[0,\overline{T}]$, where $B(\cdot,\cdot)$ denotes the beta function and

$$\delta(\overline{T},Q,\pi^D)=\exp(\delta_0+\delta_1\overline{T}). \tag{16}$$

Notice that $f_T(\cdot|\cdot)$ satisfies the model restriction $E[T^D|y^D;\overline{T},Q,\pi^D]=y^D$ since

$$E[T^D|y^D;\overline{T},Q,\pi^D]=\left(\frac{\frac{\delta(\overline{T},Q,\pi^D)y^D}{\overline{T}-y^D}}{\frac{\delta(\overline{T},Q,\pi^D)y^D}{\overline{T}-y^D}+\delta(\overline{T},Q,\pi^D)}\right)\overline{T}=y^D.$$

Several comments are in order. First, our parameterization of $f_y(\cdot|\cdot)$ and $f_T(\cdot|\cdot)$ are highly flexible, and allow us to capture the (potential) effects of the institutional environment on

experimentation with alternative specifications suggests that our results are not too sensitive to the specific parameterization chosen.

the (expected and actual) duration of governments of different types in a fairly unrestricted way.[17] For example, government coalitions of different sizes may differ in their ability to cope with events even when exposed to similar shocks. Specifically, minority governments may be expected to last less than majority governments. Second, the specification described in equations (12)-(16) above also allows for the possibility that government coalitions of the same size may face different survival prospects depending on the remaining time horizon $\overline{T}$.

4 Results

Table 2 presents the maximum likelihood estimates of the parameters of the model, α, β, γ, δ, λ, and ρ, where $\alpha = (\alpha_0, \alpha_1, \alpha_2)$, $\gamma = (\gamma_0, ..., \gamma_7)$, and $\delta = (\delta_0, \delta_1)$.[18] To assess the fit of the model we present Tables 3 to 7. In each of these tables, we focus on a different dimension of the data and we compare the predictions of the model to the empirical distribution. For each dimension of the data, one of the criteria we use to assess how well the model fits the data is Pearson's χ^2 test

$$q \sum_{j=1}^{K} \frac{[f(j) - \widehat{f}(j)]^2}{\widehat{f}(j)} \sim \chi^2_{K-1},$$

where $f(\cdot)$ denotes the empirical density function, or histogram, of a given (endogenous) variable, $\widehat{f}(\cdot)$ denotes the maximum likelihood estimate of the density function of that variable, q is the number of observations, and K is the number of bins of the histogram.

The results from table 3-7 show that the model performs remarkably well in reproducing all aggregate features of the data. Moreover, the χ^2 goodness-of-fit test never rejects the model at conventional significance levels. The ability of the model to fit the data is an important step toward building confidence in the quantitative implications of the model.

[17] Notice that, by definition of beta distributions, $\gamma(\cdot)$ and $\delta(\cdot)$ must be strictly positive. This justifies the exponential functions in (13) and (16). Also, to economize on the number of parameters, we restricted $F_y(\cdot|\cdot)$ to be a power-function distribution (i.e., a beta distribution with one parameter normalized to one).

[18] Note that, since the likelihood function is proportional to the formateur selection probability, α_0 and α_1 can be estimated separately from the other parameters using a simple logit model.

4.1 Constitutional Experiment

We use our estimated model to evaluate the following counterfactual constitutional experiment. Suppose in 1945 Belgium had eliminated government responsibility to the upper chamber from its constitution. What would have been the effects on the composition and durability of Belgian governments according to our model? To answer this question we use the results of past elections and the estimated model to predict the outcomes of the government formation process in the absence of dual responsibility. In particular, we replace $\pi^S = (0, ..., 0)$ for all elections and we set $MAJSENATE = 1$ for the given governing coalition.

The results of our experiment are documented in Table 8. In this table, column 1 summarizes the data relative to Belgian governments, and column 2 contains the results of the constitutional experiment predicted by our model.[19] Several interesting findings emerge from Table 8. The model predicts that abolishing dual responsibility would have had virtually no effect on the average duration of Belgian governments, while at the same time producing a sizeable impact on their composition. According to our analysis, eliminating government responsibility to the Senate would significantly reduce the occurrence of surplus governments (from 18% to 10%) and increase the occurrence of minority governments (from 12% to 78%).

Our theoretical model provides an equilibrium interpretation of these results. At the heart of our bargaining model there is a fundamental trade-off between "durability" (i.e., larger coalitions are typically more durable and hence are associated with larger cakes) and "control" (i.e., larger coalitions imply smaller shares of the cake for each coalition member) which drives the equilibrium selection of government coalitions subject to the institutional constraints. The terms of this trade-off depend crucially on the relative durability of the

[19] All the predicted quantities reported here and their associated standard errors are obtained by drawing 5,000 samples of parameter values from the (estimated) asymptotic distribution of the vector of model parameters (based on the estimated variance-covariance matrix), and then computing the mean and standard deviation of the object of interest over all draws.

different options which, in turn, depends on the institutional environment where government formation takes place. Changes in the institutional environment brought about by constitutional reforms induce changes in the terms of the trade-off which trigger an equilibrium response in the selection of the type of government coalitions that form and their relative stability. When the government is responsible both to the House and the Senate, a vote of no-confidence in either chamber of parliament is sufficient to terminate the government. The equilibrium response to this institutional constraint is to form larger (perhaps even surplus) coalitions (possibly constituting a majority in both chambers), to achieve the desired level of durability at the cost of a loss of control. Removing dual responsibility, while holding everything else the same, removes one source of instability and by making each coalition more durable, it allows the formateur to achieve higher payoffs by forming smaller coalitions (especially minority governments), an instance of the equilibrium replacement effect. Since smaller coalitions are relatively less durable than larger coalitions, however, the replacement effect compensates the duration-enhancing effect of removing dual responsibility, thus leading to a negligible change in average government duration. Constitutional reform proposals that do not take equilibrium effects into account therefore are likely to lead to unanticipated consequences.

4.2 Out-of-Sample Predictions

As shown above, our estimated structural model performs well within the sample in fitting Belgian data, and generates interesting predictions regarding the possible effects of a specific constitutional experiment. But do these results generalize to other cases? Unfortunately, several factors prevent us from directly applying the Belgian case to answer this question, by comparing, for example, data before and after the 1995 reform. First, the post-1995 data set is too small to allow for a meaningful comparison. Second, in 1995, Belgium not only eliminated dual responsibility, but also simultaneously abolished the *investiture vote* and introduced the *constructive vote of no confidence*. Both of these constitutional features

also impact the choice of coalition governments and their stability (Diermeier, Eraslan, and Merlo 2003), thus making a direct comparison impossible.

A better, though not perfect, example is the Swedish constitutional reform of 1970. In 1970, Sweden abandoned its second chamber, and with it, dual responsibility. These events allow us not only to compare our estimated results with an out-of-sample case, but also with some of the alternative accounts of bicameralism discussed in the introduction (e.g., Lijphart 1984, Sjölin 1993, Tsebelis 2000, 2002). A veto-player model, for example, would predict increased cabinet durations. The Lijphart-Sjölin conjecture, on the other hand, would predict a significant decrease in super-majority cabinets. However, neither of these implications is supported by the Swedish case as we can see from Table 9. In this table, column 1 summarizes the data relative to the 12 Swedish governments prior to the 1970 reform, while column 2 summarizes the data relative to the 14 Swedish governments after the reform. In particular, contrary to the prediction of the veto-player model, government duration remained virtually unchanged. On the other hand, Sweden never experienced surplus governments (either before or after the reform). But, as in the case of the estimated effect for Belgium, we do observe a sharp increase in the fraction of minority governments which more than doubled (from 42% to 86%).

While these findings are certainly intriguing, they should be interpreted with caution. First, the estimated and predicted values for the Belgian case depend on specific (estimated) parameter values (e.g., the discount parameter). As explained in the numerical example above, for other parameter values the model does not necessarily imply an increase in minority cabinets and a negligible effect on coalition duration. Of course, in the Swedish case we do not observe or estimate these parameters from the data. Second, the Swedish constitution differed in various other respects from the Belgian case. For example, it exhibited a constitutional feature known as *negative parliamentarism* which, according to Diermeier, Eraslan, and Merlo (2003), would explain the absence of super-majority governments. Third,

in the constitutional reform the second chamber was eliminated entirely, not just the dual responsibility feature.

Given these considerations, in order to further validate our model and the implications of the constitutional experiment we consider in this paper, we have to rely on indirect evidence by performing an out-of-sample experiment of the estimated model. In particular, we use our estimated model without dual responsibility (i.e., with $\pi^S = (0, ..., 0)$ and $MAJSENATE = 1$) to predict government outcomes for another country which shares most of the constitutional features with pre-1995 Belgium except for dual responsibility: Denmark.[20] To perform this experiment, we input data on the number of Danish parties and their distribution of parliamentary seats in 30 bargaining episodes over the period 1947-1999 into our estimated model, and compare its predictions about the average number of attempts, government duration, and size, and the distribution of government types to their empirical counterparts. The results are reported in Table 10.[21]

As we can see from Table 10, the model is capable of reproducing the observed pattern of government types, and most of the relevant statistics computed from the data fall within their respective 95% prediction intervals based on the estimated model, even though the model's point predictions are not very accurate. Since the estimation of the model's parameters relied exclusively on data from a single country (Belgium), and given the remaining differences between the Belgian and the Danish constitutions, we conclude that the predictions of our

[20] While Denmark is as close a reference case as we can identify, there are important differences. For example, in contrast to the Belgian case the Danish constitution exhibits *negative parliamentarism*. Also, prior to 1995, Belgian, unlike Danish, governments had to survive an *investiture vote* (Diermeier, Eraslan, and Merlo 2003).

[21] As in the case of Table 8, all the predicted quantities reported here and their associated standard errors are obtained by drawing 5,000 samples of parameter values from the (estimated) asymptotic distribution of the vector of model parameters (based on the estimated variance-covariance matrix), and then computing the mean and standard deviation of the object of interest over all draws.

model with respect to the effects of dual responsibility on the formation and stability of coalition governments appear to be reasonably robust.

5 Conclusion

In this paper, we have proposed a structural approach based on a non-cooperative dynamic stochastic bargaining model as a framework to study the effects of constitutional rules and reforms. We have applied this approach to the questions of how changes in the rules of cabinet formation affect the distribution of cabinet types and their observed duration. Specifically, we have considered the effects of "dual responsibility" on the composition and stability of coalition governments in the context of a bargaining model of government formation in a bicameral parliamentary democracy. To quantify the qualitative insights of our theoretical model, we have estimated the model's parameters using a data set that contains all Belgian coalition governments between 1945 and 1995, the year Belgium abandoned dual responsibility in its constitution. We have then used these estimates to conduct a counterfactual experiment of constitutional design where we eliminated dual responsibility. Our model and estimates show that the *prima facie* plausible belief of dual responsibility leading to less stable governments is unfounded. The key oversight is that both the type (i.e., minority, minimum winning, or surplus) of the government coalition as well as government duration are jointly determined in equilibrium. The following two equilibrium effects play a key role in providing intuition for our findings. First, there is a trade-off between the size of a coalition and the share of the surplus each coalition member receives. This trade-off determines the equilibrium choice of a coalition and government duration given the composition of parliament in the presence of dual responsibility. Second, there is an equilibrium replacement effect, such that in equilibrium smaller coalitions "replace" larger coalitions. If dual responsibility is removed, the terms of the trade-off change in a way that makes minority coalitions relatively more attractive while leaving government duration the same. In addition to characterizing the equilibrium response of strategic parties to changes in their

constitutional environment, our approach also allows us to *quantify* the effects of dual responsibility on the composition of government coalitions and government duration. Based on our estimates the net effect of removing dual responsibility on average government duration is negligible, while the percentage of minority governments sharply increases. These findings are largely confirmed by considering out-of-sample predictions for Sweden and Denmark.

Our findings cast some doubt on the validity of much of the existing empirical research on government stability (e.g., King et al. 1990, Strom 1990, Warwick 1994) that rely on coalition specific characteristics (such as the coalition's majority status) or the political context of government formation (e.g., the number of formation attempts) as exogenous variables in a regression model. As shown in our analysis, the government's majority status (and, in general, which coalition forms the government), its formation time, and its expected duration are all endogenous variables and are simultaneously determined in equilibrium. This suggests that the traditional methodology used by many existing studies is problematic and may lead to incorrect inference. We hope to explore the implications of these insights further in future research.

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Table 1: Descriptive statistics

Variable	Mean	Standard deviation	Minimum	Maximum
Number of attempts	2.412	1.500	1	7
Government duration (days)	494.853	475.660	7	1502
Time to next election (days)	1208.265	361.485	133	1515
Number of parties	6.588	2.047	4	11
Size of government coalition (% in House)	61.912	12.274	34	85
Size of government coalition (% in Senate)	63.921	12.895	33	88
MINORITY	0.118	0.327	0	1
MINWIN	0.706	0.462	0	1
SURPLUS	0.176	0.387	0	1
MAJSENATE	0.971	0.171	0	1

Table 2: Maximum likelihood estimates

Parameter	Estimate	Standard error
α_0	9.768	3.753
α_1	2.217	0.575
α_2	1.865	0.476
β	0.885	0.115
γ_0	-2.170	0.909
γ_1	-0.165	0.642
γ_2	-2.026	0.737
γ_3	0.143	0.388
γ_4	-3.913	1.350
γ_5	1.291	0.660
γ_6	0.044	0.339
γ_7	2.310	0.484
δ_0	2.526	1.015
δ_1	-0.002	0.001
λ	-0.002	0.619
ρ	25.200	6.410
Log-likelihood	-408.515	

Table 3: Density functions of formateur size and goodness-of-fit test

Interval	Data	Model
0-10%	0.000	0.017
10%-20%	0.000	0.008
20%-30%	0.147	0.149
30%-40%	0.618	0.558
40%-50%	0.147	0.181
50%+	0.088	0.088
χ^2 test	1.268	
$Pr(\chi^2(5) \geq 1.268)$	0.938	

Table 4: Density functions of negotiation duration and goodness-of-fit test

Attempt	Data	Model
1	0.353	0.408
2	0.265	0.232
3	0.147	0.134
4	0.147	0.079
5	0.059	0.048
6	0.000	0.030
7	0.029	0.019
8+	0.000	0.051
Mean number of attempts	2.412	2.547
χ^2 test	3.768	
$Pr(\chi^2(7) \geq 4.109)$	0.806	

Table 5: Density functions of government duration and goodness-of-fit test

Interval	Data	Model
0-6 mo	0.353	0.344
6 mo-1 yr	0.235	0.173
1 yr-1.5 yr	0.059	0.117
1.5 yr-2 yr	0.088	0.089
2 yr-2.5 yr	0.059	0.073
2.5 yr-3 yr	0.029	0.062
3 yr-3.5 yr	0.088	0.058
3.5 yr-4 yr	0.088	0.084
Mean government duration	495 days	486 days
χ^2 test	3.702	
$Pr(\chi^2(7) \geq 2.946)$	0.813	

Table 6: Density functions of government size and goodness-of-fit test

Interval	Data	Model
0-10%	0.000	0.000
10%-20%	0.000	0.000
20%-30%	0.000	0.007
30%-40%	0.029	0.039
40%-50%	0.088	0.088
50%-60%	0.382	0.473
60%-70%	0.235	0.176
70%-80%	0.147	0.096
80%-90%	0.118	0.065
90%-100%	0.000	0.056
Mean government coalition size	62%	61%
χ^2 test	5.808	
$Pr(\chi^2(9) \geq 5.808)$	0.759	

Table 7: Density functions of government type and goodness-of-fit test

Government type	Data	Model
Minority	12%	13%
Minimum winning	70%	65%
Surplus	18%	22%
χ^2 test	0.512	
$Pr(\chi^2(2) \geq 0.512)$	0.774	

Table 8: Constitutional experiment in Belgium*

	Actual (dual responsibility)	Predicted (single responsibility)
Average number of attempts	2.412	2.447 (0.664)
Average government duration (days)	494.853	493.107 (86.153)
Average government size (% in the House)	61.912	42.487 (2.226)
% minority governments	11.765	77.731 (6.757)
% minimum winning governments	70.588	12.721 (6.687)
% surplus governments	17.647	9.548 (4.761)

* standard errors in parentheses

Table 9: Constitutional reform in Sweden

	Before 1970 (dual responsibility)	After 1970 (single responsibility)
Average number of attempts	1.250	1.143
Average government duration (days)	764.167	718.714
Average government size (% in the House)	51.867	43.029
% minority governments	41.667	85.714
% minimum winning Governments	58.333	14.286
% surplus governments	0.000	0.000

Table 10: Out-of-sample predictions for Denmark*

	Actual	Predicted
Average number of attempts	1.767	2.462 (0.721)
Average government duration (days)	626.400	523.327 (93.608)
Average government size (% in the House)	40.667	34.779 (1.999)
% minority governments	83.333	90.224 (7.673)
% minimum winning governments	16.667	5.415 (5.739)
% surplus governments	0.000	4.544 (2.389)

* standard errors in parentheses

Figure 1: Formateur's equilibrium payoffs and coalition choices with dual responsibility

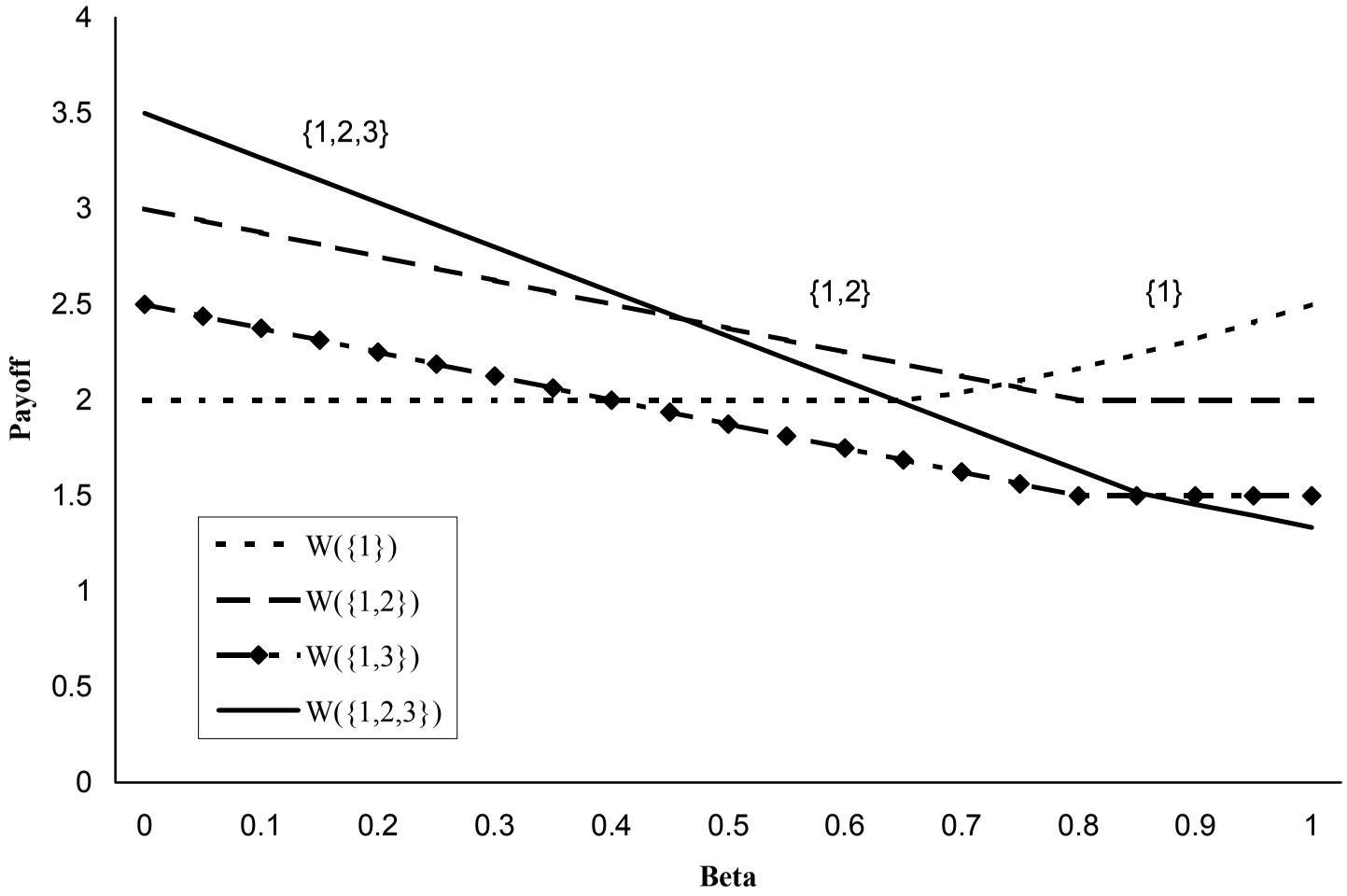

Figure 2: Formateur's equilibrium payoffs and coalition choices with single responsibility

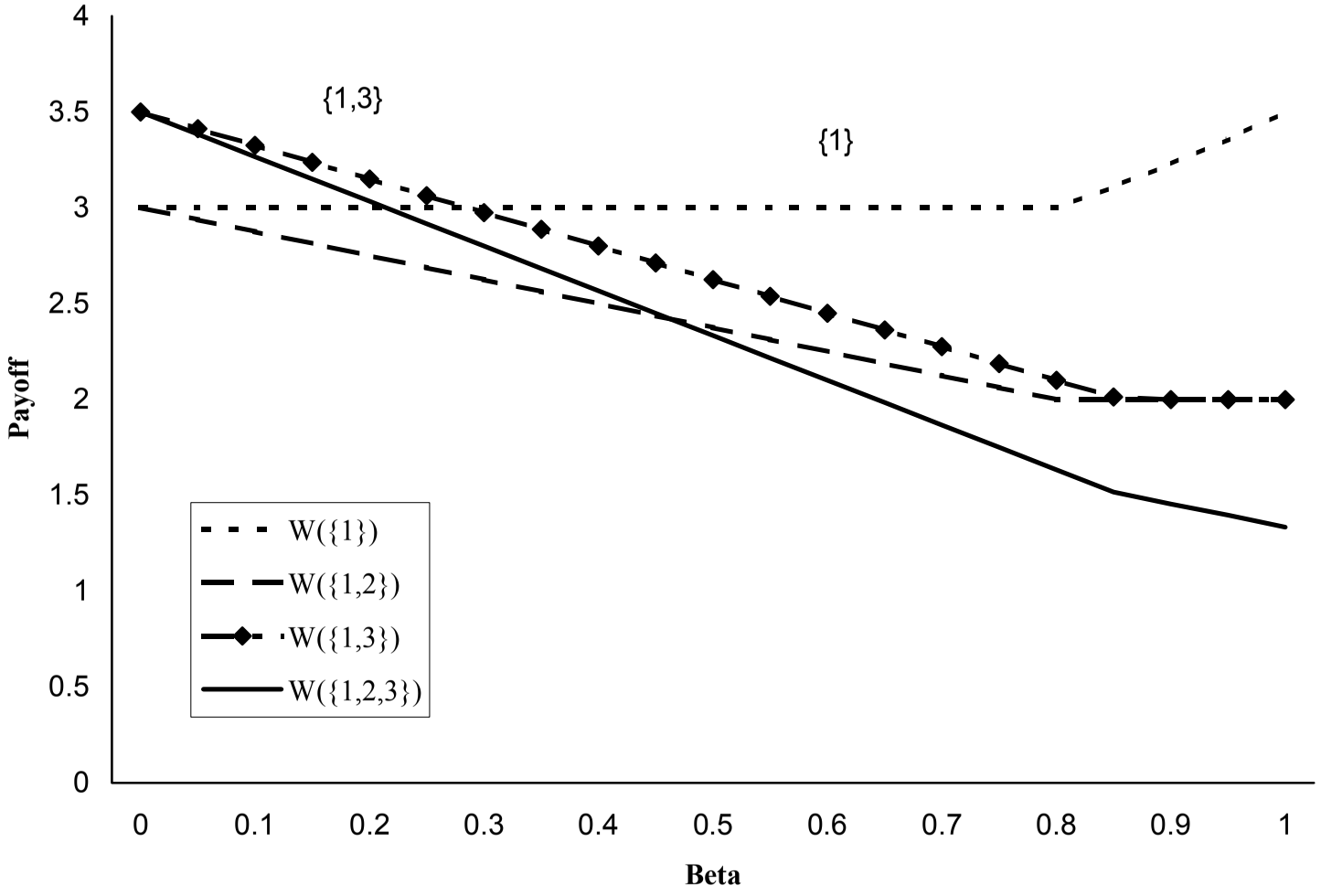

Figure 3: Equilibrium duration and coalition choices with and without dual responsibility