

Merlo, Antonio; Diermeier, Daniel; Eraslan, Hülya

**Working Paper**

## Bicameralism and Government Formation

Nota di Lavoro, No. 81.2004

**Provided in Cooperation with:**

Fondazione Eni Enrico Mattei (FEEM)

*Suggested Citation:* Merlo, Antonio; Diermeier, Daniel; Eraslan, Hülya (2004) : Bicameralism and Government Formation, Nota di Lavoro, No. 81.2004, Fondazione Eni Enrico Mattei (FEEM), Milano

This Version is available at:

<https://hdl.handle.net/10419/117965>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# **Bicameralism and Government Formation**

Daniel Diermeier, Hülya Eraslan  
and Antonio Merlo

NOTA DI LAVORO 81.2004

**MAY 2004**

CTN – Coalition Theory Network
--------------------------------

Daniel Diermeier, *MEDS, Kellogg School of Management, Northwestern University*  
Hülya Eraslan, *Finance Department, Wharton School, University of Pennsylvania*  
Antonio Merlo, *Department of Economics, University of Pennsylvania and CEPR*

This paper can be downloaded without charge at:

The Fondazione Eni Enrico Mattei Note di Lavoro Series Index:  
<http://www.feem.it/Feem/Pub/Publications/WPapers/default.htm>

Social Science Research Network Electronic Paper Collection:  
<http://ssrn.com/abstract=XXXXXX>

The opinions expressed in this paper do not necessarily reflect the position of  
Fondazione Eni Enrico Mattei

# Bicameralism and Government Formation

## Summary

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.

**Keywords:** Political stability, Government formation, Government dissolution, Bicameralism, Comparative constitutional design

**JEL Classification:** D72, H19, C73

*We thank Torsten Persson, Guido Tabellini, Ken Wolpin, and seminar participants at the University of California-Berkeley, the University of Western Ontario and ITAM for their helpful comments and suggestions. Hugo Nopo provided valuable research assistance.*

*This paper was presented at the 9<sup>th</sup> Coalition Theory Workshop on "Collective Decisions and Institutional Design" held in Barcelona, Spain, on 30-31 January 2004 and organised by the Universitat Autònoma de Barcelona.*

*Address for correspondence:*

Antonio Merlo  
Department of Economics  
University of Pennsylvania  
3718 Locust Walk  
Philadelphia, PA 19104  
USA  
Phone: 215 898 7933  
Fax: 215 573 2057  
E-mail: merloa@econ.upenn.edu

# 1 Introduction

The formation and termination of coalition governments is one of the few literatures in political science with a tight connection between theoretical and empirical analysis. Over the last decade models of coalition formation have been predominantly using non-cooperative game theory (e.g. Baron 1993, Diermeier and Merlo 2000, Diermeier, Eraslan, and Merlo 2003, Diermeier and Stevenson 2000, Lupia and Strom 1995, Merlo 1997). In a recent paper Lupia and Strom (1995) argued that a similar approach can be used to study the duration of coalition governments. That is, coalition governments need to be sustained as equilibrium outcomes over time in the presence of potentially destabilizing changes to the political and economic environment, so-called "critical events" (Browne et. al. 1984, King et al. 1990, Warwick 1994).

On the one hand this approach marks a promising shift in the study of cabinet durations. In particular, the specification of explicit models of inter-party bargaining is likely to focus attention on the role of institutional features of the bargaining environment in determining cabinet failure. On the other hand, the bargaining approach creates various challenging methodological problems. First, Diermeier and Stevenson (2000) show that testing the Lupia-Strom model requires careful specifications of the stochastic model that preclude the usage of "off-the-shelf" event study methods. Second, Merlo (1997) pointed out that changing expectations about government duration (due to external events such as the release of macro-economic data) may lead party leaders to delay the formation of a government. Hence, governments that actually form should be viewed as the result of strategic selection by the members of the proto-coalition. Third, as Diermeier and Merlo (2000) have shown in a game-theoretic model, expectations about government duration may also influence which government is chosen in the first place. Together, these results imply that government type, formation time, and government duration are *all simultaneously determined in equilibrium*. That is, taking the concept of governments-as-equilibria seriously may require a radical

departure from existing empirical approaches that rely on regression-based reduced form specifications.

In this paper we present an alternative approach that involves structural estimation. By specifying a formal model we can interpret the observed 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 (e.g. constitutional characteristics) and then generate simulated data which can be compared to the original data to quantify the effect of constitutional changes. Specifically, we use this method to investigate the role of bicameralism on government formation and duration.

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 (that is, a constitutional arrangement where the legislative function is distributed among multiple chambers). Recent examples include Diermeier and Myerson (1999), who show how bicameralism can affect the internal institutional structure of legislatures, and Tsebelis and Money (1997), who explore the consequences of inter-chamber committees on legislative output. Our focus, however, is on *governmental* bicameralism (that is, a constitutional arrangement where multiple 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. We henceforth 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.<sup>1</sup>

The investigation of dual responsibility, however, is important beyond its immediate practical application to constitutional debates (e.g., whether dual responsibility leads to shorter government duration). Rather, it presents an ideal test case to investigate the validity of some basic beliefs about the logic of government formation. For example, one of the more common beliefs about government formation is that minimal governments are the “normal” outcome of government formation and that minority or super-majority governments constitute an “anomaly” that needs to be explained. Of course, it is now well-known that minority and super-majority governments are quite typical and should not be interpreted as a crisis phenomenon (e.g. Strom 1990). However, this empirical reorientation did not lead to a corresponding theoretical shift. Existing accounts of minority governments, for example, focus on specific explanations why majority governments would not form. In his influential work Strom (1990), for example, suggests two such mechanisms: opposition parties may have other channels of influencing policy or they may fear to pay an electoral cost of joining an unpopular government. 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 Italy and Belgium 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.

By studying dual responsibility in detail we can show that this intuition is incorrect. 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

---

<sup>1</sup>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.

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). However, there is no reason that this equilibrium replacement effect will stop at minimal winning coalitions. Rather, minimal winning governments will form when the incentives between durability and control are balanced.

The key methodological point of this analysis is that we need to account for the equilibrium response of strategic party leaders in evaluating issues of constitutional design or reform. Just because *potential* governments may last longer does not imply that *actual* governments will be more durable, since government formation is the outcome of a strategic bargaining and selection process.

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). 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 the argument that when the agreement of two chambers is required to change the *status quo* (that is, there are two “veto players”), the government is relatively more unstable. The second conclusion follows from the argument that, in order to pass legislation and hence implement policies, government coalitions need the support of a majority in both chambers of parliament.<sup>2</sup> In a recent empirical study of government formation and duration

---

<sup>2</sup>Lijphart’s (1984) argument, however, only applies to cases where the two chambers are elected by different constituencies. Italy, for example would be excluded because even though both Italian chambers share all legislative and electoral powers, the representatives are elected from the same constituencies and thus, according to Lijphart, are expected to represent the same interests. Germany, on the other hand, would

in West European bicameral parliamentary democracies, Druckman and Thies (2002) find 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 they find little evidence that governments add parties that generate “oversized” coalitions in the lower chamber in order to ensure a majority in the upper chamber.<sup>3</sup>

As described above we can use the estimated structural model to conduct (counterfactual) constitutional experiments. In our application we are interested in the consequences of removing dual responsibility. 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 of our bargaining model. We also compare the results of our counterfactual experiment with the results of the constitutional reform conducted in Sweden. Since Sweden eliminated dual responsibility (and in fact eliminated its upper chamber altogether) in 1970, a simple comparison of the data before and after the constitutional reform can provide some external validity on the importance of the equilibrium effects identified by our analysis.<sup>4</sup>

The results of our analysis can be summarized as follows. 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 

---

qualify because even though the veto-powers of Germany’s upper house are limited, it represents state rather than federal or district-specific constituencies.

<sup>3</sup>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.

<sup>4</sup>Note that we cannot follow the same procedure for Belgium since there are not enough observations following the 1995 reform.



significantly reduce the occurrence of surplus governments and increase the occurrence of *minority* governments. Second, the effects predicted by the model line up with the observations following the 1970 Swedish constitutional reform, where the average duration of governments remained essentially unchanged but the fraction of minority governments doubled.

Thus, our findings demonstrate that the intuition that the *prima facie* plausible belief that dual responsibility leads 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 determined in equilibrium. The following two equilibrium effects play a key role to provide an 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.

## 2 Model

We consider a bargaining model of government formation in a bicameral parliamentary democracy with dual responsibility which generalizes the theoretical framework developed in Diermeier, Eraslan, and Merlo (2003). Let  $N = \{1, \dots, n\}$  denote the set of parties represented in the parliament and let  $\pi^C \in \Pi^C = \{(\pi_1^C, \dots, \pi_n^C) : \pi_i^C \in (0, 1), \sum_{i \in N} \pi_i^C = 1\}$  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).<sup>5</sup>

---

<sup>5</sup>The shares are determined by the outcome of a general election which is not modeled here.

Each party  $i \in N$  has linear von Neumann-Morgenstern preferences over the benefits from holding office  $x_i \in \mathbb{R}_+$  and the composition of the government coalition  $G \subseteq N$ ,

$$U_i(x_i, G) = x_i + u_i^G, \quad (1)$$

where

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

$\varepsilon_i^G > \eta_i^G$ ,  $\varepsilon_i^G, \eta_i^G \in \mathbb{R}$ . 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. In particular,  $\varepsilon_i^G$  can be thought of as the utility that a party in the government coalition obtains from implementing government policies. The policies implemented by a government depend on the coalition partners' relative preferences over policy outcomes and on the institutional mechanisms through which policies are determined. In this paper, we summarize all policy related considerations in equation (2).<sup>6</sup> The assumption that  $\varepsilon_i^G > \eta_i^G$  for all  $i \in N$  and for all  $G \subseteq N$ , implies that, *ceteris paribus*, parties always prefer to be included in the government coalition rather than being excluded. We let  $\beta \in (0, 1)$  denote the common discount factor reflecting the parties' degree of impatience.

Our analysis begins after an election or the resignation of an incumbent government (possibly because of a general election or because of a no-confidence vote in the parliament). We let  $\bar{T}$  denote the *time horizon* to the next scheduled election (which represents the maximum amount of time a new government could remain in office) and  $s \in \Sigma$  denote the current *state of the world* (which summarizes the current political and economic situation). While  $\bar{T}$  is constant, we assume that the state of the world evolves over time according to an independently and identically distributed (i.i.d.) stochastic process  $\sigma$  with state space  $\Sigma$  and probability distribution function  $F_\sigma(\cdot)$ .

---

<sup>6</sup>For a richer, spatial model of government formation where government policies are endogenously determined, see Diermeier and Merlo (2000).

After the resignation of an incumbent government, the head of state chooses one of the parties represented in the parliament to try to form a new government. We refer to the selected party  $\mathbb{k} \in N$  as the *formateur*. Following Laver and Shepsle (1996) and Baron (1993), we assume that the choice of a formateur is non-partisan and the head of state is non-strategic.<sup>7</sup> In particular, we assume that each party  $i \in N$  is selected to be a formateur with probability

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

where  $\mathbb{k}_{-1} \in N$  denotes the party of the former prime minister, and  $I_i$  is a dummy variable that takes the value 1 if  $\mathbb{k}_{-1} = i$  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. It also reflects the fact that if a party has an absolute majority in either chamber of the parliament (where an absolute majority in the Senate is relevant because of dual responsibility), then it has to be selected as the formateur.<sup>8</sup>

The formateur then chooses a *proto-coalition*  $D \in \Delta_{\mathbb{k}}$ , where  $\Delta_{\mathbb{k}}$  denotes the set of subsets of  $N$  which contain  $\mathbb{k}$ .<sup>9</sup> Intuitively, a proto-coalition is a set of parties that agree to talk to each other about forming a government together. Let  $\pi^D \equiv (\sum_{i \in D} \pi_i^H, \sum_{i \in D} \pi_i^S)$  denote the *size* of proto-coalition  $D$ . The proto-coalition bargains over the formation of a new government, which determines the allocation of government portfolios among the coalition

---

<sup>7</sup>Note that most constitutions are silent with respect to the rules for selecting a formateur, which are generally reflected in unwritten conventions and norms.

<sup>8</sup>There are no cases in the data where different parties have absolute majorities in different chambers.

<sup>9</sup>Our assumption that parties always prefer to be included in the government coalition immediately implies that the formateur party will never propose a proto-coalition that does not include itself.

members,  $x^D = (x_i^D)_{i \in D} \in \mathbb{R}_+^{|D|}$ . Following Merlo (1997), we assume that cabinet portfolios generate a (perfectly divisible) unit level of surplus in every period a government is in power and we let  $T^D \in [0, \bar{T}]$  denote the duration of a government formed by proto-coalition  $D$ .

Government duration in parliamentary democracies is not fixed. Rather, it depends on institutional factors (which include 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 (see, e.g., King et al. 1990, Merlo 1998, and Warwick 1994). Let  $Q$  denote the vector of institutional characteristics (possibly) affecting government duration. Hence,  $T^D$  can be represented as a random variable with density function  $f(t^D | s, \bar{T}, Q, \pi^D)$  over the support  $[0, \bar{T}]$ .<sup>10</sup>

Given the current state  $s$  and the vector of (time-invariant) characteristics  $(\bar{T}, Q, \pi^D)$ , let

$$y^D(s, \bar{T}, Q, \pi^D) \equiv E[T^D | s, \bar{T}, Q, \pi^D] \quad (4)$$

denote the *cake* to be divided among the members of the proto-coalition  $D$  if they agree to form a government in that state. That is,  $y^D(\cdot) \in (0, \bar{T})$  represents the total expected office benefits from forming a government in state  $s$ . Given proto-coalition  $D$ , for any state  $s$ , let

$$X^D(s, \bar{T}, Q, \pi^D) \equiv \left\{ x^D \in \mathbb{R}_+^{|D|} : \sum_{i \in D} x_i^D \leq y^D(s, \bar{T}, Q, \pi^D) \right\} \quad (5)$$

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  $x^D \in X^D(s, \bar{T}, Q, \pi^D)$ . If  $\mathbb{k}$  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

---

<sup>10</sup>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).

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

$$\tilde{p}_i(\pi^H, \pi^S, D) = \begin{cases} 1 & \text{if } \pi_i^H > 0.5 \text{ or } \pi_i^S > 0.5 \text{ and } \pi_j^H \leq 0.5, \forall j \in D \\ \frac{\exp(\alpha_2 \pi_i^H)}{\sum_{j \in D} \exp(\alpha_2 \pi_j^H)} & \text{if } \pi_j^C \leq 0.5, \forall j \in N, \text{ for } C = H, S \\ 0 & \text{if } \exists j \neq i : \pi_j^C > 0.5, \text{ for } C = H \text{ or } C = S \end{cases}, \quad (6)$$

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  $(\tau^D, \chi^D)$  may be defined as a stopping time  $\tau^D = 0, 1, \dots$  and a  $|D|$ -dimensional random vector  $\chi^D$  which satisfies  $\chi^D \in X^D(\sigma_{\tau^D}, \bar{T}, Q, \pi^D)$  if  $\tau^D < +\infty$  and  $\chi^D = 0$  otherwise. Given a realization of  $\sigma$ ,  $\tau^D$  denotes the period in which a proposal is accepted by proto-coalition  $D$ , and  $\chi^D$  denotes the proposed allocation that is accepted in state  $\sigma_{\tau^D}$ . Define  $\beta^\infty = 0$ . Then an outcome  $(\tau^D, \chi^D)$  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  $j \in N \setminus D$  equal to  $\eta_j^D$ . Let

$$V_{\mathbb{k}}(D, \bar{T}, Q, \pi^D) \equiv E[\beta^{\tau^D} \chi_i^D]. \quad (7)$$

For any formateur  $\mathbb{k} \in N$ , each potential proto-coalition  $D \in \Delta_{\mathbb{k}}$  is associated with an expected payoff for party  $\mathbb{k}$

$$W_{\mathbb{k}}(D, \bar{T}, Q, \pi^D) = V_{\mathbb{k}}(D, \bar{T}, Q, \pi^D) + \varepsilon_{\mathbb{k}}^D. \quad (8)$$

Hence, party  $\mathbb{k}$  chooses the proto-coalition to solve

$$\max_{D \in \Delta_{\mathbb{k}}} W_{\mathbb{k}}(D, \bar{T}, Q, \pi^D). \quad (9)$$

Let  $D_{\mathbb{k}} \in \Delta_{\mathbb{k}}$  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). In particular, the unique stationary subgame perfect equilibrium of this game has the following features. First, the equilibrium agreement rule possesses a *reservation property*: in any state  $s$ , coalition  $D$  agrees in that state if and only if  $y^D(s, \bar{T}, Q, \pi^D) \geq y^*(D, \bar{T}, Q, \pi^D)$ , where  $y^*(\cdot)$  solves

$$y^*(D, \bar{T}, Q, \pi^D) = \beta \int \max\{y^D(s', \bar{T}, Q, \pi^D), y^*(D, \bar{T}, Q, \pi^D)\} dF_\sigma(s'). \quad (10)$$

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  $\beta$ ), their institutional environment (summarized by  $Q$ ), the length of the time horizon to the next scheduled election (given by  $\bar{T}$ ), the size and composition of the proto-coalition (equal to  $\pi^D$  and  $D$ , respectively), and the uncertainty about the future (summarized by the stochastic process  $\sigma$ ).

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  $D \in \Delta_{\mathbb{k}}$ , if  $D$  is chosen as the proto-coalition, then  $D$  forms the government.

Third, for any formateur  $\mathbb{k} \in N$  and for any potential proto-coalition  $D \in \Delta_{\mathbb{k}}$ , the ex-ante

expected equilibrium payoff to party  $\mathbb{k}$  is given by

$$W_{\mathbb{k}}(D, \bar{T}, Q, \pi^D) = \left( \frac{1 - \beta(1 - \tilde{p}_{\mathbb{k}}(\pi^H, \pi^S, D))}{\beta} \right) y^*(D, \bar{T}, Q, \pi^D) + \varepsilon_{\mathbb{k}}^D. \quad (11)$$

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

$$D_{\mathbb{k}} = \arg \max_{D \in \Delta_{\mathbb{k}}} \left( \frac{1 - \beta(1 - \tilde{p}_{\mathbb{k}}(\pi^H, \pi^S, D))}{\beta} \right) y^*(D, \bar{T}, Q, \pi^D) + \varepsilon_{\mathbb{k}}^D, \quad (12)$$

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

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  $\beta$ , its relative “bargaining power”  $\tilde{p}_{\mathbb{k}}(\cdot)$ , and the formateur’s tastes for its coalition partners  $\varepsilon_{\mathbb{k}}^D$ .

To further explore the intuition of the model and 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  $\tilde{p}_1 = 1/|D|$ . 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,  $\bar{T} = 5$ . 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 for every possible proto-coalition  $D \in \Delta_1$ . Consider first the case where  $D = \{1\}$ . Using equation (10) 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 (11) above, the equilibrium payoff to party 1 from choosing proto-coalition  $\{1\}$  is equal to

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

Next, consider the cases where  $D = \{1, 2\}$  or  $D = \{1, 3\}$ . It is easy to verify that if  $\beta \leq 4/5$ , then  $y^*(\{1, 2\}) = y^*(\{1, 3\}) = 5\beta/2 \leq y^{\{1,2\}}(b) = y^{\{1,3\}}(b)$ , which implies that agreement occurs in both states of the world. If, on the other hand,  $\beta > 4/5$ , then  $y^*(\{1, 2\}) = y^*(\{1, 3\}) = 3\beta/(2 - \beta) > y^{\{1,2\}}(b) = y^{\{1,3\}}(b)$ , which implies that agreement only occurs when  $s = g$ . Hence, the equilibrium payoff to party 1 from choosing proto-coalition  $\{1, 2\}$  is equal to

$$W_1(\{1, 2\}) = \begin{cases} \frac{5(2-\beta)}{4} + \frac{1}{2} & \text{if } \beta \leq \frac{4}{5} \\ 2 & \text{if } \beta > \frac{4}{5} \end{cases},$$



and its equilibrium payoff from choosing proto-coalition  $\{1, 3\}$  is equal to

$$W_1(\{1, 3\}) = \begin{cases} \frac{5(2-\beta)}{4} & \text{if } \beta \leq \frac{4}{5} \\ \frac{3}{2} & \text{if } \beta > \frac{4}{5} \end{cases} .$$

Finally, consider the case where  $D = \{1, 2, 3\}$ . It is easy to verify that if  $\beta \leq 6/7$ , then  $y^*(\{1, 2, 3\}) = 7\beta/2 \leq y^{\{1,2,3\}}(b)$ , which implies that agreement occurs in both states of the world. If, on the other hand,  $\beta > 6/7$ , then  $y^*(\{1, 2, 3\}) = 4\beta/(2 - \beta) > y^{\{1,2,3\}}(b)$ , which implies that agreement only occurs when  $s = g$ . Hence, the equilibrium payoff to party 1 from choosing proto-coalition  $\{1, 2, 3\}$  is equal to

$$W_1(\{1, 2, 3\}) = \begin{cases} \frac{7(3-2\beta)}{6} & \text{if } \beta \leq \frac{6}{7} \\ \frac{4(3-2\beta)}{6-3\beta} & \text{if } \beta > \frac{6}{7} \end{cases} .$$

The equilibrium payoffs to the formateur party 1 associated with all possible proto-coalitions are depicted in Figure 1 as functions of the parameter  $\beta$ .

Hence, the equilibrium proto-coalition choice of the formateur party 1 is given by<sup>11</sup>

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

A relatively high degree of impatience would induce the formateur to choose a surplus coalition that would immediately agree to form the government.<sup>12</sup> 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 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.<sup>13</sup> Finally, for sufficiently low

---

<sup>11</sup>Since ties are zero probability events, we are ignoring here the event of a tie between two alternatives.

<sup>12</sup>Notice that when  $D = \{1, 2, 3\}$  and  $\beta \in (0, 0.46)$  agreement occurs in both states of the world.

<sup>13</sup>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  $\{1, 2\}$ .

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  $\beta$  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 without dual 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  $y^{\{1,3\}}(g) = y^{\{1,2,3\}}(g) = 4$ , 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.<sup>14</sup>

As above, we begin by analyzing the outcome of proto-coalition bargaining for every possible proto-coalition  $D \in \Delta_1$ . Consider first the case where  $D = \{1\}$  or  $D = \{1, 2\}$ . It is easy to verify that if  $\beta \leq 4/5$ , then  $y^*(\{1\}) = y^*(\{1, 2\}) = 5\beta/2 \leq y^{\{1\}}(b) = y^{\{1,2\}}(b)$ , which implies that delays never occur. If, on the other hand,  $\beta > 4/5$ , then  $y^*(\{1\}) = y^*(\{1, 2\}) = 3\beta/(2 - \beta) > y^{\{1\}}(b) = y^{\{1,2\}}(b)$ , which implies that delays occur when  $s = b$ . Hence, the equilibrium payoff to party 1 from choosing proto-coalition  $\{1\}$  is equal to

$$W_1(\{1\}) = \begin{cases} 3 & \text{if } \beta \leq \frac{4}{5} \\ \frac{3}{2-\beta} + \frac{1}{2} & \text{if } \beta > \frac{4}{5} \end{cases},$$

and its payoff from choosing proto-coalition  $\{1, 2\}$  is equal to

$$W_1(\{1, 2\}) = \begin{cases} \frac{5(2-\beta)}{4} + \frac{1}{2} & \text{if } \beta \leq \frac{4}{5} \\ 2 & \text{if } \beta > \frac{4}{5} \end{cases}.$$

Next, consider the cases where  $D = \{1, 3\}$  or  $D = \{1, 2, 3\}$ . It is easy to verify that if  $\beta \leq 6/7$ , then  $y^*(\{1, 3\}) = y^*(\{1, 2, 3\}) = 7\beta/2 \leq y^{\{1,3\}}(b) = y^{\{1,2,3\}}(b)$ , which implies that agreement occurs in both states of the world. If, on the other hand,  $\beta > 6/7$ , then  $y^*(\{1, 3\}) = y^*(\{1, 2, 3\}) = 4\beta/(2 - \beta) > y^{\{1,3\}}(b) = y^{\{1,2,3\}}(b)$ , which implies that agreement only occurs when  $s = g$ . Hence, the equilibrium payoff to party 1 from choosing proto-coalition  $\{1, 3\}$  is equal to

$$W_1(\{1, 3\}) = \begin{cases} \frac{7(2-\beta)}{4} & \text{if } \beta \leq \frac{6}{7} \\ 2 & \text{if } \beta > \frac{6}{7} \end{cases},$$

---

<sup>14</sup>See, e.g., Tsebelis (2000).

and its equilibrium payoff from choosing proto-coalition  $\{1, 2, 3\}$  is equal to

$$W_1(\{1, 2, 3\}) = \begin{cases} \frac{7(3-2\beta)}{6} & \text{if } \beta \leq \frac{6}{7} \\ \frac{4(3-2\beta)}{6-3\beta} & \text{if } \beta > \frac{6}{7} \end{cases}.$$

The equilibrium payoffs to the formateur party 1 associated with all possible proto-coalitions are depicted in Figure 2 as functions of the parameter  $\beta$ .

Thus, in this case, the equilibrium proto-coalition choice of the formateur party 1 is given by

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

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  $\beta$ . 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  $\beta$  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  $\beta < 0.29$ , 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 effect of dual responsibility on government duration is illustrated in Figure 3. 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  $\beta \in (0.29, 0.46)$ ). This last possibility illustrates the potentially powerful consequences of accounting for equilibrium responses by strategic parties. If  $\beta \in (0.29, 0.46)$ , the formateur party 1 would choose to be in a minority government rather than in the surplus coalition  $\{1, 2, 3\}$  if dual responsibility was abandoned.

The example illustrates the equilibrium replacement effect captured by our model. Above, we described the model’s 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 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 (surplus) coalitions (possibly constituting a majority in both chambers), to achieve the desired level of durability at the cost of a loss of control on the part of the formateur. Removing dual responsibility, while holding everything else the same, removes one source of instability and makes it possible to achieve similar levels of durability by “replacing” larger coalitions with smaller coalitions.

As evidenced in this example, our model is capable of addressing the issues discussed in the introduction. However, it should also be clear from the example that the predictions of the model critically depend on the values of the model’s parameters. In order to assess

quantitatively the effects that removing dual responsibility would have on the formation and dissolution of coalition governments, we need to estimate our 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,  $\ell_2, \dots, \ell_{\tau^{D_{\mathbb{k}}}}$ , 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,  $\bar{T}$ , the set of parties represented in the parliament,  $N$ , the vector of their relative seat shares,  $\pi^H$  and  $\pi^S$ , 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.

In the bargaining model described in Section 2, we specified the cake a generic proto-coalition  $D$  bargains over in any given period,  $y^D$ , to be equal to the expected government duration conditional on the state of the world in that period,  $s$ , given the vector of (time-invariant) characteristics,  $(\bar{T}, Q, \pi^D)$ . Also, we characterized the conditions under which agreement occurs in terms of a reservation rule on the size of the current cake. Hence, from the perspective of the political parties that observe the cakes, the sequence of events in a negotiation is deterministic, since they agree to form a government as soon as the current cake is above a threshold that depends only on their expectation about future states of the world and hence future cakes. The only uncertainty concerns the actual duration of the government after it is formed:  $T^D$ . The sources for this uncertainty are political events (such as a scandal) occurring while the government is in power. Thus,  $T^D$  is modeled as a random variable.

We (the econometricians), however, do not observe the state of the world  $s$ .<sup>15</sup> Hence, from the perspective of the econometrician, the cake  $y^D(s, \bar{T}, Q, \pi^D) \equiv E[T^D | s, \bar{T}, Q, \pi^D]$  is also a random variable.<sup>16</sup> Let  $F_y(y^D | \bar{T}, Q, \pi^D)$  denote the conditional distribution of cakes

---

<sup>15</sup>In particular, we do not observe all the relevant elements in the parties' information set when they form their expectations about government durations. Thus, we do not observe the cake.

<sup>16</sup>Since, by assumption,  $s$  is i.i.d.,  $y^D$  is also i.i.d.. The assumption that the state of the world follows an i.i.d. stochastic process is critical to obtain the simple equilibrium characterization described in Section 2 above, which makes the estimation of the model feasible.

with conditional density  $f_y(\cdot|\cdot)$  defined over the support  $[0, \bar{y}]$ , and let  $F_T(t^D|y^D; \bar{T}, Q, \pi^D)$  denote the conditional distribution of government durations with conditional density  $f_T(\cdot|\cdot)$  defined over the support  $[0, \bar{T}]$ , where  $\bar{y} < \bar{T}$  is the upper bound on the expectations over government duration and  $F_T(\cdot|\cdot)$  satisfies the restriction  $E[T^D|y^D; \bar{T}, Q, \pi^D] = y^D$ .<sup>17</sup> Thus, from the point of view of the econometrician,  $y^*(D, \bar{T}, Q, \pi^D)$  solves

$$\begin{aligned} y^* &= \beta \int \max\{y^D, y^*\} dF_y(y^D|\bar{T}, Q, \pi^D) \\ &= \beta \left( E[y^D|\bar{T}, Q, \pi^D] + \int_0^{y^*} (y^* - y^D) dF_y(y^D|\bar{T}, Q, \pi^D) \right), \end{aligned} \quad (13)$$

and the probability of a negotiation lasting  $\tau$  rounds is equal to

$$\begin{aligned} \Pr(\tau) &= [\Pr(y^D < y^*(D, \bar{T}, Q, \pi^D))]^{\tau-1} \Pr(y^D \geq y^*(D, \bar{T}, Q, \pi^D)) \\ &= [F_y(y^*(\cdot)|\bar{T}, Q, \pi^D)]^{\tau-1} [1 - F_y(y^*(\cdot)|\bar{T}, Q, \pi^D)]. \end{aligned} \quad (14)$$

This is the probability that the first  $\tau-1$  cakes are smaller than the threshold  $y^*(D, \bar{T}, Q, \pi^D)$  and the cake in period  $\tau$  is greater than or equal to  $y^*(D, \bar{T}, Q, \pi^D)$ . Moreover, the probability of a government duration  $t$  following an agreement after  $\tau$  rounds of negotiations is equal to

$$\begin{aligned} \Pr(t|\tau) &= \Pr(t|y^D \geq y^*(D, \bar{T}, Q, \pi^D)) \\ &= \frac{\int_{y^*(\cdot)}^{\bar{y}} f_T(t|y^D; \bar{T}, Q, \pi^D) dF_y(y^D|\bar{T}, Q, \pi^D)}{1 - F_y(y^*(\cdot)|\bar{T}, Q, \pi^D)}. \end{aligned} \quad (15)$$

Agreement implies that the expected government duration is above the threshold  $y^*(D, \bar{T}, Q, \pi^D)$ . However, we (the econometricians) do not know exactly which cake led to the agreement. Hence, in order to compute this probability, we have to average over all the possible cakes that may have induced the agreement.

Let us now consider the decision problem faced by the formateur party  $\mathbb{k}$ . For each possible coalition  $D \in \Delta_{\mathbb{k}}$ , party  $\mathbb{k}$  can compute its expected equilibrium payoff if  $D$  is

---

<sup>17</sup>Note that  $F_y(y^D|\bar{T}, Q, \pi^D)$  and  $F_T(t^D|y^D; \bar{T}, Q, \pi^D)$  imply a distribution of  $T^D$  conditional on  $(\bar{T}, Q, \pi^D)$ .



chosen as the proto-coalition and bargains over the formation of a new government. The formateur's expected payoff is given in equation (11) and depends on the expected outcome of the bargaining process as well as the formateur's tastes for its coalition partners,  $\varepsilon_{\mathbb{k}}^D$ . Hence, from the perspective of the formateur party that knows its tastes, the optimal coalition choice described in equation (12) is deterministic. We (the econometricians), however, do not observe the formateur's tastes for its coalition partners,  $\varepsilon_{\mathbb{k}}^D$ . Hence, as above, from the perspective of the econometrician,  $\varepsilon_{\mathbb{k}}^D$  is a random variable. This implies that the expected payoff  $W_{\mathbb{k}}(D, \bar{T}, Q, \pi^D)$  is also a random variable, which in turn implies that the formateur's decision problem is probabilistic. Following McFadden (1973), Rust (1987) and many others, we assume that  $\varepsilon_{\mathbb{k}}^D$ ,  $D \in \Delta_{\mathbb{k}}$ , are independently and identically distributed according to a type I extreme value distribution with standard deviation  $\rho$ .<sup>18</sup> Thus, from the point of view of the econometrician, the probability that the formateur party  $\mathbb{k}$  chooses a particular proto-coalition  $D' \in \Delta_{\mathbb{k}}$  to form the government is given by

$$\begin{aligned} \Pr(D') &= \Pr\left(W_{\mathbb{k}}(D', \bar{T}, Q, \pi^{D'}) > W_{\mathbb{k}}(D, \bar{T}, Q, \pi^D), \forall D \in \Delta_{\mathbb{k}}\right) \\ &= \frac{\exp\left(\frac{[1-\beta(1-\tilde{p}_{\mathbb{k}}(\pi, D'))]y^*(D', \bar{T}, Q, \pi^{D'})}{\beta\rho}\right)}{\sum_{D \in \Delta_{\mathbb{k}}} \exp\left(\frac{[1-\beta(1-\tilde{p}_{\mathbb{k}}(\pi, D))]y^*(D, \bar{T}, Q, \pi^D)}{\beta\rho}\right)}. \end{aligned} \quad (16)$$

We can now derive the likelihood function which represents the basis for the estimation 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  $(\mathbb{k}, D_{\mathbb{k}}, \tau^{D_{\mathbb{k}}}, \ell_2, \dots, \ell_{\tau^{D_{\mathbb{k}}}}, t^{D_{\mathbb{k}}})$  conditional on the vector of (exogenous) characteristics  $Z = (\bar{T}, Q, N, \pi, \mathbb{k}_{-1})$ , given the vector of the model's parameters  $\theta = (\alpha_0, \alpha_1, \alpha_2, \beta, \rho, F_y, F_T)$ . Given the structure of our model and our equilibrium characterization, this probability can

---

<sup>18</sup>For a detailed description of the properties of this family of distributions see, e.g., Johnson and Kotz (1970; vol. 1, pp. 272-295).

be written as

$$\begin{aligned}
\Pr(\mathbb{k}, D_{\mathbb{k}}, \tau^{D_{\mathbb{k}}}, \ell_2, \dots, \ell_{\tau^{D_{\mathbb{k}}}}, t^{D_{\mathbb{k}}}|Z; \theta) &= \Pr(\mathbb{k}|Z; \theta) \times \\
&\Pr(D_{\mathbb{k}}|\mathbb{k}, Z; \theta) \times \\
&\Pr(\tau^{D_{\mathbb{k}}}|D_{\mathbb{k}}, \mathbb{k}, Z; \theta) \times \\
&\Pr(\ell_2, \dots, \ell_{\tau^{D_{\mathbb{k}}}}|\tau^{D_{\mathbb{k}}}, D_{\mathbb{k}}, \mathbb{k}, Z; \theta) \times \\
&\Pr(t^{D_{\mathbb{k}}}|t^{D_{\mathbb{k}}}, D_{\mathbb{k}}, \mathbb{k}, Z; \theta), \tag{17}
\end{aligned}$$

where

$$\begin{aligned}
\Pr(\mathbb{k}|Z; \theta) &= p_{\mathbb{k}}(\pi, \mathbb{k}_{-1}; \alpha_0, \alpha_1), \\
\Pr(D_{\mathbb{k}}|\mathbb{k}, Z; \theta) &= \frac{\exp\left(\frac{[1-\beta(1-\tilde{p}_{\mathbb{k}}(\pi, D_{\mathbb{k}}; \alpha_3))]y^*(D_{\mathbb{k}}, \bar{T}, Q, \pi^{D_{\mathbb{k}}})}{\beta\rho}\right)}{\sum_{D \in \Delta_{\mathbb{k}}} \exp\left(\frac{[1-\beta(1-\tilde{p}_{\mathbb{k}}(\pi, D; \alpha_3))]y^*(D, \bar{T}, Q, \pi^D)}{\beta\rho}\right)}, \\
\Pr(\tau^{D_{\mathbb{k}}}|D_{\mathbb{k}}, \mathbb{k}, Z; \theta) &= [F_y(y^*(D_{\mathbb{k}}, \bar{T}, Q, \pi^{D_{\mathbb{k}}})|\bar{T}, Q, \pi^{D_{\mathbb{k}}})]^{D_{\mathbb{k}}-1} [1 - F_y(y^*(D_{\mathbb{k}}, \bar{T}, Q, \pi^{D_{\mathbb{k}}})|\bar{T}, Q, \pi^{D_{\mathbb{k}}})], \\
\Pr(\ell_2, \dots, \ell_{\tau^{D_{\mathbb{k}}}}|\tau^{D_{\mathbb{k}}}, D_{\mathbb{k}}, \mathbb{k}, Z; \theta) &= \prod_{j=2}^{\tau^{D_{\mathbb{k}}}} \tilde{p}_{\ell_j}(\pi, D_{\mathbb{k}}; \alpha_2),
\end{aligned}$$

and

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

The log-likelihood function is obtained by summing the logs of (17) over all the elements in the sample.<sup>19</sup>

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.<sup>20</sup> In

---

<sup>19</sup>Note that computing the likelihood function is a rather burdensome task since one has to enumerate all possible proto-coalitions and solve all possible bargaining games a formateur may choose to play.

<sup>20</sup>The family of beta distributions is the most flexible family of parametric distributions for continuous random variables with a finite support (see, e.g., Johnson and Kotz 1970; vol. 1, pp. 37-56). Some amount of experimentation with alternative specifications suggests that our results are not too sensitive to the specific parameterization chosen.

particular, we let

$$f_y(y^D|\bar{T}, Q, \pi^D) = \gamma(\bar{T}, Q, \pi^D) \left[ \frac{[y^D]^{\gamma(\bar{T}, Q, \pi^D)-1}}{[\bar{y}(\bar{T}, Q)]^{\gamma(\bar{T}, Q, \pi^D)}} \right], \quad (18)$$

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

$$\begin{aligned} \gamma(\bar{T}, Q, \pi^D) = & \exp((\gamma_0 + \gamma_1\pi^D)MINORITY + \\ & (\gamma_2 + \gamma_3\pi^D)MINWIN + \\ & (\gamma_4 + \gamma_5\pi^D)SURPLUS + \\ & \gamma_6MAJSENATE + \\ & \gamma_7\bar{T}), \end{aligned} \quad (19)$$

and

$$\bar{y}(\bar{T}, Q) = \frac{\exp(\lambda)}{1 + \exp(\lambda)} \bar{T} \quad (20)$$

Furthermore, we let

$$f_T(t^D|y^D; \bar{T}, Q, \pi^D) = \frac{1}{B\left(\frac{\delta(\bar{T}, Q, \pi^D)y^D}{\bar{T}-y^D}, \delta(\bar{T}, Q, \pi^D)\right)} \left[ \frac{[t^D]^{\frac{\delta(\bar{T}, Q, \pi^D)y^D}{\bar{T}-y^D}-1} [\bar{T} - t^D]^{\delta(\bar{T}, Q, \pi^D)-1}}{[\bar{T}]^{\frac{\delta(\bar{T}, Q, \pi^D)y^D}{\bar{T}-y^D} + \delta(\bar{T}, Q, \pi^D)-1}} \right], \quad (21)$$

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

$$\delta(\bar{T}, Q, \pi^D) = \exp(\delta_0 + \delta_1\bar{T}). \quad (22)$$

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

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

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 the (expected and actual) duration of governments of different types in a fairly unrestricted

way.<sup>21</sup> 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 (18)-(22) above also allows for the possibility that government coalitions of the same size may face different survival prospects depending on the remaining time horizon  $\bar{T}$ .

## 4 Results

Table 2 presents the maximum likelihood estimates of the parameters of the model,  $(\alpha, \beta, \gamma, \delta, \lambda, \rho)$ , where  $\alpha = (\alpha_0, \alpha_1, \alpha_2)$ ,  $\gamma = (\gamma_0, \dots, \gamma_7)$ , and  $\delta = (\delta_0, \delta_1)$ . 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  $\chi^2$  test

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

where  $f(\cdot)$  denotes the empirical density function, or histogram, of a given (endogenous) variable,  $\hat{f}(\cdot)$  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  $\chi^2$  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.

### 4.1 Constitutional Experiments

We use our estimated model to evaluate the following counterfactual constitutional experiment. Suppose in 1945 Belgium had eliminated government responsibility to the upper

---

<sup>21</sup>Notice that, by definition of beta distributions,  $\gamma(\cdot)$  and  $\delta(\cdot)$  must be strictly positive. This justifies the exponential functions in (19) and (21). 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).

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  $\pi^S = (0, \dots, 0)$  for all elections and we set  $MAJSENATE = 1$  for all possible coalitions.

The results of our experiment are documented in columns 2 and 3 of Table 8. Here, column 1 summarizes the data relative to Belgian governments, column 2 reports the model's predictions based on the actual Belgian constitution (which, until 1995, prescribed the dual responsibility of the government), and column 3 contains the results of the constitutional experiment predicted by our model. 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 22% to 6%) and increase the occurrence of minority governments (from 13% to 86%).

To provide an external point of comparison we consider the outcomes of a similar constitutional reform implemented in Sweden in 1970. The results of this reform are reported in 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. As we can see from this table, the results of the constitutional reform are similar to the ones predicted by our model for Belgium. In particular, while government duration remained virtually unchanged, the fraction of minority governments more than doubled (from 42% to 86%). Note that Sweden never experienced surplus governments (either before or after the reform).<sup>22</sup>

---

<sup>22</sup>As explained in Diermeier, Eraslan, and Merlo (2003), the lack of surplus governments in Sweden (but also in Denmark and Norway) is due to a constitutional feature known as *negative parliamentarism*. This feature is not present in the Belgian constitution.

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 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 (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 (*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. The magnitude of these effects depends on the magnitude of the model’s parameters.

## 5 Conclusion

In this paper, we propose a structural approach to study 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 estimate 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. These estimates are then used to conduct a counterfactual experiment of constitutional design where we eliminate dual responsibility. Our results indicate a strong selection effect in the types of governments that form. Without dual responsibility formateurs have a stronger incentive to propose minority governments. Since minority governments are less durable than majority governments, the longer expected coalition duration conditional on having formed in a system where dual responsibility has been removed is offset by the selection of shorter-lived coalition types. Based on our estimates, the net effect of removing dual responsibility on average government duration is negligible.

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 and are simultaneously determined in equilibrium. This suggests that the traditional methodology used by existing studies is problematic and may lead to incorrect inferences. We hope to explore the implications of these insights further in future research.

# References

- Baron, David P. 1993. "Government Formation and Endogenous Parties." *American Political Science Review* 87:34-47.
- Browne, Eric C., John P. Frendreis, and Dennis W. Gleiber. 1984. "An 'Events' Approach to the Problem of Cabinet Stability." *Comparative Political Studies* 17:167-97.
- Diermeier, Daniel, Eraslan, Hülya, and Antonio Merlo. 2003. "A Structural Model of Government Formation." *Econometrica*.
- Diermeier, Daniel and Antonio Merlo, 2000. "Government Turnover in Parliamentary Democracies." *Journal of Economic Theory* 94, 46-79.
- Diermeier, Daniel and Roger B. Myerson. 1999. "Bicameralism and Its Consequences for the Internal Organization of Legislatures." *American Economic Review* 89:1182-1196.
- Diermeier, Daniel and Randolph T. Stevenson. 2000. "Cabinet Terminations and Critical Events." *American Political Science Review*. 2000. 94(3): 627-640.
- Druckman, James N., and Michael F. Thies. 2002. "The Importance of Concurrence: The Impact of Bicameralism on Government Formation and Duration." *American Journal of Political Science* 46(4):760-772..
- Finer, S.E. 1997. *The History of Government*. Oxford: Oxford University Press.
- Johnson, Norman and Samuel Kotz 1970. *Continuous Univariate Distributions*. 2 vols. Distributions in Statistics. New York: Wiley.
- King, Gary, Alt, James, Burns, Nancy, and Michael Laver 1990. "A Unified Model of Cabinet Dissolution in Parliamentary Democracies." *American Journal of Political Science* 34:846-871.
- Laver, Michael, and Kenneth A. Shepsle. 1996. *Making and Breaking Governments: Cabinets and Legislatures in Parliamentary Democracies*. Cambridge: Cambridge University Press.
- Lijphart, Arend. 1984. *Democracies: Patterns of Majoritarian and Consensus Govern-*



*ment in Twenty-one Countries*. New Haven: Yale University Press.

Lupia, Arthur, and Kaare Strom. 1995. "Coalition Termination and the Strategic Timing of Parliamentary Elections." *American Political Science Review* 89(3):648-69.

Mackie, Thomas and Richard Rose. 1990. *The International Almanac of Electoral History*, 3rd edition. New York: Facts on File.

McFadden, David. 1973. "Conditional Logit Analysis of Qualitative Choice Behavior." in P. Zarembka, ed., *Frontiers in Econometrics*. New York: Academic Press.

Merlo, Antonio 1997. "Bargaining over Governments in a Stochastic Environment." *Journal of Political Economy* 105:101-131.

Merlo, Antonio 1998. "Economic Dynamics and Government Stability in Postwar Italy." *Review of Economics and Statistics* 80:629:637.

Merlo, Antonio and Charles Wilson 1995. "A Stochastic Model of Sequential Bargaining with Complete Information." *Econometrica* 63:371-399.

Merlo, Antonio and Charles Wilson. 1998. "Efficient Delays in a Stochastic Model of Bargaining" *Economic Theory* 11:39-55.

Rust, John. 1987. "Optimal Replacement of GMC Bus Engines: An Empirical Model of Harold Zurcher." *Econometrica* 55:999-1033.

Sjölin, Mats. 1993. *Coalition Politics and Parliamentary Power*. Sweden: Lund University Press.

Strom, Kaare. 1990. *Minority Government and Majority Rule*. Cambridge: Cambridge University Press.

Tsebelis, George. 2000. "Veto Players and Institutional Analysis." *Governance* 13: 441-74.

Tsebelis, George, and Jeannette Money. 1997. *Bicameralism*. New York: Cambridge University Press.

Warwick, Paul. 1994. *Government Survival in Parliamentary Democracies*. Cambridge:

Cambridge University Press.

**Table 1: Descriptive Statistics**

<b>Variable</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
Number of attempts	2.41	1.50	1	7
Government duration (days)	494.85	475.66	7	1502
Time to next election (days)	1208.27	361.48	133	1515
Number of parties	6.59	2.05	4	11
Size of government coalition (% in House)	61.91	12.27	34.20	84.90
Size of government coalition (% in Senate)	63.92	12.89	32.90	88.00
MINORITY	0.12	0.33	0	1
MINWIN	0.70	0.46	0	1
SURPLUS	0.18	0.39	0	1
MAJSENATE	0.97	0.17	0	1

**Table 2: Maximum Likelihood Estimates**

<b>Parameter</b>	<b>Estimate</b>	<b>Standard error</b>
$\alpha_0$	9.768	3.753
$\alpha_1$	2.217	0.575
$\alpha_2$	1.865	0.476
$\beta$	0.885	0.115
$\gamma_0$	-2.170	0.909
$\gamma_1$	-0.165	0.642
$\gamma_2$	-2.026	0.737
$\gamma_3$	0.143	0.388
$\gamma_4$	-3.913	1.350
$\gamma_5$	1.291	0.660
$\gamma_6$	0.044	0.339
$\gamma_7$	2.310	0.484
$\delta_0$	2.526	1.015
$\delta_1$	-4.095	1.584
$\lambda$	-0.002	0.619
$\rho$	25.200	6.410
Log-likelihood	-408.515	

**Table 3: Density Functions of Formateur Size and Goodness-of-fit Test**

<b>Interval</b>	<b>Data</b>	<b>Model</b>
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
$\chi^2$ test	1.268	
$\Pr(\chi^2(5) \geq 1.268)$	0.938	

**Table 4: Density Functions of Negotiation Duration and Goodness-of-fit Test**

<b>Attempt</b>	<b>Data</b>	<b>Model</b>
1	0.353	0.426
2	0.265	0.238
3	0.147	0.134
4	0.147	0.077
5	0.059	0.045
6	0.000	0.027
7	0.029	0.017
8+	0.000	0.036
<hr/>		
$\chi^2$ test	4.109	
$\Pr(\chi^2(7) \geq 4.109)$	0.767	
<hr/>		
Mean number of attempts	2.412	2.405

**Table 5: Density Functions of Government Duration and Goodness-of-fit Test**

<b>Interval</b>	<b>Data</b>	<b>Model</b>
0-6 mo	0.353	0.335
6 mo-1 yr	0.235	0.178
1 yr-1.5 yr	0.059	0.121
1.5 yr-2 yr	0.088	0.090
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	0.083
<hr/>		
$\chi^2$ test	2.946	
$\Pr(\chi^2 (7) \geq 2.946)$	0.890	
<hr/>		
Mean government duration	495 days	487 days

**Table 6: Density Functions of Government Size and Goodness-of-fit Test**

<b>Interval</b>	<b>Data</b>	<b>Model</b>
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
<hr/>		
$\chi^2$ test	5.808	
$\Pr(\chi^2(9) \geq 5.808)$	0.759	
<hr/>		
Mean government coalition size	62%	61%



**Table 7: Density Functions of Government Type and Goodness-of-fit Test**

<b>Type</b>	<b>Data</b>	<b>Model</b>
Minority	12%	13%
Minimum winning	70%	65%
Surplus	18%	22%
$\chi^2$ test	0.512	
$\Pr(\chi^2(2) \geq 0.512)$	0.774	

**Table 8: Constitutional Experiment in Belgium**

	<b>ACTUAL (dual responsibility)</b>	<b>PREDICTED (dual responsibility)</b>	<b>PREDICTED (single responsibility)</b>
Average Number of Attempts	2.4	2.4 (.04)	2.3 (.05)
Average Government Duration (days)	495	487 (72)	492 (73)
Average Government Size (% in the House)	62	61 (3)	40 (1)
% Minority Governments	12	13 (8)	86 (4)
% Min. Win. Governments	70	65 (10)	8 (4)
% Surplus Governments	18	22 (9)	6 (2)

\* standard errors in parentheses

**Table 9: Constitutional Change in Sweden**

	<b>BEFORE 1970 (dual responsibility)</b>	<b>AFTER 1970 (single responsibility)</b>
Average Number of Attempts	1.3	1.1
Average Government Duration (days)	764	719
Average Government Size (% in the House)	52	43
% Minority Governments	42	86
% Min. Win. Governments	58	14
% Surplus Governments	0	0

Figure 1: Formateur's Payoffs with Dual Responsibility

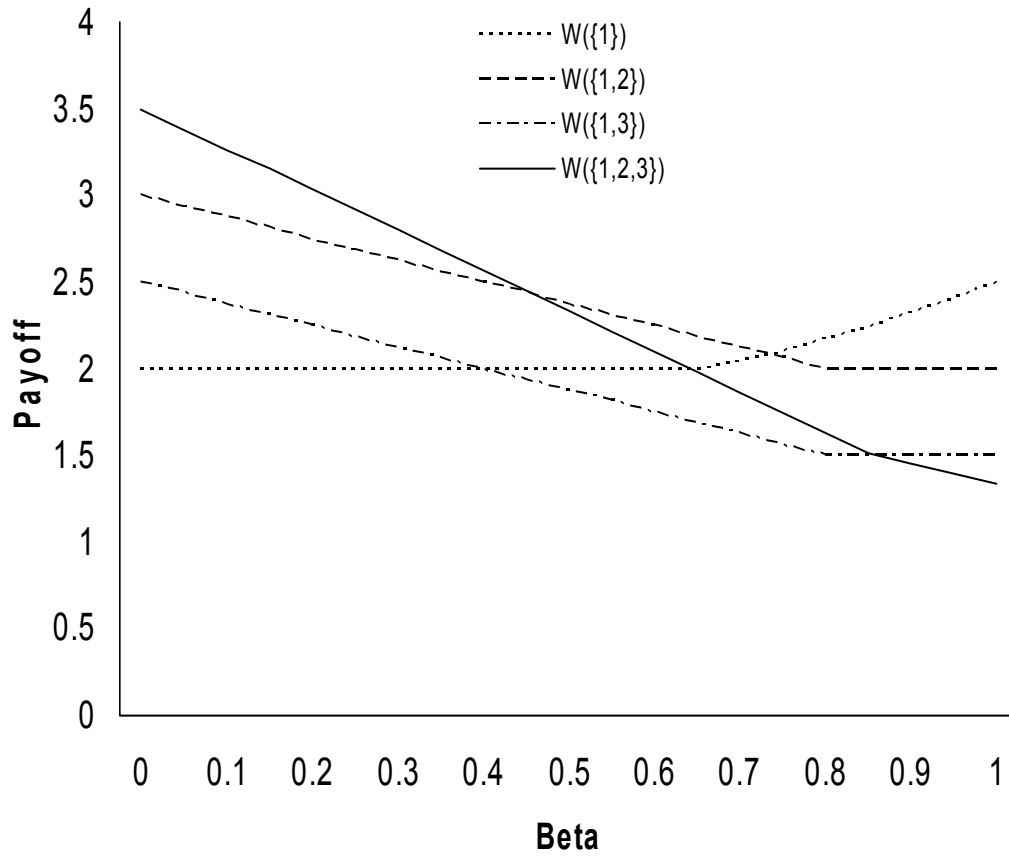
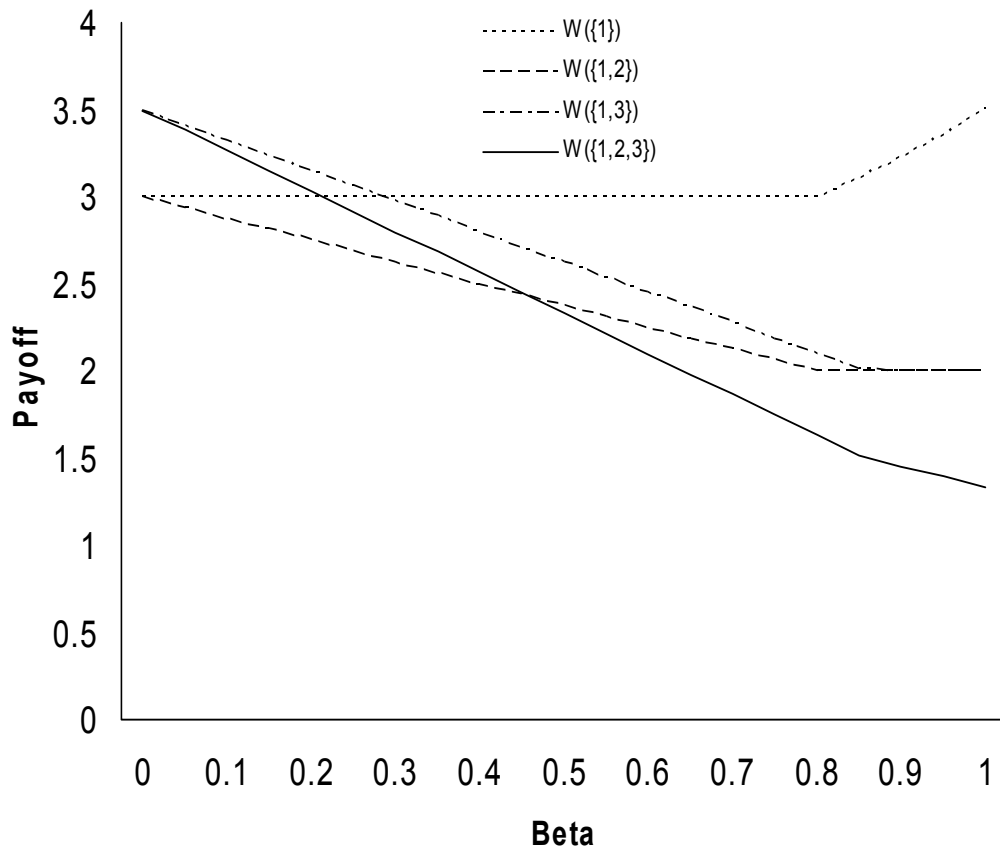
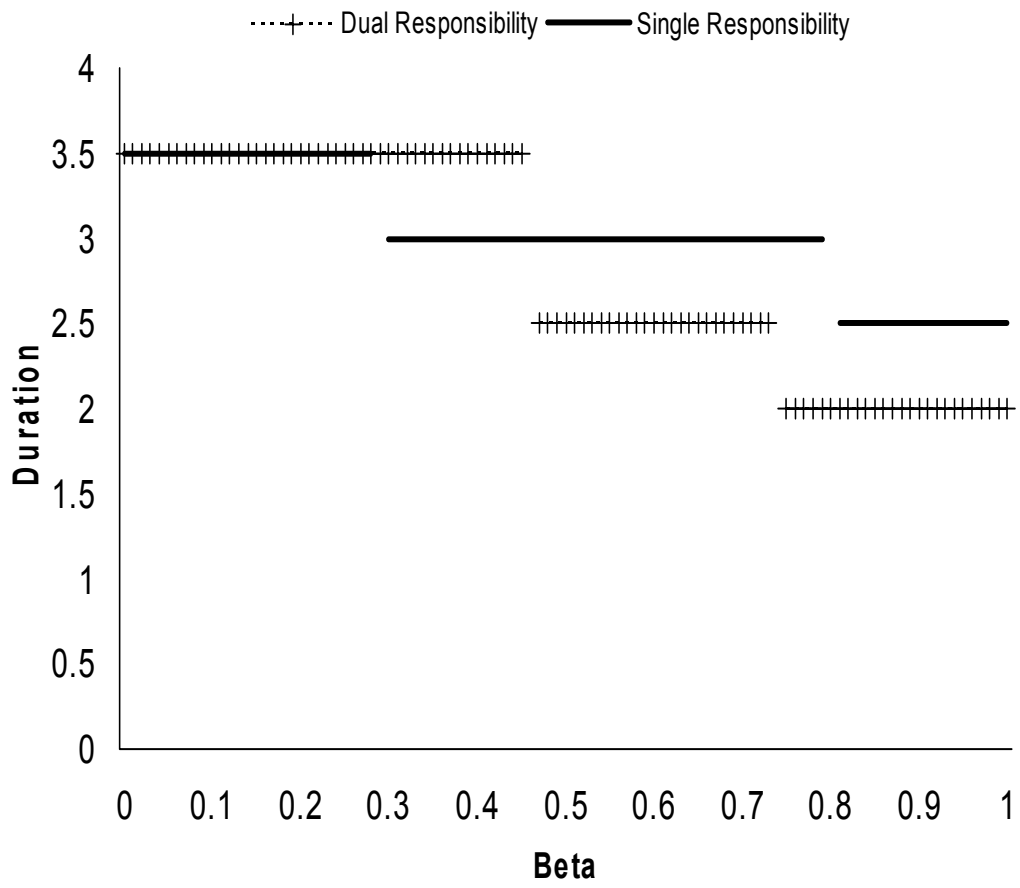


Figure 2: Formateur's Payoffs with Single Responsibility



**Figure 3: Average Government Duration**



## NOTE DI LAVORO DELLA FONDAZIONE ENI ENRICO MATTEI

### Fondazione Eni Enrico Mattei Working Paper Series

Our Note di Lavoro are available on the Internet at the following addresses:

<http://www.feem.it/Feem/Pub/Publications/WPapers/default.html>

<http://www.ssrn.com/link/feem.html>

### NOTE DI LAVORO PUBLISHED IN 2003

PRIV	1.2003	<i>Gabriella CHIESA and Giovanna NICODANO</i> : <u>Privatization and Financial Market Development: Theoretical Issues</u>
PRIV	2.2003	<i>Ibolya SCHINDELE</i> : <u>Theory of Privatization in Eastern Europe: Literature Review</u>
PRIV	3.2003	<i>Wietze LISE, Claudia KEMFERT and Richard S.J. TOL</i> : <u>Strategic Action in the Liberalised German Electricity Market</u>
CLIM	4.2003	<i>Laura MARSILIANI and Thomas I. RENSTRÖM</i> : <u>Environmental Policy and Capital Movements: The Role of Government Commitment</u>
KNOW	5.2003	<i>Reyer GERLAGH</i> : <u>Induced Technological Change under Technological Competition</u>
ETA	6.2003	<i>Efrem CASTELNUOVO</i> : <u>Squeezing the Interest Rate Smoothing Weight with a Hybrid Expectations Model</u>
SIEV	7.2003	<i>Anna ALBERINI, Alberto LONGO, Stefania TONIN, Francesco TROMBETTA and Margherita TURVANI</i> : <u>The Role of Liability, Regulation and Economic Incentives in Brownfield Remediation and Redevelopment: Evidence from Surveys of Developers</u>
NRM	8.2003	<i>Elissaios POPYRAKIS and Reyner GERLAGH</i> : <u>Natural Resources: A Blessing or a Curse?</u>
CLIM	9.2003	<i>A. CAPARRÓS, J.-C. PEREAU and T. TAZDAÏT</i> : <u>North-South Climate Change Negotiations: a Sequential Game with Asymmetric Information</u>
KNOW	10.2003	<i>Giorgio BRUNELLO and Daniele CHECCHI</i> : <u>School Quality and Family Background in Italy</u>
CLIM	11.2003	<i>Efrem CASTELNUOVO and Marzio GALEOTTI</i> : <u>Learning By Doing vs Learning By Researching in a Model of Climate Change Policy Analysis</u>
KNOW	12.2003	<i>Carole MAIGNAN, Gianmarco OTTAVIANO and Dino PINELLI (eds.)</i> : <u>Economic Growth, Innovation, Cultural Diversity: What are we all talking about? A critical survey of the state-of-the-art</u>
KNOW	13.2003	<i>Carole MAIGNAN, Gianmarco OTTAVIANO, Dino PINELLI and Francesco RULLANI (lix)</i> : <u>Bio-Ecological Diversity vs. Socio-Economic Diversity. A Comparison of Existing Measures</u>
KNOW	14.2003	<i>Maddy JANSSENS and Chris STEYAERT (lix)</i> : <u>Theories of Diversity within Organisation Studies: Debates and Future Trajectories</u>
KNOW	15.2003	<i>Tuzin BAYCAN LEVENT, Enno MASUREL and Peter NIJKAMP (lix)</i> : <u>Diversity in Entrepreneurship: Ethnic and Female Roles in Urban Economic Life</u>
KNOW	16.2003	<i>Alexandra BITUSIKOVA (lix)</i> : <u>Post-Communist City on its Way from Grey to Colourful: The Case Study from Slovakia</u>
KNOW	17.2003	<i>Billy E. VAUGHN and Katarina MLEKOV (lix)</i> : <u>A Stage Model of Developing an Inclusive Community</u>
KNOW	18.2003	<i>Selma van LONDEN and Arie de RUIJTER (lix)</i> : <u>Managing Diversity in a Globalizing World</u>
Coalition		
Theory	19.2003	<i>Sergio CURRARINI</i> : <u>On the Stability of Hierarchies in Games with Externalities</u>
Network		
PRIV	20.2003	<i>Giacomo CALZOLARI and Alessandro PAVAN (lx)</i> : <u>Monopoly with Resale</u>
PRIV	21.2003	<i>Claudio MEZZETTI (lx)</i> : <u>Auction Design with Interdependent Valuations: The Generalized Revelation Principle, Efficiency, Full Surplus Extraction and Information Acquisition</u>
PRIV	22.2003	<i>Marco LiCalzi and Alessandro PAVAN (lx)</i> : <u>Tilting the Supply Schedule to Enhance Competition in Uniform-Price Auctions</u>
PRIV	23.2003	<i>David ETTINGER (lx)</i> : <u>Bidding among Friends and Enemies</u>
PRIV	24.2003	<i>Hannu VARTIAINEN (lx)</i> : <u>Auction Design without Commitment</u>
PRIV	25.2003	<i>Matti KELOHARJU, Kjell G. NYBORG and Kristian RYDQVIST (lx)</i> : <u>Strategic Behavior and Underpricing in Uniform Price Auctions: Evidence from Finnish Treasury Auctions</u>
PRIV	26.2003	<i>Christine A. PARLOUR and Uday RAJAN (lx)</i> : <u>Rationing in IPOs</u>
PRIV	27.2003	<i>Kjell G. NYBORG and Ilya A. STREBULAIEV (lx)</i> : <u>Multiple Unit Auctions and Short Squeezes</u>
PRIV	28.2003	<i>Anders LUNANDER and Jan-Eric NILSSON (lx)</i> : <u>Taking the Lab to the Field: Experimental Tests of Alternative Mechanisms to Procure Multiple Contracts</u>
PRIV	29.2003	<i>TangaMcDANIEL and Karsten NEUHOFF (lx)</i> : <u>Use of Long-term Auctions for Network Investment</u>
PRIV	30.2003	<i>Emiel MAASLAND and Sander ONDERSTAL (lx)</i> : <u>Auctions with Financial Externalities</u>
ETA	31.2003	<i>Michael FINUS and Bianca RUNDSHAGEN</i> : <u>A Non-cooperative Foundation of Core-Stability in Positive Externality NTU-Coalition Games</u>
KNOW	32.2003	<i>Michele MORETTO</i> : <u>Competition and Irreversible Investments under Uncertainty</u>
PRIV	33.2003	<i>Philippe QUIRION</i> : <u>Relative Quotas: Correct Answer to Uncertainty or Case of Regulatory Capture?</u>
KNOW	34.2003	<i>Giuseppe MEDA, Claudio PIGA and Donald SIEGEL</i> : <u>On the Relationship between R&amp;D and Productivity: A Treatment Effect Analysis</u>
ETA	35.2003	<i>Alessandra DEL BOCA, Marzio GALEOTTI and Paola ROTTA</i> : <u>Non-convexities in the Adjustment of Different Capital Inputs: A Firm-level Investigation</u>

GG	36.2003	<i>Matthieu GLACHANT</i> : <u>Voluntary Agreements under Endogenous Legislative Threats</u>
PRIV	37.2003	<i>Narjess BOUBAKRI, Jean-Claude COSSET and Omrane GUEDHAMI</i> : <u>Postprivatization Corporate Governance: the Role of Ownership Structure and Investor Protection</u>
CLIM	38.2003	<i>Rolf GOLOMBEK and Michael HOEL</i> : <u>Climate Policy under Technology Spillovers</u>
KNOW	39.2003	<i>Slim BEN YOUSSEF</i> : <u>Transboundary Pollution, R&amp;D Spillovers and International Trade</u>
CTN	40.2003	<i>Carlo CARRARO and Carmen MARCHIORI</i> : <u>Endogenous Strategic Issue Linkage in International Negotiations</u>
KNOW	41.2003	<i>Sonia OREFFICE</i> : <u>Abortion and Female Power in the Household: Evidence from Labor Supply</u>
KNOW	42.2003	<i>Timo GOESCHL and Timothy SWANSON</i> : <u>On Biology and Technology: The Economics of Managing Biotechnologies</u>
ETA	43.2003	<i>Giorgio Busetti and Matteo MANERA</i> : <u>STAR-GARCH Models for Stock Market Interactions in the Pacific Basin Region, Japan and US</u>
CLIM	44.2003	<i>Katrin MILLOCK and Céline NAUGES</i> : <u>The French Tax on Air Pollution: Some Preliminary Results on its Effectiveness</u>
PRIV	45.2003	<i>Bernardo BORTOLOTTI and Paolo PINOTTI</i> : <u>The Political Economy of Privatization</u>
SIEV	46.2003	<i>Elbert DIJKGRAAF and Herman R.J. VOLLEBERGH</i> : <u>Burn or Bury? A Social Cost Comparison of Final Waste Disposal Methods</u>
ETA	47.2003	<i>Jens HORBACH</i> : <u>Employment and Innovations in the Environmental Sector: Determinants and Econometrical Results for Germany</u>
CLIM	48.2003	<i>Lori SNYDER, Nolan MILLER and Robert STAVINS</i> : <u>The Effects of Environmental Regulation on Technology Diffusion: The Case of Chlorine Manufacturing</u>
CLIM	49.2003	<i>Lori SNYDER, Robert STAVINS and Alexander F. WAGNER</i> : <u>Private Options to Use Public Goods. Exploiting Revealed Preferences to Estimate Environmental Benefits</u>
CTN	50.2003	<i>László Á. KÓCZY and Luc LAUWERS</i> (Ixi): <u>The Minimal Dominant Set is a Non-Empty Core-Extension</u>
CTN	51.2003	<i>Matthew O. JACKSON</i> (Ixi): <u>Allocation Rules for Network Games</u>
CTN	52.2003	<i>Ana MAULEON and Vincent VANNETELBOSCH</i> (Ixi): <u>Farsightedness and Cautiousness in Coalition Formation</u>
CTN	53.2003	<i>Fernando VEGA-REDONDO</i> (Ixi): <u>Building Up Social Capital in a Changing World: a network approach</u>
CTN	54.2003	<i>Matthew HAAG and Roger LAGUNOFF</i> (Ixi): <u>On the Size and Structure of Group Cooperation</u>
CTN	55.2003	<i>Taiji FURUSAWA and Hideo KONISHI</i> (Ixi): <u>Free Trade Networks</u>
CTN	56.2003	<i>Halis Murat YILDIZ</i> (Ixi): <u>National Versus International Mergers and Trade Liberalization</u>
CTN	57.2003	<i>Santiago RUBIO and Alistair ULPH</i> (Ixi): <u>An Infinite-Horizon Model of Dynamic Membership of International Environmental Agreements</u>
KNOW	58.2003	<i>Carole MAIGNAN, Dino PINELLI and Gianmarco I.P. OTTAVIANO</i> : <u>ICT, Clusters and Regional Cohesion: A Summary of Theoretical and Empirical Research</u>
KNOW	59.2003	<i>Giorgio BELLETTINI and Gianmarco I.P. OTTAVIANO</i> : <u>Special Interests and Technological Change</u>
ETA	60.2003	<i>Ronnie SCHÖB</i> : <u>The Double Dividend Hypothesis of Environmental Taxes: A Survey</u>
CLIM	61.2003	<i>Michael FINUS, Ekko van IERLAND and Robert DELLINK</i> : <u>Stability of Climate Coalitions in a Cartel Formation Game</u>
GG	62.2003	<i>Michael FINUS and Bianca RUNDSHAGEN</i> : <u>How the Rules of Coalition Formation Affect Stability of International Environmental Agreements</u>
SIEV	63.2003	<i>Alberto PETRUCCI</i> : <u>Taxing Land Rent in an Open Economy</u>
CLIM	64.2003	<i>Joseph E. ALDY, Scott BARRETT and Robert N. STAVINS</i> : <u>Thirteen Plus One: A Comparison of Global Climate Policy Architectures</u>
SIEV	65.2003	<i>Edi DEFRANCESCO</i> : <u>The Beginning of Organic Fish Farming in Italy</u>
SIEV	66.2003	<i>Klaus CONRAD</i> : <u>Price Competition and Product Differentiation when Consumers Care for the Environment</u>
SIEV	67.2003	<i>Paulo A.L.D. NUNES, Luca ROSSETTO, Arianne DE BLAEIJ</i> : <u>Monetary Value Assessment of Clam Fishing Management Practices in the Venice Lagoon: Results from a Stated Choice Exercise</u>
CLIM	68.2003	<i>ZhongXiang ZHANG</i> : <u>Open Trade with the U.S. Without Compromising Canada's Ability to Comply with its Kyoto Target</u>
KNOW	69.2003	<i>David FRANTZ</i> (Iix): <u>Lorenzo Market between Diversity and Mutation</u>
KNOW	70.2003	<i>Ercole SORI</i> (Iix): <u>Mapping Diversity in Social History</u>
KNOW	71.2003	<i>Ljiljana DERU SIMIC</i> (Ixi): <u>What is Specific about Art/Cultural Projects?</u>
KNOW	72.2003	<i>Natalya V. TARANOVA</i> (Ixi): <u>The Role of the City in Fostering Intergroup Communication in a Multicultural Environment: Saint-Petersburg's Case</u>
KNOW	73.2003	<i>Kristine CRANE</i> (Ixi): <u>The City as an Arena for the Expression of Multiple Identities in the Age of Globalisation and Migration</u>
KNOW	74.2003	<i>Kazuma MATOBA</i> (Ixi): <u>Glocal Dialogue- Transformation through Transcultural Communication</u>
KNOW	75.2003	<i>Catarina REIS OLIVEIRA</i> (Ixi): <u>Immigrants' Entrepreneurial Opportunities: The Case of the Chinese in Portugal</u>
KNOW	76.2003	<i>Sandra WALLMAN</i> (Ixi): <u>The Diversity of Diversity - towards a typology of urban systems</u>
KNOW	77.2003	<i>Richard PEARCE</i> (Ixi): <u>A Biologist's View of Individual Cultural Identity for the Study of Cities</u>
KNOW	78.2003	<i>Vincent MERK</i> (Ixi): <u>Communication Across Cultures: from Cultural Awareness to Reconciliation of the Dilemmas</u>
KNOW	79.2003	<i>Giorgio BELLETTINI, Carlotta BERTI CERONI and Gianmarco I.P. OTTAVIANO</i> : <u>Child Labor and Resistance to Change</u>
ETA	80.2003	<i>Michele MORETTO, Paolo M. PANTEGHINI and Carlo SCARPA</i> : <u>Investment Size and Firm's Value under Profit Sharing Regulation</u>



IEM	81.2003	<i>Alessandro LANZA, Matteo MANERA and Massimo GIOVANNINI: <u>Oil and Product Dynamics in International Petroleum Markets</u></i>
CLIM	82.2003	<i>Y. Hossein FARZIN and Jinhua ZHAO: <u>Pollution Abatement Investment When Firms Lobby Against Environmental Regulation</u></i>
CLIM	83.2003	<i>Giuseppe DI VITA: <u>Is the Discount Rate Relevant in Explaining the Environmental Kuznets Curve?</u></i>
CLIM	84.2003	<i>Reyer GERLAGH and Wietze LISE: <u>Induced Technological Change Under Carbon Taxes</u></i>
NRM	85.2003	<i>Rinaldo BRAU, Alessandro LANZA and Francesco PIGLIARU: <u>How Fast are the Tourism Countries Growing? The cross-country evidence</u></i>
KNOW	86.2003	<i>Elena BELLINI, Gianmarco I.P. OTTAVIANO and Dino PINELLI: <u>The ICT Revolution: opportunities and risks for the Mezzogiorno</u></i>
SIEV	87.2003	<i>Lucas BRETSCGHER and Sjak SMULDERS: <u>Sustainability and Substitution of Exhaustible Natural Resources. How resource prices affect long-term R&amp;D investments</u></i>
CLIM	88.2003	<i>Johan EYCKMANS and Michael FINUS: <u>New Roads to International Environmental Agreements: The Case of Global Warming</u></i>
CLIM	89.2003	<i>Marzio GALEOTTI: <u>Economic Development and Environmental Protection</u></i>
CLIM	90.2003	<i>Marzio GALEOTTI: <u>Environment and Economic Growth: Is Technical Change the Key to Decoupling?</u></i>
CLIM	91.2003	<i>Marzio GALEOTTI and Barbara BUCHNER: <u>Climate Policy and Economic Growth in Developing Countries</u></i>
IEM	92.2003	<i>A. MARKANDYA, A. GOLUB and E. STRUKOVA: <u>The Influence of Climate Change Considerations on Energy Policy: The Case of Russia</u></i>
ETA	93.2003	<i>Andrea BELTRATTI: <u>Socially Responsible Investment in General Equilibrium</u></i>
CTN	94.2003	<i>Parkash CHANDER: <u>The <math>\gamma</math>-Core and Coalition Formation</u></i>
IEM	95.2003	<i>Matteo MANERA and Angelo MARZULLO: <u>Modelling the Load Curve of Aggregate Electricity Consumption Using Principal Components</u></i>
IEM	96.2003	<i>Alessandro LANZA, Matteo MANERA, Margherita GRASSO and Massimo GIOVANNINI: <u>Long-run Models of Oil Stock Prices</u></i>
CTN	97.2003	<i>Steven J. BRAMS, Michael A. JONES, and D. Marc KILGOUR: <u>Forming Stable Coalitions: The Process Matters</u></i>
KNOW	98.2003	<i>John CROWLEY, Marie-Cecile NAVES (Ixxiii): <u>Anti-Racist Policies in France. From Ideological and Historical Schemes to Socio-Political Realities</u></i>
KNOW	99.2003	<i>Richard THOMPSON FORD (Ixxiii): <u>Cultural Rights and Civic Virtue</u></i>
KNOW	100.2003	<i>Alaknanda PATEL (Ixxiii): <u>Cultural Diversity and Conflict in Multicultural Cities</u></i>
KNOW	101.2003	<i>David MAY (Ixxiii): <u>The Struggle of Becoming Established in a Deprived Inner-City Neighbourhood</u></i>
KNOW	102.2003	<i>Sébastien ARCAND, Danielle JUTEAU, Sirma BILGE, and Francine LEMIRE (Ixxiii) : <u>Municipal Reform on the Island of Montreal: Tensions Between Two Majority Groups in a Multicultural City</u></i>
CLIM	103.2003	<i>Barbara BUCHNER and Carlo CARRARO: <u>China and the Evolution of the Present Climate Regime</u></i>
CLIM	104.2003	<i>Barbara BUCHNER and Carlo CARRARO: <u>Emissions Trading Regimes and Incentives to Participate in International Climate Agreements</u></i>
CLIM	105.2003	<i>Anil MARKANDYA and Dirk T.G. RÜBBELKE: <u>Ancillary Benefits of Climate Policy</u></i>
NRM	106.2003	<i>Anne Sophie CRÉPIN (Ixiv): <u>Management Challenges for Multiple-Species Boreal Forests</u></i>
NRM	107.2003	<i>Anne Sophie CRÉPIN (Ixiv): <u>Threshold Effects in Coral Reef Fisheries</u></i>
SIEV	108.2003	<i>Sara ANIYAR (Ixiv): <u>Estimating the Value of Oil Capital in a Small Open Economy: The Venezuela's Example</u></i>
SIEV	109.2003	<i>Kenneth ARROW, Partha DASGUPTA and Karl-Göran MÄLER(Ixiv): <u>Evaluating Projects and Assessing Sustainable Development in Imperfect Economies</u></i>
NRM	110.2003	<i>Anastasios XEPAPADEAS and Catarina ROSETA-PALMA(Ixiv): <u>Instabilities and Robust Control in Fisheries</u></i>
NRM	111.2003	<i>Charles PERRINGS and Brian WALKER (Ixiv): <u>Conservation and Optimal Use of Rangelands</u></i>
ETA	112.2003	<i>Jack GOODY (Ixiv): <u>Globalisation, Population and Ecology</u></i>
CTN	113.2003	<i>Carlo CARRARO, Carmen MARCHIORI and Sonia OREFFICE: <u>Endogenous Minimum Participation in International Environmental Treaties</u></i>
CTN	114.2003	<i>Guillaume HAERINGER and Myrna WOODERS: <u>Decentralized Job Matching</u></i>
CTN	115.2003	<i>Hideo KONISHI and M. Utku UNVER: <u>Credible Group Stability in Multi-Partner Matching Problems</u></i>
CTN	116.2003	<i>Somdeb LAHIRI: <u>Stable Matchings for the Room-Mates Problem</u></i>
CTN	117.2003	<i>Somdeb LAHIRI: <u>Stable Matchings for a Generalized Marriage Problem</u></i>
CTN	118.2003	<i>Marita LAUKKANEN: <u>Transboundary Fisheries Management under Implementation Uncertainty</u></i>
CTN	119.2003	<i>Edward CARTWRIGHT and Myrna WOODERS: <u>Social Conformity and Bounded Rationality in Arbitrary Games with Incomplete Information: Some First Results</u></i>
CTN	120.2003	<i>Gianluigi VERNASCA: <u>Dynamic Price Competition with Price Adjustment Costs and Product Differentiation</u></i>
CTN	121.2003	<i>Myrna WOODERS, Edward CARTWRIGHT and Reinhard SELTEN: <u>Social Conformity in Games with Many Players</u></i>
CTN	122.2003	<i>Edward CARTWRIGHT and Myrna WOODERS: <u>On Equilibrium in Pure Strategies in Games with Many Players</u></i>
CTN	123.2003	<i>Edward CARTWRIGHT and Myrna WOODERS: <u>Conformity and Bounded Rationality in Games with Many Players</u></i>
	<b>1000</b>	<b>Carlo CARRARO, Alessandro LANZA and Valeria PAPPONETTI: <u>One Thousand Working Papers</u></b>

**NOTE DI LAVORO PUBLISHED IN 2004**

IEM	1.2004	<i>Anil MARKANDYA, Suzette PEDROSO and Alexander GOLUB: <u>Empirical Analysis of National Income and So2 Emissions in Selected European Countries</u></i>
ETA	2.2004	<i>Masahisa FUJITA and Shlomo WEBER: <u>Strategic Immigration Policies and Welfare in Heterogeneous Countries</u></i>
PRA	3.2004	<i>Adolfo DI CARLUCCIO, Giovanni FERRI, Cecilia FRALE and Ottavio RICCHI: <u>Do Privatizations Boost Household Shareholding? Evidence from Italy</u></i>
ETA	4.2004	<i>Victor GINSBURGH and Shlomo WEBER: <u>Languages Disenfranchisement in the European Union</u></i>
ETA	5.2004	<i>Romano PIRAS: <u>Growth, Congestion of Public Goods, and Second-Best Optimal Policy</u></i>
CCMP	6.2004	<i>Herman R.J. VOLLEBERGH: <u>Lessons from the Polder: Is Dutch CO2-Taxation Optimal</u></i>
PRA	7.2004	<i>Sandro BRUSCO, Giuseppe LOPOMO and S. VISWANATHAN (lxv): <u>Merger Mechanisms</u></i>
PRA	8.2004	<i>Wolfgang AUSSENEGG, Pegaret PICHLER and Alex STOMPER (lxv): <u>IPO Pricing with Bookbuilding, and a When-Issued Market</u></i>
PRA	9.2004	<i>Pegaret PICHLER and Alex STOMPER (lxv): <u>Primary Market Design: Direct Mechanisms and Markets</u></i>
PRA	10.2004	<i>Florian ENGLMAIER, Pablo GUILLEN, Loreto LLORENTE, Sander ONDERSTAL and Rupert SAUSGRUBER (lxv): <u>The Chopstick Auction: A Study of the Exposure Problem in Multi-Unit Auctions</u></i>
PRA	11.2004	<i>Bjarne BRENDSTRUP and Harry J. PAARSCH (lxv): <u>Nonparametric Identification and Estimation of Multi-Unit, Sequential, Oral, Ascending-Price Auctions With Asymmetric Bidders</u></i>
PRA	12.2004	<i>Ohad KADAN (lxv): <u>Equilibrium in the Two Player, k-Double Auction with Affiliated Private Values</u></i>
PRA	13.2004	<i>Maarten C.W. JANSSEN (lxv): <u>Auctions as Coordination Devices</u></i>
PRA	14.2004	<i>Gadi FIBICH, Arieh GAVIOUS and Aner SELA (lxv): <u>All-Pay Auctions with Weakly Risk-Averse Buyers</u></i>
PRA	15.2004	<i>Orly SADE, Charles SCHNITZLEIN and Jaime F. ZENDER (lxv): <u>Competition and Cooperation in Divisible Good Auctions: An Experimental Examination</u></i>
PRA	16.2004	<i>Marta STRYSZOWSKA (lxv): <u>Late and Multiple Bidding in Competing Second Price Internet Auctions</u></i>
CCMP	17.2004	<i>Slim Ben YOUSSEF: <u>R&amp;D in Cleaner Technology and International Trade</u></i>
NRM	18.2004	<i>Angelo ANTOCI, Simone BORGHESI and Paolo RUSSU (lxvi): <u>Biodiversity and Economic Growth: Stabilization Versus Preservation of the Ecological Dynamics</u></i>
SIEV	19.2004	<i>Anna ALBERINI, Paolo ROSATO, Alberto LONGO and Valentina ZANATTA: <u>Information and Willingness to Pay in a Contingent Valuation Study: The Value of S. Erasmo in the Lagoon of Venice</u></i>
NRM	20.2004	<i>Guido CANDELA and Roberto CELLINI (lxvii): <u>Investment in Tourism Market: A Dynamic Model of Differentiated Oligopoly</u></i>
NRM	21.2004	<i>Jacqueline M. HAMILTON (lxvii): <u>Climate and the Destination Choice of German Tourists</u></i>
NRM	22.2004	<i>Javier Rey-MAQUIEIRA PALMER, Javier LOZANO IBÁÑEZ and Carlos Mario GÓMEZ GÓMEZ (lxvii): <u>Land, Environmental Externalities and Tourism Development</u></i>
NRM	23.2004	<i>Pius ODUNGA and Henk FOLMER (lxvii): <u>Profiling Tourists for Balanced Utilization of Tourism-Based Resources in Kenya</u></i>
NRM	24.2004	<i>Jean-Jacques NOWAK, Mondher SAHLI and Pasquale M. SGRO (lxvii): <u>Tourism, Trade and Domestic Welfare</u></i>
NRM	25.2004	<i>Riaz SHAREEF (lxvii): <u>Country Risk Ratings of Small Island Tourism Economies</u></i>
NRM	26.2004	<i>Juan Luis EUGENIO-MARTÍN, Noelia MARTÍN MORALES and Riccardo SCARPA (lxvii): <u>Tourism and Economic Growth in Latin American Countries: A Panel Data Approach</u></i>
NRM	27.2004	<i>Raúl Hernández MARTÍN (lxvii): <u>Impact of Tourism Consumption on GDP. The Role of Imports</u></i>
CSRM	28.2004	<i>Nicoletta FERRO: <u>Cross-Country Ethical Dilemmas in Business: A Descriptive Framework</u></i>
NRM	29.2004	<i>Marian WEBER (lxvi): <u>Assessing the Effectiveness of Tradable Landuse Rights for Biodiversity Conservation: an Application to Canada's Boreal Mixedwood Forest</u></i>
NRM	30.2004	<i>Trond BJORN DAL, Phoebe KOUNDOURI and Sean PASCOE (lxvi): <u>Output Substitution in Multi-Species Trawl Fisheries: Implications for Quota Setting</u></i>
CCMP	31.2004	<i>Marzio GALEOTTI, Alessandra GORIA, Paolo MOMBRINI and Evi SPANTIDAKI: <u>Weather Impacts on Natural, Social and Economic Systems (WISE) Part I: Sectoral Analysis of Climate Impacts in Italy</u></i>
CCMP	32.2004	<i>Marzio GALEOTTI, Alessandra GORIA, Paolo MOMBRINI and Evi SPANTIDAKI: <u>Weather Impacts on Natural, Social and Economic Systems (WISE) Part II: Individual Perception of Climate Extremes in Italy</u></i>
CTN	33.2004	<i>Wilson PEREZ: <u>Divide and Conquer: Noisy Communication in Networks, Power, and Wealth Distribution</u></i>
KTHC	34.2004	<i>Gianmarco I.P. OTTAVIANO and Giovanni PERI (lxviii): <u>The Economic Value of Cultural Diversity: Evidence from US Cities</u></i>
KTHC	35.2004	<i>Linda CHAIB (lxviii): <u>Immigration and Local Urban Participatory Democracy: A Boston-Paris Comparison</u></i>
KTHC	36.2004	<i>Franca ECKERT COEN and Claudio ROSSI (lxviii): <u>Foreigners, Immigrants, Host Cities: The Policies of Multi-Ethnicity in Rome. Reading Governance in a Local Context</u></i>
KTHC	37.2004	<i>Kristine CRANE (lxviii): <u>Governing Migration: Immigrant Groups' Strategies in Three Italian Cities – Rome, Naples and Bari</u></i>
KTHC	38.2004	<i>Kiflemariam HAMDE (lxviii): <u>Mind in Africa, Body in Europe: The Struggle for Maintaining and Transforming Cultural Identity - A Note from the Experience of Eritrean Immigrants in Stockholm</u></i>
ETA	39.2004	<i>Alberto CAVALIERE: <u>Price Competition with Information Disparities in a Vertically Differentiated Duopoly</u></i>
PRA	40.2004	<i>Andrea BIGANO and Stef PROOST: <u>The Opening of the European Electricity Market and Environmental Policy: Does the Degree of Competition Matter?</u></i>
CCMP	41.2004	<i>Micheal FINUS (lxix): <u>International Cooperation to Resolve International Pollution Problems</u></i>

KTHC	42.2004	<i>Francesco CRESPI</i> : <u>Notes on the Determinants of Innovation: A Multi-Perspective Analysis</u>
CTN	43.2004	<i>Sergio CURRARINI and Marco MARINI</i> : <u>Coalition Formation in Games without Synergies</u>
CTN	44.2004	<i>Marc ESCRHUELA-VILLAR</i> : <u>Cartel Sustainability and Cartel Stability</u>
NRM	45.2004	<i>Sebastian BERVOETS and Nicolas GRAVEL</i> (Ixvi): <u>Appraising Diversity with an Ordinal Notion of Similarity: An Axiomatic Approach</u>
NRM	46.2004	<i>Signe ANTHON and Bo JELLESMARK THORSEN</i> (Ixvi): <u>Optimal Afforestation Contracts with Asymmetric Information on Private Environmental Benefits</u>
NRM	47.2004	<i>John MBURU</i> (Ixvi): <u>Wildlife Conservation and Management in Kenya: Towards a Co-management Approach</u>
NRM	48.2004	<i>Ekin BIROL, Ágnes GYOVAI and Melinda SMALE</i> (Ixvi): <u>Using a Choice Experiment to Value Agricultural Biodiversity on Hungarian Small Farms: Agri-Environmental Policies in a Transitional Economy</u>
CCMP	49.2004	<i>Gernot KLEPPER and Sonja PETERSON</i> : <u>The EU Emissions Trading Scheme. Allowance Prices, Trade Flows, Competitiveness Effects</u>
GG	50.2004	<i>Scott BARRETT and Michael HOEL</i> : <u>Optimal Disease Eradication</u>
CTN	51.2004	<i>Dinko DIMITROV, Peter BORM, Ruud HENDRICKX and Shao CHIN SUNG</i> : <u>Simple Priorities and Core Stability in Hedonic Games</u>
SIEV	52.2004	<i>Francesco RICCI</i> : <u>Channels of Transmission of Environmental Policy to Economic Growth: A Survey of the Theory</u>
SIEV	53.2004	<i>Anna ALBERINI, Maureen CROPPER, Alan KRUPNICK and Nathalie B. SIMON</i> : <u>Willingness to Pay for Mortality Risk Reductions: Does Latency Matter?</u>
NRM	54.2004	<i>Ingo BRÄUER and Rainer MARGGRAF</i> (Ixvi): <u>Valuation of Ecosystem Services Provided by Biodiversity Conservation: An Integrated Hydrological and Economic Model to Value the Enhanced Nitrogen Retention in Renaturated Streams</u>
NRM	55.2004	<i>Timo GOESCHL and Tun LIN</i> (Ixvi): <u>Biodiversity Conservation on Private Lands: Information Problems and Regulatory Choices</u>
NRM	56.2004	<i>Tom DEDEURWAERDERE</i> (Ixvi): <u>Bioprospection: From the Economics of Contracts to Reflexive Governance</u>
CCMP	57.2004	<i>Katrin REHDANZ and David MADDISON</i> : <u>The Amenity Value of Climate to German Households</u>
CCMP	58.2004	<i>Koen SMEKENS and Bob VAN DER ZWAAN</i> : <u>Environmental Externalities of Geological Carbon Sequestration Effects on Energy Scenarios</u>
NRM	59.2004	<i>Valentina BOSETTI, Mariaeater CASSINELLI and Alessandro LANZA</i> (Ixvii): <u>Using Data Envelopment Analysis to Evaluate Environmentally Conscious Tourism Management</u>
NRM	60.2004	<i>Timo GOESCHL and Danilo CAMARGO IGLIORI</i> (Ixvi): <u>Property Rights Conservation and Development: An Analysis of Extractive Reserves in the Brazilian Amazon</u>
CCMP	61.2004	<i>Barbara BUCHNER and Carlo CARRARO</i> : <u>Economic and Environmental Effectiveness of a Technology-based Climate Protocol</u>
NRM	62.2004	<i>Elissaios POPYRAKIS and Reyer GERLAGH</i> : <u>Resource-Abundance and Economic Growth in the U.S.</u>
NRM	63.2004	<i>Györgyi BELA, György PATAKI, Melinda SMALE and Mariann HAJDÚ</i> (Ixvi): <u>Conserving Crop Genetic Resources on Smallholder Farms in Hungary: Institutional Analysis</u>
NRM	64.2004	<i>E.C.M. RUIJGROK and E.E.M. NILLESEN</i> (Ixvi): <u>The Socio-Economic Value of Natural Riverbanks in the Netherlands</u>
NRM	65.2004	<i>E.C.M. RUIJGROK</i> (Ixvi): <u>Reducing Acidification: The Benefits of Increased Nature Quality. Investigating the Possibilities of the Contingent Valuation Method</u>
ETA	66.2004	<i>Giannis VARDAS and Anastasios XEPAPADEAS</i> : <u>Uncertainty Aversion, Robust Control and Asset Holdings</u>
GG	67.2004	<i>Anastasios XEPAPADEAS and Constadina PASSA</i> : <u>Participation in and Compliance with Public Voluntary Environmental Programs: An Evolutionary Approach</u>
GG	68.2004	<i>Michael FINUS</i> : <u>Modesty Pays: Sometimes!</u>
NRM	69.2004	<i>Trond BJØRNDAL and Ana BRASÃO</i> : <u>The Northern Atlantic Bluefin Tuna Fisheries: Management and Policy Implications</u>
CTN	70.2004	<i>Alejandro CAPARRÓS, Abdelhakim HAMMOUDI and Tarik TAZDAÏT</i> : <u>On Coalition Formation with Heterogeneous Agents</u>
IEM	71.2004	<i>Massimo GIOVANNINI, Margherita GRASSO, Alessandro LANZA and Matteo MANERA</i> : <u>Conditional Correlations in the Returns on Oil Companies Stock Prices and Their Determinants</u>
IEM	72.2004	<i>Alessandro LANZA, Matteo MANERA and Michael MCALEER</i> : <u>Modelling Dynamic Conditional Correlations in WTI Oil Forward and Futures Returns</u>
SIEV	73.2004	<i>Margarita GENIUS and Elisabetta STRAZZERA</i> : <u>The Copula Approach to Sample Selection Modelling: An Application to the Recreational Value of Forests</u>
CCMP	74.2004	<i>Rob DELLINK and Ekko van IERLAND</i> : <u>Pollution Abatement in the Netherlands: A Dynamic Applied General Equilibrium Assessment</u>
ETA	75.2004	<i>Rosella LEVAGGI and Michele MORETTO</i> : <u>Investment in Hospital Care Technology under Different Purchasing Rules: A Real Option Approach</u>
CTN	76.2004	<i>Salvador BARBERÀ and Matthew O. JACKSON</i> (Ixx): <u>On the Weights of Nations: Assigning Voting Weights in a Heterogeneous Union</u>
CTN	77.2004	<i>Àlex ARENAS, Antonio CABRALES, Albert DÍAZ-GUILERA, Roger GUIMERA and Fernando VEGA-REDONDO</i> (Ixx): <u>Optimal Information Transmission in Organizations: Search and Congestion</u>
CTN	78.2004	<i>Francis BLOCH and Armando GOMES</i> (Ixx): <u>Contracting with Externalities and Outside Options</u>

CTN 79.2004 *Rabah AMIR, Effrosyni DIAMANTOUDI and Licun XUE* (lxx): Merger Performance under Uncertain Efficiency Gains

CTN 80.2004 *Francis BLOCH and Matthew O. JACKSON* (lxx): The Formation of Networks with Transfers among Players

CTN 81.2004 *Daniel DIERMEIER, Hülya ERASLAN and Antonio MERLO* (lxx): Bicameralism and Government Formation

- (lix) This paper was presented at the ENGIME Workshop on “Mapping Diversity”, Leuven, May 16-17, 2002
- (lx) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications”, organised by the Fondazione Eni Enrico Mattei, Milan, September 26-28, 2002
- (lxi) This paper was presented at the Eighth Meeting of the Coalition Theory Network organised by the GREQAM, Aix-en-Provence, France, January 24-25, 2003
- (lxii) This paper was presented at the ENGIME Workshop on “Communication across Cultures in Multicultural Cities”, The Hague, November 7-8, 2002
- (lxiii) This paper was presented at the ENGIME Workshop on “Social dynamics and conflicts in multicultural cities”, Milan, March 20-21, 2003
- (lxiv) This paper was presented at the International Conference on “Theoretical Topics in Ecological Economics”, organised by the Abdus Salam International Centre for Theoretical Physics - ICTP, the Beijer International Institute of Ecological Economics, and Fondazione Eni Enrico Mattei – FEEM Trieste, February 10-21, 2003
- (lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003
- (lxvi) This paper has been presented at the 4th BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL), Venice, August 28-29, 2003
- (lxvii) This paper has been presented at the international conference on “Tourism and Sustainable Economic Development – Macro and Micro Economic Issues” jointly organised by CRENoS (Università di Cagliari e Sassari, Italy) and Fondazione Eni Enrico Mattei, and supported by the World Bank, Sardinia, September 19-20, 2003
- (lxviii) This paper was presented at the ENGIME Workshop on “Governance and Policies in Multicultural Cities”, Rome, June 5-6, 2003
- (lxix) This paper was presented at the Fourth EEP Plenary Workshop and EEP Conference “The Future of Climate Policy”, Cagliari, Italy, 27-28 March 2003
- (lxx) This paper was presented at the 9<sup>th</sup> Coalition Theory Workshop on "Collective Decisions and Institutional Design" organised by the Universitat Autònoma de Barcelona and held in Barcelona, Spain, January 30-31, 2004

**2003 SERIES**

<b>CLIM</b>	<i>Climate Change Modelling and Policy</i> (Editor: Marzio Galeotti )
<b>GG</b>	<i>Global Governance</i> (Editor: Carlo Carraro)
<b>SIEV</b>	<i>Sustainability Indicators and Environmental Valuation</i> (Editor: Anna Alberini)
<b>NRM</b>	<i>Natural Resources Management</i> (Editor: Carlo Giupponi)
<b>KNOW</b>	<i>Knowledge, Technology, Human Capital</i> (Editor: Gianmarco Ottaviano)
<b>IEM</b>	<i>International Energy Markets</i> (Editor: Anil Markandya)
<b>CSR</b>	<i>Corporate Social Responsibility and Management</i> (Editor: Sabina Ratti)
<b>PRIV</b>	<i>Privatisation, Regulation, Antitrust</i> (Editor: Bernardo Bortolotti)
<b>ETA</b>	<i>Economic Theory and Applications</i> (Editor: Carlo Carraro)
<b>CTN</b>	<i>Coalition Theory Network</i>

**2004 SERIES**

<b>CCMP</b>	<i>Climate Change Modelling and Policy</i> (Editor: Marzio Galeotti )
<b>GG</b>	<i>Global Governance</i> (Editor: Carlo Carraro)
<b>SIEV</b>	<i>Sustainability Indicators and Environmental Valuation</i> (Editor: Anna Alberini)
<b>NRM</b>	<i>Natural Resources Management</i> (Editor: Carlo Giupponi)
<b>KTHC</b>	<i>Knowledge, Technology, Human Capital</i> (Editor: Gianmarco Ottaviano)
<b>IEM</b>	<i>International Energy Markets</i> (Editor: Anil Markandya)
<b>CSR</b>	<i>Corporate Social Responsibility and Management</i> (Editor: Sabina Ratti)
<b>PRA</b>	<i>Privatisation, Regulation, Antitrust</i> (Editor: Bernardo Bortolotti)
<b>ETA</b>	<i>Economic Theory and Applications</i> (Editor: Carlo Carraro)
<b>CTN</b>	<i>Coalition Theory Network</i>