Bargaining over Governments in a Stochastic Environment
Author(s): Antonio Merlo
Reviewed work(s):
Source: *Journal of Political Economy*, Vol. 105, No. 1 (Feb., 1997), pp. 101-131
Published by: The University of Chicago Press
Stable URL: http://www.jstor.org/stable/2138873

Bargaining over Governments in a Stochastic Environment

Antonio Merlo

University of Minnesota and Federal Reserve Bank of Minneapolis

In this paper, I structurally estimate a stochastic bargaining model of government formation in a multiparty parliamentary democracy, and I conduct policy experiments to evaluate the effects of changes in the bargaining procedure. I show that the model fits well data on the duration of negotiations and government durations in postwar Italy. Also, I show that changes in the proposer selection process would not affect either the duration of negotiations or government durations, whereas the imposition of a strict deadline would in general reduce the incentives to delay agreement as well as government durations.

I. Introduction

Government formation in multiparty parliamentary democracies has long represented a natural application of bargaining theories. Since

This paper is based in part on a chapter of my Ph.D. dissertation. I am especially indebted to Chris Flinn and Chuck Wilson for their advice and encouragement. I would also like to thank Robert E. Lucas, Jr. and an anonymous referee whose helpful comments and suggestions substantially improved the exposition of the paper. David Baron, V. V. Chari, Daniel Diermeier, Zvi Eckstein, John Freeman, Mike Keane, John Kennan, Yuichi Kitamura, Pedro Mira, Ariel Pakes, Gianni Parmigiani, John Rust, Arthur Schram, Wilbert Van Der Klaauw, Ken Wolpin, and the participants of seminars and conferences at many institutions provided useful comments. The financial support of the Alfred P. Sloan Foundation and the National Science Foundation (grant SBR-9410910) and the technical support of the C. V. Starr Center for Applied Economics are gratefully acknowledged. The views expressed herein are those of the author and not necessarily those of the Federal Reserve Bank of Minneapolis or the Federal Reserve System. I am solely responsible for all remaining errors and inconsistencies.

[*Journal of Political Economy,* 1997, vol. 105, no. 1]

the appearance of Gamson's (1961) and Riker's (1962) original work, many bargaining models have been proposed to deal with this issue (see, e.g., Baron and Ferejohn 1989; Austen-Smith and Banks 1990; Laver and Shepsle 1990; Baron 1991, 1993). Existing models, however, are ill equipped to explain the occurrence of delay in bargaining, for they uniformly yield equilibria with immediate agreement.

Delays are frequently observed in negotiations over the formation of a new government. In a study of 15 parliamentary democracies over the period 1945–87, Strom (1990) reports that agreement is reached on the first proposal in only about 57 percent of the cases. Furthermore, he finds that the mean duration of the government formation process, measured by the number of weeks of negotiations before a government formed, is about 4 weeks (with a standard deviation of about 5 weeks and a maximum duration of 39 weeks). Hence, bargaining over governments takes time, and failures to reach an agreement in the early stages of the process represent an important phenomenon that is not adequately studied in the literature.

In this paper, I focus on the timing and the terms of government agreements in the context of a *multilateral stochastic model of sequential bargaining with complete information* (Merlo and Wilson 1995), where delays may occur in the unique equilibrium. Although delays in the formation of a new government are in general costly and inefficient from the point of view of society, for they disrupt the normal course of the democratic process, my analysis shows that they may be optimal from the point of view of the political parties involved in the negotiating process. When parties bargain over governments, the terms of agreement depend on aspects of the environment that may change stochastically during the negotiating period. As a consequence, the surplus to be divided may evolve over time according to a stochastic process, and if the discounted value of the surplus does not always decrease with time, the parties may find it in their interests to delay until better agreements can be implemented.[1]

Despite the extraordinary development of the theoretical literature on bargaining in the last decade (see, e.g., the survey by Osborne and Rubinstein [1990]), little has been done to date to apply these models to data. Notable exceptions are represented by the work of Kennan and Wilson (1989), Cramton and Tracy (1992), and Eckstein and Wolpin (1995). Eckstein and Wolpin structurally estimate a Nash bargaining model to explain the observed relationship

[1] For a discussion of alternative theories of delay in bargaining, see Merlo and Wilson (1994) and the references therein.

between duration to first job and accepted wages. Cramton and Tracy and Kennan and Wilson use strategic bargaining models with one-sided incomplete information to interpret strike duration data, but they do not estimate the parameters of these models.

In this paper, I structurally estimate a noncooperative bargaining model of government formation in postwar Italy. Besides showing that the model yields a good fit to Italian data on the duration of negotiations as well as government durations, I estimate the gains from proposing and conduct policy experiments to evaluate the effects of changes in the bargaining procedure. I show that the gains from proposing tend to be significant. Also, I show that changes in the proposer selection process would not affect either the duration of negotiations or government durations, whereas the imposition of a strict deadline would in general reduce both the incentives to delay agreement and government durations. This result suggests the existence of a trade-off between short-lasting negotiations and long-lasting governments that limits the desirability of policies that impose rigid deadlines on government formation.

The remainder of the paper is organized as follows. In Section II, I present the issue under investigation. Section III contains a description of the bargaining model and a characterization of its equilibrium. Section IV contains the results of the empirical analysis. Policy experiments are presented in Section V. Concluding remarks are included in Section VI.

II. Bargaining over Governments in Postwar Italy

In this section, I briefly describe the process of government formation in a modern multiparty parliamentary democracy. Most of the general features of this process are common across many western European countries, although the details vary across different political regimes. Rather than abstract from institutional detail, I explicitly refer here to the Italian case, which represents the focus of my empirical investigation.

After a referendum in 1946, which abolished the monarchy, Italy adopted a republican parliamentary form of constitution that went into effect in 1948, following a period of provisional government. The Italian political system is a parliamentary regime with a president, a bicameral legislature, and a government (i.e., a cabinet executive) headed by a prime minister. The president of the republic is selected for a 7-year term by an electoral college consisting of both houses of Parliament (Senate and Chamber of Deputies). The president is responsible for nominating the prime minister and may dissolve the Parliament and call new elections at any time prior to the last six months of a full parliamentary term, the constitutional duration of which is 5 years. Both houses of Parliament, which have equal legislative power, are chosen by direct universal suffrage under proportional representation and are subject to dissolution at the holding of new elections.[2]

Many parties contest elections and win parliamentary seats. Since no single party has ever held an absolute majority of seats in both houses of Parliament, all postwar Italian governments have been coalition governments. Coalitions typically form before an election, which determines the ruling coalition, and a change in the ruling coalition requires new elections.

To form a new government, the president selects a prime minister from one of the parties in the ruling coalition. Within a week of being appointed, the prime minister designate has to make a government proposal (i.e., an allocation of cabinet posts among the parties in the coalition) that can be either accepted or rejected by the coalition partners. If the proposal is accepted, a new government is inaugurated. If the proposal is rejected, the president appoints a new prime minister again from one of the parties in the ruling coalition (possibly even from the same party) to make a new government proposal. After multiple failed attempts to form a government, the president may call new elections.

Within 10 days of its inauguration, a government has to be separately approved by both houses of Parliament. If a government fails on either vote, it must resign. A government must also resign at any time if the Parliament withdraws its support to the government by a vote of "no confidence." When a prime minister resigns, the president can ask him or her to make an attempt to form a new government, designate a new prime minister, or dissolve the Parliament and call new elections.[3]

Before I turn my attention to the specification of the model, a few remarks are in order. Note that the ruling coalition is always well defined when negotiations over the formation of a new government take place. Also, although approval by the Parliament of a newly formed government involves majority voting, a government agreement entails unanimous approval by the members of the ruling co-

[2] In 1994, a reform substantially modified Italy's electoral law, leading to a reorganization of the Italian political system. In particular, the new electoral rules prescribe that significant fractions of the representatives in both houses of Parliament be chosen under a majoritarian system instead of proportional representation. This study focuses on the period preceding the reform, known as Italy's First Republic (April 1948 to March 1994).

[3] A more extensive description of the Italian political system can be found, e.g., in Pasquino (1985). For a comparison with other political systems, see, e.g., Laver and Schofield (1990).

alition, and even a failure to obtain approval by the Parliament does not annul a government's existence in office.

The Italian constitution is quite vague about the details of the government formation process, which is mostly regulated by informal rules described in unofficial documents (Mershon 1991). In particular, there is no clear rule for determining which party is assigned the right to make a proposal in the first or subsequent rounds of negotiations, although the larger parties in the ruling coalition are more likely to be selected.[4] Also, although there is no explicit deadline by which the members of the ruling coalition have to reach an agreement, they cannot disagree forever. The need for a government implicitly establishes the existence of a deadline by which either the coalition partners agree to form a government or new elections are called to determine a realignment of the coalition members.

III. The Model

Existing models of government formation, building on the work of Rubinstein (1982), typically identify the object of bargaining with a fixed "cake" with a set number of pieces (i.e., the cabinet posts), the discounted value of which shrinks at a constant rate. Negotiations over government formation, however, entail bargaining among the member parties of the ruling coalition over the allocation of patronage, so that a more durable government implies a larger cake. Conditional on their information about the state of the world in any given period while bargaining over a new government, the coalition partners form an expectation about the (uncertain) duration of a government formed in that state. This expectation determines the ex ante value of a government agreement and hence the size of the cake (in expected utility terms) for that period.[5] As the state of the world changes during the negotiating period or new information becomes available resolving key elements of uncertainty, the size of the cake would change accordingly.

Empirical studies (see, e.g., King et al. [1990] and Warwick [1992] for multicountry studies and Merlo [1991] for an analysis of the Italian case) have identified four important variables to explain government duration in multiparty parliamentary democracies. These

[4] A member of the largest party in the ruling coalition was selected as a prime minister about 80 percent of the time over the period 1948–94.

[5] If one assumes, e.g., that parties are risk neutral and a given level of surplus is available every period a government is in power, then the cake the coalition partners bargain over is given by the (possibly discounted) expected sum of surplus levels from the time a government forms until the (uncertain) time it dissolves.

variables are the size of the ruling coalition (i.e., the fraction of parliamentary seats it controls), the time horizon to the next election, the state of the economy at the time a government forms, and political and economic events occurring while a government is in power. In particular, on specifying parametric functional forms for the stochastic processes generating the shocks, these studies find that governments tend to survive longer the larger the size of the coalition, the longer the time horizon to the next election, and the lower the inflation and unemployment rates at the time governments form and during their tenure in office. Together with the political climate in which negotiations take place (defined, e.g., by the popularity of the ruling coalition), the size of the coalition, the time horizon to the next election, the current state of the economy, and expectations about the likelihood of future shocks can all be thought of as defining the parties' relevant information while bargaining over governments. The size of the ruling coalition is fixed and does not change during the negotiating period. The time horizon to the next election decreases in a deterministic fashion with each rejected offer. The political climate and the state of the economy, however, change stochastically during the negotiating period, and if one accepts that certain states of the world may be more conducive to the formation of a stable government than others, this order of considerations leads one to consider a bargaining model in which the cake to be divided follows a stochastic process.

A. *The Game*

Let $K = \{1, \ldots, k\}$, $k \geq 2$, denote the set of parties in the ruling coalition, with typical element i, and let $\Pi \equiv (\pi_1, \ldots, \pi_k)$, $\pi_i \geq 0$, $\sum_{i=1}^{k} \pi_i = 1$, denote the vector of the parties' shares in the coalition.[6] Let S denote the set of possible states of the world, with typical element s, and let σ denote a temporally homogeneous Markov process with state space S and transition probability distribution function $P(\cdot|s)$. For $t = 0, 1, \ldots, T < H$, let $\sigma^t \equiv (\sigma_0, \ldots, \sigma_t)$ denote the t-period state history with typical realization $(s_0, \ldots, s_t)$, where a period corresponds to a week, T denotes the bargaining deadline, and H denotes the time horizon to the next scheduled election from the time the negotiation begins. I refer to a state $s \in S$ realized in period t, $t = 0, 1, \ldots, T$, as a *state* (s, t).

For any state (s, t), let $y(s, t)$ be a nonnegative real number repre-

[6] For simplicity, I restrict my attention to the case of a unique parliamentary chamber so that $\pi_i = \omega_i / \sum_{j=1}^{k} \omega_j$, where ω_i is party i's seat share and $\sum_{j=1}^{k} \omega_j$ is the size of the ruling coalition.

senting the *cake* to be divided among the coalition partners if they agree in that state. For consistency with the specification I adopt in the empirical analysis, I assume that the cake in state (s, t) is equal to the expected duration of a government formed in that state, so that $y(s, t) < H - t$ for any (s, t).[7] For any state (s, t), let

$$X(s, t) \equiv \left\{ x \in R^k \colon x_i \geq 0, \sum_{i=1}^{k} x_i \leq y(s, t) \right\}$$

denote the set of feasible utility vectors to be allocated in that state. For an allocation $x \in X(s, t)$, x_i is the amount of cake awarded to party i.

The game is played as follows. At the realization of state $(s, 0)$, party $i \in K$ is selected to make a government proposal with probability π_i.[8] The appointed proposer chooses either to *pass* or to propose an allocation in $X(s, 0)$. If it proposes an allocation, all the other parties in the coalition sequentially respond by either accepting or rejecting the proposal until either some party has rejected the offer or all parties have accepted it.[9] If the proposal is unanimously accepted by the parties in the ruling coalition, a government is inaugurated and the game is over. If no proposal is offered and accepted by all parties in the coalition, state $(s', 1)$ is realized in the next period according to the Markov process σ, and a new proposer is selected with probabilities Π. The bargaining process continues until either a government agreement is reached or the deadline T expires without an agreement.

An outcome of this bargaining game is either a pair (τ, χ)—where $\tau \leq T$ denotes the period in which a proposal is accepted and $\chi \in X(s_\tau, \tau)$ denotes the proposed allocation that is accepted in period τ—or disagreement. An outcome (τ, χ) implies a von Neumann–Morgenstern payoff to party i, $\beta^\tau \chi_i$, where $\beta \in (0, 1)$ is the common discount factor reflecting the parties' degree of impatience. The pay-

[7] In particular, one may assume either that a unitary level of surplus is available every period a government is in power and there is no discounting or that the level of surplus per period generated while a government is in power grows at the same rate as the rate at which parties discount future payoffs. In either case, the expected sum of surplus levels from the time a government forms until the (uncertain) time it dissolves is equal to the expected duration of the government. Note that this expectation has to be smaller than the maximum potential duration of a government, which is equal to $H - t$. This simplification, which is unnecessary for the theoretical analysis, plays an important role in the estimation of the model.

[8] A random selection rule was initially proposed by Binmore (1987) as an alternative to Rubinstein's (1982) alternating offers structure. It is also used by Baron and Ferejohn (1989) in their analysis of government formation.

[9] Since the order in which parties respond does not matter, I assume that they respond in the order prescribed by K.

off to disagreement is normalized to be a k-dimensional vector of zeros.[10]

A history is a specification of a finite sequence of realized states and proposers and the actions taken at each state in the sequence up to that point. A strategy for party i specifies a feasible action at every history at which it must act. A strategy profile is a k-tuple of strategies, one for each party. At any history, a strategy profile induces an outcome and hence a payoff for each party. A strategy profile is subgame perfect if, at every history, it is a best response to itself. I refer to the outcome and payoff functions induced by a subgame perfect strategy profile as a subgame perfect outcome and subgame perfect payoff, respectively.

Before I turn my attention to the solution of the model, a few comments are in order. As in Baron and Ferejohn (1989), I assume that the probability of making offers is associated with the fraction of parliamentary seats controlled by a party. This assumption seems very natural since it is consistent with the observation that larger parties are more likely to be selected as proposers. Furthermore, an appealing justification of this rule is that it implies that a party cannot increase its chances of proposing by splitting, and two parties cannot get more joint proposal chances by merging. In any event, I show below that the main results in the paper are independent of the way the proposer is selected.

As I take electoral results and the ruling coalition as given, I ignore issues related either to the game between political parties and voters that determines the number, size, and platforms of parties in the political system or to the game among the parties in the system determining the size and composition of the ruling coalition.[11] Also, although negotiations over the formation of new governments are potentially linked through time, in the sense that the outcome of a negotiation may affect future negotiations, I study each bargaining episode in isolation. Hence, the game described here refers to a single negotiation over the formation of a new government.[12] Finally, I treat the stability of a government agreement as exogenous and rule out the possibility of renegotiation. Although extreme, this last assumption is not unreasonable since the collapse of a government

[10] I assume that if the parties cannot agree before the expiration of the deadline, new elections will be called to determine a new ruling coalition.

[11] These questions are typically addressed in the literature in the context of spatial models or cooperative game-theoretic frameworks (see, e.g., Austen-Smith and Banks 1988, 1990; Laver and Shepsle 1990; Baron 1991, 1993).

[12] Solving a multilateral repeated bargaining model would involve complications that are outside the scope of this paper. For an attempt to deal with the issue of repeated contracts in a two-player bargaining framework with private information, see Kennan (1994).

that is necessary for a new negotiation to take place may induce new elections and a realignment of the coalition members.[13] This implies that renegotiation may be extremely costly.

B. *Characterization of Subgame Perfect Equilibria*

The model I just described belongs to a class of stochastic bargaining models for which Merlo and Wilson (1994, 1995) provide general characterization results. I therefore rely on those papers for proofs of the arguments that are only informally presented here. Note, however, that the fact that the specific game I study in this paper has a finite horizon greatly simplifies the analysis since backward induction guarantees the existence of a unique subgame perfect payoff. This is in contrast to the massive indeterminacy that emerges for (deterministic and stochastic) infinite-horizon multilateral bargaining games, where the set of subgame perfect payoffs generally includes all individually rational payoffs (see, e.g., Sutton 1986; Baron and Ferejohn 1989; Merlo and Wilson 1995). In these games, uniqueness of the equilibrium may arise only by restriction of the players' strategies to be stationary (i.e., the actions prescribed at any history depend only on the current state and current offer) or if the discount factor is very small. If future offers can depend on rejected past offers and the players are sufficiently patient, then for almost any arbitrary offer, it is possible to sustain a nonstationary subgame perfect equilibrium in which anyone who deviates by not making or not accepting the offer will be punished by being excluded from all future offers (unless someone else deviates, in which case the players would switch to a different infinite punishment path, and so on). Because of the finiteness of the time horizon of the specific bargaining game I consider in this paper, backward induction eliminates all such nonstationary equilibria and pins down a unique subgame perfect payoff that is stationary. This is easy to see on realizing that in the last period of the game there does not exist any credible threat to prevent the proposer from implementing his or her most preferred action.

Let $v_j(s, t, i)$ denote the subgame perfect payoff of party j in state (s, t) when party i is the proposer. The parties' subgame perfect payoffs are the unique solution to the following system of recursive equations:

[13] In Italy, even simple government reshuffles (i.e., reallocations of cabinet posts among the same coalition members) usually require a new negotiation, and after a government resigns, the president always has the option of calling new elections.

$$v_i(s,\ t,\ i) = \max\left\{y(s,\ t) - \sum_{j \neq i} v_j(s,\ t,\ i),\right.$$
$$\beta \int \left[\sum_{j \neq i} \pi_j v_i(s',\ t+1,\ j)\right.$$
$$\left.\left. + \pi_i v_i(s',\ t+1,\ i)\right] dP(s' | s)\right\}, \tag{1}$$
$$v_j(s,\ t,\ i) = \beta \int \left[\sum_{r \neq j} \pi_r v_j(s',\ t+1,\ r)\right.$$
$$\left. + \pi_j v_j(s',\ t+1,\ j)\right] dP(s' | s),$$

$i,\ j,\ r \in K,\ i \neq j,\ j \neq r,\ t = 0,\ 1,\ \ldots,\ T$, and $v_j(s,\ T+1,\ i) = 0$, for any s, i, and j. The interpretation of (1) is straightforward. In order to induce acceptance of its proposal, the proposer party has to offer its equilibrium continuation value to each other party in the coalition. The proposer does so only if what is left over from the currently available cake is at least as large as what it can guarantee itself by passing and hence delaying agreement. Therefore, delays may occur in the unique subgame perfect equilibrium.

Let

$$w(s,\ t,\ i) \equiv \sum_{j=1}^{k} v_j(s,\ t,\ i)$$

denote the subgame perfect total payoff in state $(s,\ t)$ when party i is the proposer. Given the structure of the game, if a party is not selected to make a proposal, it is indifferent to the identity of the proposer; that is, for any state $(s,\ t)$, $v_j(s,\ t,\ i) = v_j(s,\ t,\ r)$, $i,\ j,\ r \in K$, $i \neq r \neq j$. Hence, it is straightforward to verify that in equilibrium, for any state $(s,\ t)$, $w(s,\ t,\ i) = w(s,\ t,\ j) = w(s,\ t)$, $i,\ j \in K,\ i \neq j$, where

$$w(s,\ t) = \max\{y(s,\ t),\ \beta \int w(s',\ t+1)\, dP(s' | s)\}, \tag{2}$$

and regardless of the identity of the current proposer and the likelihood of its reappointment in the future, the parties agree in state $(s,\ t)$ only if

$$y(s,\ t) \geq \beta \int w(s',\ t+1)\, dP(s' | s)$$

and delay agreement otherwise.

By rearranging the terms in (1) and exploiting (2), I obtain an expression for the gains from proposing as

$$v_i(s,\ t,\ i) - v_i(s,\ t,\ j) = \max\{y(s,\ t) - \beta \int w(s',\ t+1)\, dP(s' | s),\ 0\}, \tag{3}$$

$i, j \in K$, $i \neq j$. If agreement is reached in state (s, t), then the gains to a party from being the proposer are equal to the difference between the current cake size and the expected discounted value of the future cakes that will be agreed on.

One striking implication of this characterization of the subgame perfect equilibrium is that the set of states in which the parties agree depends only on the discount factor, the cake function, and the Markov process σ and is independent of the identity of the proposer in each state. Furthermore, the gains to a party from being the proposer in a state in which agreement occurs also depend only on β, y, and P and are independent of Π. The vector Π, however, together with P, y, and β, affects how the surplus is allocated in equilibrium. Merlo and Wilson (1994) refer to this result as the separation principle for stationary subgame perfect equilibria of generic multilateral stochastic bargaining games with complete information in which the cake is a simplex of random size and the players share a common discount factor. Under these assumptions, which are satisfied here, the set of states in which agreement occurs in any stationary subgame perfect outcome is determined as the solution to a dynamic programming problem, the objective of which is to maximize the expected discounted size of the cake. Hence, any stationary subgame perfect payoff (and consequently any delay in agreement) must be Pareto efficient.

When one recognizes that opportunities to make offers are like property rights, the separation principle can be usefully compared to the Coase theorem. Like the Coase theorem, the separation principle guarantees that Pareto efficiency is achieved independently of the initial allocation of property rights.[14] Also, the separation principle implies that the results on the timing of government agreements and the advantage to proposing are robust with respect to misspecifications of the proposer selection process.

Note that the agreement rule, which is the solution to an optimal stopping problem, possesses a reservation property: In any state (s, t), agreement occurs if and only if $y(s, t) \geq y^*(s, t)$, where

$$y^*(s, t) = \beta \int w(s', t+1)\, dP(s' \mid s). \tag{4}$$

Also, for any $s \in S$, $y^*(s, T) = 0$ and $y^*(s, t+1) \leq y^*(s, t)$, $t = 0, \ldots, T-1$.[15]

[14] This result crucially depends on stationarity in bargaining, on the complete information among the bargainers, and on their risk neutrality (see Merlo and Wilson 1995).

[15] Technically, these results require some restrictions on the function $y(\cdot)$ (see theorem 6 in Merlo and Wilson [1994]). These restrictions are satisfied by the specification I adopt in the empirical analysis.

C. An Example

Before I turn my attention to the empirical analysis, I present a simple example to illustrate the derivation of the subgame perfect payoffs. Suppose that σ is a Markov chain with $S = \{s_1, s_2\}$ and transition probabilities p_{ij}, $i, j = 1, 2$, and

$$H - T > y_1(s_1, t) \equiv y_1 > y_2(s_2, t) \equiv y_2 > 0$$

for all $t = 0, 1, \ldots, T$. This example corresponds to a case in which there are only two possible states of the world, the duration of a government formed in either state of the world is fixed, and one state of the world induces a longer government duration than the other. Hence, I replace s_i with y_i and use (2) to express the subgame perfect total payoff as

$$w(y_i, t) = \max\{y_i, \beta[p_{i1} w(y_1, t+1) + p_{i2} w(y_2, t+1)]\},$$

$i = 1, 2$, $t = 0, 1, \ldots, T$. Since $y_1 > y_2$, the unique solution to this system of recursive equations is $w(y_1, t) = y_1$ and

$$w(y_2, t) = \max\left\{y_2, \left[\frac{1 - (\beta p_{22})^{T-t}}{1 - \beta p_{22}}\right]\beta p_{21} y_1 + (\beta p_{22})^{T-t} y_2\right\}$$

for all t. Agreement always occurs when the cake size is y_1 and in the last period of the game regardless of what the cake size is. When the cake size is y_2 and $t < T$, agreement is reached only if $y_2 \geq \beta p_{21} y_1/(1 - \beta p_{22}) \equiv y^*$.[16]

To determine the individual subgame perfect payoffs, I exploit (1) and (3) to obtain

$$\begin{aligned} v_j(y_i, t, j) = {} & \max\{y_i - \beta[p_{i1} w(y_1, t+1) + p_{i2} w(y_2, t+1)], 0\} \\ & + v_j(y_i, t, j'), \end{aligned}$$

$i = 1, 2$, $j, j' \in K$, $j' \neq j$, $t = 0, 1, \ldots, T$. There are two cases to consider.

Case 1: $w(y_2, t) = y_2 \geq y^*$.—In this case, agreement occurs for both cake sizes, so that

$$v_j(y_i, t, j) = y_i - \beta[p_{i1} w(y_1, t+1) + p_{i2} w(y_2, t+1)] + v_j(y_i, t, j').$$

Solving for the parties' subgame perfect payoffs in the initial period yields

$$v_j(y_i, 0, j) = y_i - \beta(1 - \pi_j)(p_{i1} y_1 + p_{i2} y_2)$$

[16] In contrast to the general case, the reservation cake y^* is a constant in this example.

and

$$v_{j'}(y_i, 0, j) = \beta\pi_{j'}(p_{i1}y_1 + p_{i2}y_2),$$

$i = 1, 2, j, j' \in K, j \neq j'$.

Case 2: $y_2 < y^*$.—In this case, for $t < T$, agreement occurs only when the cake size is y_1, so that

$$v_j(y_1, t, j) = y_1 - \beta[p_{11}w(y_1, t+1) + p_{12}w(y_2, t+1)] + v_j(y_1, t, j'),$$

and $v_j(y_2, t, j) = v_j(y_2, t, j')$. Solving for the parties' subgame perfect payoffs in the initial period if cake size y_1 is realized yields

$$v_j(y_1, 0, j) = y_1 - \beta(1 - \pi_j)(p_{11}y_1 + p_{12}\{[1 - (\beta p_{22})^{T-1}]y^* + (\beta p_{22})^{T-1}y_2\})$$

and

$$v_{j'}(y_1, 0, j) = \beta\pi_{j'}(p_{11}y_1 + p_{12}\{[1 - (\beta p_{22})^{T-1}]y^* + (\beta p_{22})^{T-1}y_2\}),$$

$j, j' \in K, j \neq j'$.

In both cases, the subgame perfect payoffs to the parties are proportional to their probability of being selected as proposers. Under the maintained assumption that the probability of being selected as proposer is proportional to a party's seat share, this result is consistent with Gamson's (1961) original analysis as well as the empirical findings of Browne and Frendreis (1980), who show that the shares of cabinet posts assigned to the party members of the ruling coalition in almost all western European countries in the postwar period are proportional to the parties' relative sizes. Also, note that in the second case the gains from proposing in the only state in which agreement occurs are larger the more impatient the parties (i.e., the smaller β), the more persistent the "bad" state (i.e., the larger p_{22}), and the less persistent the "good" state (i.e., the smaller p_{11}).

IV. Empirical Analysis

The predictions of my bargaining model crucially hinge on its structural components (i.e., the Markov process σ, the function y, the discount factor β, the probabilities Π, and the terminal time T). However, all the results illustrated in the previous section, except the characterization of the individual equilibrium payoffs, are independent of the proposer selection process (summarized by Π). Since measuring government payoffs to the parties is in general problematic (see, e.g., Browne and Frendreis 1980), I abstract from Π and focus on the estimation of the parameters of the model that determine the timing of government agreements and the duration of gov-

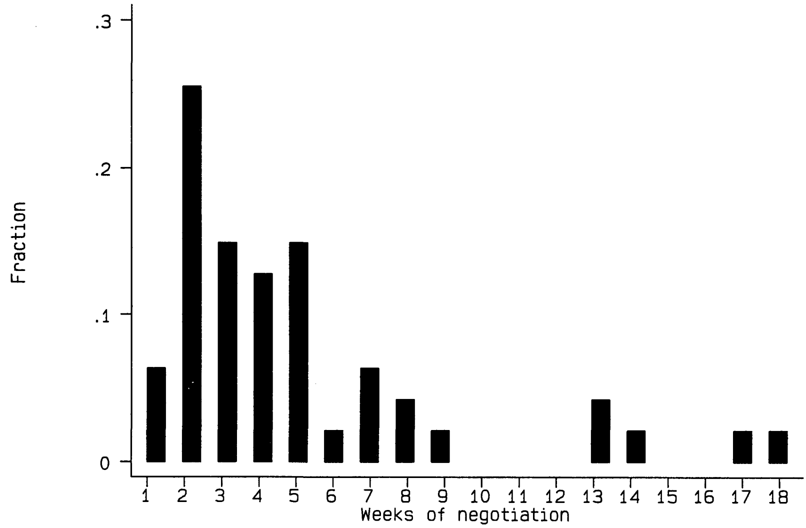

FIG. 1.—Histogram of negotiation durations

ernments that are agreed on. This allows me to test the model by evaluating its performance in fitting observed durations of negotiations over the formation of new governments as well as government durations and to quantify the effects of policies that would modify the bargaining procedure.

A. Data

The history of postwar Italy over the period April 1948 to March 1994 is characterized by a sequence of 47 governments that constitute my sample of observations. An observation in the sample is defined by the duration of a negotiation over the formation of a new government, τ, and by the duration of the government following that negotiation, d. For each element in the sample, I also observe the time horizon H to the next scheduled election from the time the negotiation begins; a binary variable M that takes the value one if the ruling coalition is a majority coalition (i.e., it controls at least 50 percent of the parliamentary seats) and zero if it is a minority coalition (i.e., it controls less than 50 percent of the parliamentary seats); and the time series of weekly inflation rates from the time the negotiation begins until a government forms. Data on the duration of negotiations are summarized in the histogram contained in figure 1. Data on government durations expressed as percentages of the time horizon to the next scheduled election from the time a government

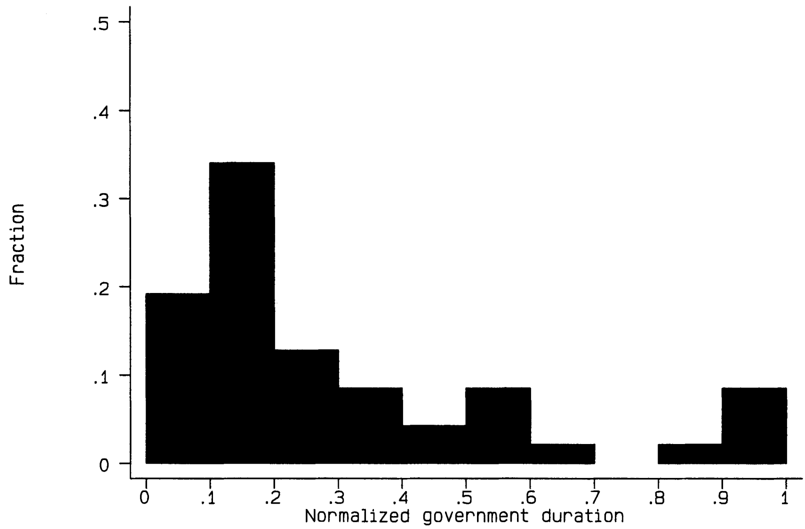

FIG. 2.—Histogram of normalized government durations

formed are summarized in the histogram displayed in figure 2. Since the time horizon to the next scheduled election represents the maximum potential duration of a government, this represents a useful normalization that allows me to compare the duration of governments formed under different circumstances. I refer to a government duration divided by its maximum potential duration, $d/(H - \tau)$, as a normalized government duration. Descriptive statistics of all the variables are reported in table 1.[17]

The inflation rate is used here as a measure of the state of the economy in each period of a negotiation over the formation of a new government.[18] For the purpose of estimation, I transform the inflation rate into a discrete variable taking only two values, low and high, depending on whether an observation is below or above the median of the distribution of inflation rates over the time frame considered here (equal to 0.47). I divide the sample of governments into four subsamples depending on whether a majority (minority) government formed when the inflation rate was high or when the

[17] Data on political variables are drawn from various issues of the *European Journal of Political Research* and from Presidenza del Consiglio dei Ministri (1994). Economic data are monthly inflation rates from the International Monetary Fund's *International Financial Statistics* and are transformed into weekly data by linear interpolation.

[18] Although it would be desirable to include in the analysis other economic variables that may affect government durability (e.g., output and unemployment), inflation is the only relevant economic time series that is available at the desired frequency for the period 1948–94.

TABLE 1

DESCRIPTIVE STATISTICS

	Mean	Standard Deviation	Minimum	Maximum
Negotiation duration (weeks)	4.979	4.019	1.000	18.000
Government duration (weeks)	45.468	32.738	1.000	151.000
Time to next scheduled election (weeks)	180.234	67.421	57.000	260.000
Normalized government duration	.298	.269	.008	1.000
Majority status of the ruling coalition	.596	.491	.000	1.000
Inflation rate (4/1948–3/1994)	.616	.897	−4.835	8.952
Inflation rate at beginning of negotiations	.538	.771	−1.236	2.620
Inflation rate at government formation	.440	.708	−1.490	2.843

TABLE 2

MEAN NORMALIZED GOVERNMENT DURATIONS BY LEVEL OF INFLATION AT GOVERNMENT FORMATION AND COALITION TYPE

	s = low, $M = 0$	s = low, $M = 1$	s = high, $M = 0$	s = high, $M = 1$
Mean normalized government duration	.193	.434	.187	.254
Number of observations	12	18	7	10

inflation rate was low. For each subsample, table 2 reports the number of observations and the mean normalized government duration. As can be seen from this table, after one controls for the time horizon to the next scheduled election, government duration tends to increase with the size of the coalition and to decrease with the inflation rate at the time of government formation.[19] The fact that majority governments are more stable than minority governments is not surprising since they have stronger support in the Parliament. The finding that government duration is negatively correlated with the inflation rate at the time of its formation is less obvious. Possible explanations of this phenomenon are that the new government may be held responsible for the increase in the price level or that, because of high persistence in inflation, a high level of inflation at the

[19] These observations are consistent with the results of the econometric analysis of Merlo (1991).

time a government forms is more likely to be followed by a high-inflation period, which is detrimental to government survival (see, e.g., Warwick 1992).

Another interesting feature of the data that emerges from table 1 is that the average inflation rate at the beginning of negotiations is larger than the average inflation rate at the time of government formation. When combined with the observation that government duration is negatively correlated with the inflation rate at the time of its formation, and under the maintained assumption that the law of motion of inflation is exogenous, this fact seems to suggest that the political parties are more likely to agree to form a government when the inflation rate is relatively low (i.e., in states of the economy that are favorable to the formation of more durable, and hence more "profitable," governments).

B. *Econometric Specification*

In the theoretical model described in Section III, I specified the cake the parties bargain over in any given period, y, to be equal to the expected government duration conditional on the state of the world in that period, given the size of the ruling coalition and the residual time horizon to the next scheduled election. Also, I 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 following the agreement, d, which also depends on events occurring during the government tenure in office.

I (the econometrician), however, do not observe the sequence of cakes in a negotiation over the formation of a new government. Also, I do not observe all the relevant elements in the parties' information set when they form their expectations about government durations. For example, although I observe how the inflation rate changes while a negotiation is in progress, I do not have a measure of the political climate in which the negotiation takes place. If one partitions the state of the world into two (independent) components, $s = (s^o, s^u)$, where s^o denotes what the econometrician observes (i.e., the inflation rate) and s^u denotes what the econometrician does not observe (e.g., the political climate), the cake y in state (s^o, s^u, t) given H and M is given by

$$\begin{aligned} y(s^o, s^u, t; H, M) &\equiv E[d|s^o, s^u, t; H, M] \\ &= E[y|s^o, t; H, M] + \epsilon_y \\ &= E[d|s^o, t; H, M] + \epsilon_y, \end{aligned} \tag{5}$$

where the first expectation is conditional on what the parties observe, the other expectations are conditional on the econometrician's data set, and ϵ_y is an unobservable random term (with zero mean) accounting for what the econometrician does not observe. Also, the duration d of a government that forms in state (s^o, s^u, t) given H and M can be expressed as

$$\begin{aligned} d &= E[d|s^o, s^u, t; H, M] + \epsilon_d \\ &= y(s^o, s^u, t; H, M) + \epsilon_d \\ &= E[d|s^o, t; H, M] + \epsilon_y + \epsilon_d, \end{aligned} \tag{6}$$

where ϵ_d is another unobservable random term (with zero mean and independent of ϵ_y) capturing the fact that the actual duration of a government also depends on events that occur while a government is in power.

Let $G(y|s^o, t; H, M)$ denote the conditional distribution of cakes with conditional density $g(\cdot|\cdot)$, and let $F(d|y; H, M)$ denote the conditional distribution of government durations with conditional density $f(\cdot|\cdot)$, where $G(\cdot|\cdot)$ and $F(\cdot|\cdot)$ are consistent with (5) and (6).[20] Also, let $s \equiv s^o$ denote the inflation rate, which I assume follows a Markov chain with state space $S = \{\text{low, high}\}$ and transition probabilities matrix $\mathbf{p} = \{p_{ss'}\}_{s,s'=\text{low,high}}$. The objective of my econometric analysis is to use the model and the data described above to estimate $G(\cdot|\cdot)$, $F(\cdot|\cdot)$, $\mathbf{p}$, β, and T using maximum likelihood techniques.

Since the model I estimate is similar to a finite-horizon search model, the econometric framework I use is similar to that used by Wolpin (1987). The similarity derives directly from the separation principle described in Section III, since to determine when agreement occurs requires solving an optimal stopping problem that is analogous to the search problem faced by a worker who, on receiving a wage offer, has to decide whether to take it or to continue searching.[21] Also, as in the search model estimated by Wolpin, agreement follows a reservation rule: given H and M, the parties agree in period t when the inflation rate is s if and only if the current cake y is greater

[20] Note that $G(y|s^o, t; H, M)$ and $F(d|y; H, M)$ imply a distribution of d conditional on $(s^o, t; H, M)$.

[21] As in Lippman and McCall (1976), the specification I consider includes a Markov structure for an underlying state of the economy indexing the distribution of surplus levels.

than or equal to the reservation cake $y^*(s, t; H, M)$, where

$$y^*(s, t; H, M) = \beta \sum_{s'=\text{low, high}} p_{ss'} \int w(s', t+1, y')\, dG(y'|s', t+1; H, M), \quad (7)$$

for $s =$ low, high and $t = 0, 1, \ldots, T$.[22]

The contribution to the likelihood function of each observation in the sample is equal to the probability of observing a negotiation lasting τ weeks followed by a government duration d, conditional on the realized history of inflation rates $(s_0, \ldots, s_\tau)$, on the type M of the coalition, and on the time horizon H to the next scheduled election. This is equal to the probability that the parties observe $\tau - 1$ consecutive cakes that are each smaller than the respective reservation cake in each of the realized states (s_t, t), $t = 0, \ldots, \tau - 1$; in state (s_τ, τ) they observe a cake that is greater than or equal to the reservation cake for that state, and the observed government duration following the agreement, d, is consistent with their expectation in that state. Hence, for a coalition of type M that begins negotiating over the formation of a new government H weeks away from a scheduled election, the probability that the parties delay agreement in period t when the inflation rate is s, given that they have not agreed up to t, is equal to the probability that the current cake is smaller than the corresponding reservation cake,

$$\Pr(\text{delay in } t|\text{delay to } t, s; H, M) = \Pr[y < y^*(s, t; H, M)]. \quad (8)$$

Similarly, the joint probability of observing agreement in period t when the inflation rate is s and of observing a government duration d following the agreement, given a delay up to t, is equal to the joint probability that the current cake is greater than or equal to the corresponding reservation cake and the observed government duration is consistent with the agreed-on cake:

$$\begin{aligned} &\Pr(\text{agreement in } t, d|\text{delay to } t, s; H, M) \\ &= \Pr[y \geq y^*(s, t; H, M), d] \qquad (9) \\ &= \Pr[d|y \geq y^*(s, t; H, M)] \cdot \Pr[y \geq y^*(s, t; H, M)]. \end{aligned}$$

Hence, given H and M, the probability of observing a negotiation lasting τ weeks, followed by a government duration d, conditional on the time series of inflation rates $(s_0, \ldots, s_\tau)$, is equal to the probability that the parties delay agreement for $\tau - 1$ consecutive

[22] Note that from the perspective of the econometrician, the cake must be included in the state vector for the dynamic programming problem whose solution yields the equilibrium agreement rule and must then be integrated out.

weeks, and in week τ they agree to form a government that is then observed to last d weeks:

$$
\begin{aligned}
&\Pr(\tau, d \mid s_0, \ldots, s_\tau; H, M) \\
&\quad = \prod_{t=0}^{\tau-1} \Pr(\text{delay in } t \mid \text{delay to } t, s_t; H, M) \qquad (10) \\
&\qquad \cdot \Pr(\text{agreement in } \tau, d \mid \text{delay to } \tau, s_\tau; H, M).
\end{aligned}
$$

The log likelihood function is obtained by summing the logs of the right-hand side of (10) over all the elements in the sample.

To estimate the model, I first use observed transition frequencies to obtain estimates of the weekly transition probabilities in the inflation rate as $\hat{p}_{ss'} = n_{ss'}/n_s$, where $n_{ss'}$ is the frequency of (one-step) transitions $s \rightarrow s'$ in the data and $n_s = \sum_{s'=\text{low, high}} n_{ss'}$, $s, s' = $ low, high.[23] The estimates I obtain (using 2,249 weekly observations) are

$\hat{\mathbf{p}} =$

	low	high
low	.930	.070
high	.071	.929

The next step consists of choosing parametric functional forms for $G(\cdot|\cdot)$ and $F(\cdot|\cdot)$ that are consistent with (5) and (6). To minimize the number of parameters, I restrict my attention to a two-parameter family of distributions and assume that $g(\cdot|\cdot)$ and $f(\cdot|\cdot)$ are power function densities:[24]

$$g(y|s, t; H, M) \equiv \alpha_s \left[\frac{y^{\alpha_s - 1}}{\bar{y}(t; H, M)^{\alpha_s}} \right], \quad 0 \leq y \leq \bar{y}(t; H, M),$$

where

$$\bar{y}(t; H, M) \equiv \left(\frac{\gamma_M}{\gamma_M + 1} \right)(H - t), \quad \alpha_s > 0, \gamma_M > 0,$$

[23] The set of transition frequencies $n_{ss'}$ forms a sufficient statistic for the transition matrix $\mathbf{p}$, and $\hat{p}_{ss'}$ is the maximum likelihood estimator of $p_{ss'}$ (see, e.g., Basawa and Prakasa Rao 1980).

[24] The class of power function distributions is a subset of the family of beta distributions, which is one of the most flexible families of parametric distributions for continuous random variables with a finite support (see, e.g., Johnson and Kotz 1970, pp. 37–56). Some amount of experimentation with alternative specifications suggests that my results are not too sensitive to the particular functional form chosen, which has the advantage of being tractable.

and

$$f(d|y; H, M) \equiv \gamma_M\left[\frac{d^{\gamma_M - 1}}{\bar{d}(y; H, M)^{\gamma_M}}\right], \quad 0 \leq d \leq \bar{d}(y; H, M),$$

where

$$\bar{d}(y; H, M) \equiv \left(\frac{\gamma_M + 1}{\gamma_M}\right)y.$$

I then use the likelihood function to estimate the remaining parameters of the model.[25] Since s and M can each take on two possible values, there are six parameters that have to be estimated (α_{low}, α_{high}, γ_0, γ_1, β, and T). Note, however, that it is possible to estimate the terminal time T separately using the maximum observed negotiation duration, τ_{max}, and then condition the estimation of the other parameters on such an estimate.[26] Hence, I replace T with $\hat{T} = \tau_{max} =$ 18 weeks.

C. *Results*

Table 3 presents the maximum likelihood estimates of the parameters of the model. Note that since β represents a weekly discount factor, a point estimate for β of 0.64 corresponds to a very low 0.17 monthly discount factor, which implies a fairly high degree of impatience on the part of the political parties. This finding is perhaps surprising when compared to the much larger estimates of the discount factor that are typically obtained for other groups of economic agents. An intuitive reason why Italian politicians may be extremely impatient, however, is that the high frequencies of government turnover and elections that characterize the Italian political system induce a high level of uncertainty at the individual level. Another consideration that suggests that Italian politicians may have a low discount factor is that during the time frame considered here, many of them were involved in (risky) corrupt dealings.

[25] The analytic expression of the likelihood function is derived in the Appendix.
[26] This is possible because the maximum of the sample of negotiation durations is a consistent estimator of T, which, as the number of observations N goes to infinity, converges in probability to T at a faster rate (N) than the maximum likelihood estimators of the other parameters, whose convergence rate is $\sqrt{N}$ (see, e.g., Balakrishnan and Cohen 1991). This result was first used by Flinn and Heckman (1982) to concentrate the likelihood function in their model of search unemployment.

TABLE 3

ESTIMATED PARAMETERS OF THE MODEL ($N = 47$)

Parameter	Estimate
β	.642
	(.063)
α_{low}	.127
	(.036)
α_{high}	.081
	(.027)
γ_0	.730
	(.216)
γ_1	7.513
	(4.144)

NOTE.—Asymptotic standard errors are in parentheses. Log likelihood is −338.468.

To interpret the estimates I obtained for the other parameters of the model, note that they imply the following estimates for the mean of the distribution of (unobservable) cakes:

$$\hat{E}[y|s = \text{low}, t; H, M = 1] = .099(H - t),$$
$$\hat{E}[y|s = \text{high}, t; H, M = 1] = .066(H - t),$$
$$\hat{E}[y|s = \text{low}, t; H, M = 0] = .048(H - t),$$
$$\hat{E}[y|s = \text{high}, t; H, M = 0] = .032(H - t).[27]$$

These estimates indicate that, for any given H, t, and s, the mean expected government duration for a majority coalition is twice as large as the mean expected government duration for a minority coalition, and for any given H, t, and M, the mean expected government duration when the inflation rate is low is one and a half times larger than the mean expected government duration when the inflation rate is high.

The coalition partners, however, agree to form a government only if its expected duration exceeds a threshold and to delay agreement otherwise. This implies that not all potential governments form, and governments that are expected to have shorter durations are less

[27] It follows from the assumption about the distribution of y that

$$E[y|s, t; H, M] = \left(\frac{\alpha_s}{\alpha_s + 1}\right)\left(\frac{\gamma_M}{\gamma_M + 1}\right)(H - t).$$

likely to form. The thresholds characterizing the agreement rule depend on s, t, H, and M, and the estimates reported in table 3 imply that

$$\hat{y}^*(s = \text{low}, t; H, M) > \hat{y}^*(s = \text{high}, t; H, M)$$

for any given t, H, and M and

$$\hat{y}^*(s, t; H, M = 1) > \hat{y}^*(s, t; H, M = 0)$$

for any given s, t, and H.[28] These results indicate that, ceteris paribus, governments of shorter expected duration are less likely to form when the inflation rate is low vis-à-vis when the inflation rate is high and when the ruling coalition is a majority coalition vis-à-vis when the ruling coalition is a minority coalition. To evaluate the extent of the selection on expected government durations, I compare the upper bound of the estimated mean expected government duration regardless of whether an agreement actually occurs,

$$\hat{E}[y|s = \text{low}, t = 0; H = 260, M = 1] = .099 \cdot 260 = 25.74 \text{ weeks},$$

to the corresponding estimated mean expected government duration if an agreement does occur,

$$\hat{E}[y|y \geq \hat{y}^*(s = \text{low}, t = 0; H = 260, M = 1)] = 100.60 \text{ weeks}.^{29}$$

This comparison indicates that the selection accomplished by delaying agreement may be substantial.

To assess the fit of the model to negotiation duration data in postwar Italy, in table 4 I compare the density of negotiation durations predicted by the model to the empirical density.[30] The χ^2 goodness-of-fit test does not reject the model at conventional significance levels (the marginal significance level is equal to 24.3 percent), and the predicted mean duration of the bargaining process differs by only 0.11 week from the mean of observed negotiation durations. Table 5 reports evidence on the fit of the model to the government duration data by comparing the density of normalized government durations predicted by the model to the empirical density. The χ^2

[28] These results follow from plugging the estimated parameter values in equation system (A2) in the Appendix.

[29] It follows from the assumption about the distribution of y that

$$E[y|y \geq y^*(s, t; H, M)] = \left(\frac{\alpha_s}{\alpha_s + 1}\right)\left[\frac{\bar{y}(t; H, M)^{\alpha_s+1} - y^*(s, t; H, M)^{\alpha_s+1}}{\bar{y}(t; H, M)^{\alpha_s} - y^*(s, t; H, M)^{\alpha_s}}\right],$$

where $\bar{y}(t; H, M) = [\gamma_M/(\gamma_M + 1)](H - t)$.

[30] The densities of negotiation duration and government duration predicted by the model are derived in the Appendix.

TABLE 4

DENSITY FUNCTIONS OF NEGOTIATION DURATIONS AND GOODNESS-OF-FIT TEST

Week	Data	Model
1	.064	.208
2	.256	.163
3	.149	.125
4	.128	.102
5	.149	.081
6	.021	.065
7	.064	.052
8	.043	.041
9	.021	.033
10	.000	.024
11	.000	.019
12	.000	.016
13	.042	.013
14	.021	.010
15	.000	.009
16	.000	.007
17	.021	.007
18	.021	.025
χ^2 test*		20.628
$\Pr(\chi^2_{17} \geq 20.628) = .243$		
Mean negotiation duration	4.979	4.867

* Pearson's χ^2 statistic is defined as

$$N \cdot \sum_{\tau=1}^{T} \frac{[f_\tau(\tau) - \hat{f}_\tau(\tau)]^2}{\hat{f}_\tau(\tau)} \sim \chi^2_{T-1},$$

where $f_\tau(\tau)$ denotes the empirical density function of negotiation duration times, $\hat{f}_\tau(\tau)$ denotes the maximum likelihood estimate of the density function of negotiation duration times, N is the number of observations, and $T = 18$. The degrees of freedom are an upper bound because I do not take into account that the parameters in the model are estimated.

goodness-of-fit test does not reject the model at conventional significance levels (the marginal significance level is equal to 17.7 percent), and the mean normalized government duration predicted by the model underestimates the one observed in the data by only 0.3 percent, which corresponds to about 0.15 week. Furthermore, the model correctly predicts the rank order of the means of normalized government durations in the four cells in the data (see the bottom panel of table 5). The model, however, overpredicts the average normalized duration of minority governments formed when the inflation rate is low and the average normalized duration of majority governments formed when the inflation rate is high; it underpredicts the average normalized duration of minority governments formed when the inflation rate is high and the average normalized duration

TABLE 5

Density Functions of Normalized Government Durations and Goodness-of-Fit Test

Interval	Data	Model
[0–0.1]	.213	.206
(0.1–0.2]	.319	.245
(0.2–0.3]	.128	.154
(0.3–0.4]	.085	.108
(0.4–0.5]	.043	.081
(0.5–0.6]	.085	.064
(0.6–0.7]	.021	.051
(0.7–0.8]	.000	.040
(0.8–0.9]	.021	.027
(0.9–1]	.085	.024
χ^2 test*		12.690
$\Pr(\chi^2_9 \geq 12.690) = .177$		
Mean normalized government duration	.298	.297
	Mean Normalized Government Duration	
s = low, $M = 0$	.193	.195
s = low, $M = 1$	.434	.408
s = high, $M = 0$	.187	.154
s = high, $M = 1$	.254	.322

* See note to table 4.

of majority governments formed when the inflation rate is low. Overall, I conclude that the model fits both negotiation duration data and government duration data reasonably well.

Using equation (3), for each negotiation in the sample, I obtain an estimate of the realized gains from proposing predicted by the model as a percentage of the realized surplus level (i.e., the observed government duration), which is given by $[d - \hat{y}^*(s_\tau, \tau; H, M)]/d$. The mean of these estimates is equal to 0.16, indicating that, on average, the realized gains from proposing amount to 16 percent of the realized surplus level. Since larger parties are more likely to be selected as proposers, the gains from proposing represent a measure of the returns from "winning" an election. The model predicts that such returns tend to be significant on average. For purposes of comparison, I compute an alternative raw measure of the gains from proposing given by the difference between the fraction of cabinet portfolios controlled by the prime minister's party in a government and the average fraction of cabinet portfolios controlled by the same party in other governments in which the prime minister does not belong to that party. This measure is constructed holding the size of the party constant. The sample average of this alternative measure is equal to 0.20, thus confirming the ability of the model to match various aspects of the data.

V. Policy Experiments

Empirical studies (see, e.g., Barro 1991) have shown that political instability has a detrimental effect on economic growth. For a democratic regime, political instability means short-lived governments and long-lasting negotiations. Hence, it seems reasonable to try to evaluate the effects of changes in the bargaining procedure on the distribution of negotiation and government durations.

To evaluate the importance of the bargaining procedure, I use my model to perform two policy experiments. Since the president has some control over the proposer selection process (see the discussion contained in Sec. II), the first question I ask is whether the president could in principle select the extensive form of the bargaining game played by the political parties so as to minimize the instability of the political system. The answer to this question is negative, and it follows directly from the separation principle described in Section III. The only function performed by the proposer selection process is to determine the equilibrium payoffs to the parties. Neither the duration of negotiations nor the distribution of governments that are agreed on is affected either by the identity of the proposer or by the way the proposer is selected in each round of negotiations. Hence, this result implies the existence of an implicit limit to the actual power of the president.

The second experiment I consider consists of shortening the deadline by which the parties in the ruling coalition have to reach an agreement before a new election must be called. To implement this experiment, I fix the parameters of the model to their estimated values and then solve the model and compute the implied distributions of negotiation and government durations for different values of T. The predicted mean negotiation durations and mean normalized government durations are reported in table 6 for $T = 18$ (baseline case), 17, 9, 4, and 0 weeks. As one can see from this table, a shorter deadline implies both shorter negotiations and shorter governments. For instance, replacing a deadline of 18 weeks with a deadline of 9 weeks would imply a reduction of the mean negotiation duration of about 0.7 week and also an 11.4 percent reduction in the mean normalized government duration, corresponding to about 6 weeks. A more radical policy experiment consists of eliminating the bargaining process altogether and replacing it with take-it-

TABLE 6

EFFECT OF CHANGES IN THE DEADLINE

	$T = 18$*	$T = 17$	$T = 9$	$T = 4$	$T = 0$
Mean negotiation duration	4.867	4.802	4.217	2.837	...
Percentage change relative to baseline	...	−1.3	−13.4	−41.7	−100.0
Mean normalized government duration	.297	.296	.263	.182	.069
Percentage change relative to baseline	...	−.3	−11.4	−38.7	−76.8
	Mean Normalized Government Duration				
s = low, $M = 0$	.195	.194	.174	.123	.048
s = low, $M = 1$	.408	.406	.363	.257	.099
s = high, $M = 0$	.154	.153	.133	.089	.032
s = high, $M = 1$	.322	.320	.279	.186	.066

* Baseline case.

or-leave-it offers at the beginning of each negotiation, which corresponds to the case in which $T = 0$. Since such offers would always be accepted in equilibrium, this policy would eliminate delays in bargaining but at the cost of a drastic reduction in the mean normalized government duration, corresponding to approximately 39 weeks. The logic behind these results derives from the fact that in my model delays act as a selection mechanism and shorter time limits on government formation would induce the parties to agree to form relatively unstable governments that they would otherwise not agree to form.[31]

Although perhaps surprising, these findings provide an explanation for the existence of a positive correlation between weeks of negotiation and subsequent government duration that has been documented in the literature (see, e.g., Strom 1985; Merlo 1991). One explanation of this phenomenon that has been proposed by Strom postulates that longer negotiations might deter partners from breaking up any existing government by the anticipation of more protracted and costly negotiations to form the next one (backward incentive effect). In contrast, the intuition I provide in this paper is

[31] Technically, these results are a direct consequence of the fact that if one considers two otherwise identical games that have different finite horizons T_1 and T_2, with $T_1 > T_2$, then the parameter estimates reported above imply that $\hat{y}_1^*(s, t; H, M) > \hat{y}_2^*(s, t; H, M)$ for all $t = 0, 1, \ldots, T_2$, where $\hat{y}_i^*(s, t; H, M)$ is the estimated reservation cake size when the deadline is T_i, $i = 1, 2$, for any given s, t, H, and M.

that longer negotiation bounds might allow parties to find more favorable circumstances for starting a new government (forward selection effect).

VI. Concluding Remarks

In this paper, I have attempted to interpret data on the process of government formation in a modern parliamentary democracy using a multilateral stochastic model of sequential bargaining. I have shown that the model fits well postwar Italian data on the duration of negotiations over the formation of new governments and government durations, and I have provided an interesting economic interpretation for the observations. My analysis has indicated that delays in the government formation process can be optimal from the point of view of the negotiating parties, although the estimates I have obtained indicate that political parties tend to be fairly impatient.

I have used the estimates of the structural parameters of the model to calculate the gains from proposing and to evaluate the effects of changes in the bargaining procedure. I have found that the gains from proposing are in general significant. I have also shown that changes in the proposer selection process would affect only the equilibrium distribution of payoffs to the parties while leaving the distributions of negotiation and government durations unaffected. Finally, I have shown that the imposition of a strict deadline on the negotiations would not only diminish the incentives to delay agreement but also lower mean government duration. Whether implementing such a policy could be beneficial for a democratic society would in general depend on the relative costs imposed by each of these two aspects (short-lasting governments vs. long-lasting negotiations) of political instability.

Appendix

In this Appendix, I derive analytic expressions for the likelihood function and the densities of negotiation durations and government durations implied by the model.

Recall that

$$g(y|s,\ t;\ H,\ M) \equiv \alpha_s\left[\frac{y^{\alpha_s-1}}{\bar{y}(t;\ H,\ M)^{\alpha_s}}\right],\quad 0 \leq y \leq \bar{y}(t;\ H,\ M),$$

where

$$\bar{y}(t;\ H,\ M) \equiv \left(\frac{\gamma_M}{\gamma_M+1}\right)(H-t),$$

and

$$f(d|y;\, H,\, M) \equiv \gamma_M\left[\frac{d^{\gamma_M-1}}{\bar{d}(y;\, H,\, M)^{\gamma_M}}\right], \quad 0 \leq d \leq \bar{d}(y;\, H,\, M),$$

where $\bar{d}(y; H, M) \equiv [(\gamma_M + 1)/\gamma_M]y$, $\alpha_s > 0$, and $\gamma_M > 0$, which imply that the joint density of (y, d) is given by

$$f_{yd}(y,\, d|s,\, t;\, H,\, M) = \alpha_s\left[\frac{y^{\alpha_s-1}}{\bar{y}(t;\, H,\, M)^{\alpha_s}}\right]\gamma_M\left[\frac{d^{\gamma_M-1}}{\bar{d}(y;\, H,\, M)^{\gamma_M}}\right], \tag{A1}$$

$0 \leq d \leq \bar{d}(y; H, M)$, $0 \leq y \leq \bar{y}(t; H, M)$, $\alpha_s > 0$, and $\gamma_M > 0$.

The first step in the derivation of the likelihood function consists of using (7) to obtain an expression for the reservation cakes characterizing the agreement rule, $y^*(s, t; H, M)$, which depends only on what the econometrician observes. The reservation cakes are the solution to the following systems of recursive equations:

$$\begin{aligned} y^*(s,\, t;\, H,\, M) = \beta \sum_{s'=\text{low, high}} \hat{p}_{ss'}\Bigg\{&\left(\frac{\alpha_{s'}}{\alpha_{s'}+1}\right)\bar{y}(t+1;\, H,\, M) \\ &+ \left(\frac{1}{\alpha_{s'}+1}\right)\left[\frac{y^*(s',\, t+1;\, H,\, M)^{\alpha_{s'}+1}}{\bar{y}(t+1;\, H,\, M)^{\alpha_{s'}}}\right]\Bigg\}, \end{aligned} \tag{A2}$$

$M = 0, 1$, $s =$ low, high, $t = 0, 1, \ldots, T - 1$, and $y^*(s, T; H, M) = 0$ for all s and M.

Given the reservation cakes, I derive analytic expressions for (8) and (9) as

$$\begin{aligned} \Pr[y < y^*(s,\, t;\, H,\, M)] &= G(y^*(s,\, t;\, H,\, M)\,|\,s,\, t;\, H,\, M) \\ &= \left[\frac{y^*(s,\, t;\, H,\, M)}{\bar{y}(t;\, H,\, M)}\right]^{\alpha_s} \end{aligned} \tag{A3}$$

and

$$\begin{aligned} &\Pr[y \geq y^*(s,\, t;\, H,\, M),\, d] \\ &= \int_{\max\{y^*(s,\, t;\, H,\, M),\, [\gamma_M/(\gamma_M+1)]\, d\}}^{\bar{y}} f_{yd}(y,\, d)\, dy \\ &= \gamma_M\alpha_s d^{\gamma_M-1}\left(\frac{\gamma_M}{\gamma_M+1}\right)^{\gamma_M}\bar{y}(t;\, H,\, M)^{-\alpha_s}\cdot\left(\frac{1}{\alpha_s-\gamma_M}\right) \\ &\times\left[\bar{y}(t;\, H,\, M)^{\alpha_s-\gamma_M} - \max\left\{y^*(s,\, t;\, H,\, M),\, \left(\frac{\gamma_M}{\gamma_M+1}\right)d\right\}^{\alpha_s-\gamma_M}\right], \end{aligned} \tag{A4}$$

respectively, from which the likelihood function can easily be constructed.

The marginal densities of negotiation durations and government durations predicted by the model can also be easily derived using (A3) and (A4) since

$$f_\tau(\tau|s_0, \ldots, s_\tau; H, M) = \prod_{t=0}^{\tau-1} \Pr[y < y^*(s_t, t; H, M)] \cdot \Pr[y \geq y^*(s_\tau, \tau; H, M)] \tag{A5}$$

and

$$f_d(d|s_\tau, \tau; H, M) = f_d(d|y \geq y^*(s_\tau, \tau; H, M)) = \frac{\Pr[y \geq y^*(s_\tau, \tau; H, M), d]}{\Pr[y \geq y^*(s_\tau, \tau; H, M)]}. \tag{A6}$$

References

Austen-Smith, David, and Banks, Jeffrey. "Elections, Coalitions, and Legislative Outcomes." *American Polit. Sci. Rev.* 82 (June 1988): 405–22.

———. "Stable Governments and the Allocation of Policy Portfolios." *American Polit. Sci. Rev.* 84 (September 1990): 891–906.

Balakrishnan, N., and Cohen, A. Clifford. *Order Statistics and Inference: Estimation Methods.* San Diego: Academic Press, 1991.

Baron, David P. "A Spatial Bargaining Theory of Government Formation in Parliamentary Systems." *American Polit. Sci. Rev.* 85 (March 1991): 137–64.

———. "Government Formation and Endogenous Parties." *American Polit. Sci. Rev.* 87 (March 1993): 34–47.

Baron, David P., and Ferejohn, John A. "Bargaining in Legislatures." *American Polit. Sci. Rev.* 83 (December 1989): 1181–1206.

Barro, Robert J. "Economic Growth in a Cross Section of Countries." *Q.J.E.* 106 (May 1991): 407–43.

Basawa, Ishwar V., and Prakasa Rao, B. L. S. *Statistical Inference for Stochastic Processes.* New York: Academic Press, 1980.

Binmore, Ken. "Perfect Equilibria in Bargaining Models." In *The Economics of Bargaining,* edited by Ken Binmore and Partha Dasgupta. Oxford: Blackwell, 1987.

Browne, Eric C., and Frendreis, John P. "Allocating Coalition Payoffs by Conventional Norm: An Assessment of the Evidence from Cabinet Coalition Situations." *American J. Polit. Sci.* 24 (November 1980): 753–68.

Cramton, Peter C., and Tracy, Joseph S. "Strikes and Holdouts in Wage Bargaining: Theory and Data." *A.E.R.* 82 (March 1992): 100–121.

Eckstein, Zvi, and Wolpin, Kenneth I. "Duration to First Job and the Return to Schooling: Estimates from a Search-Matching Model." *Rev. Econ. Studies* 62 (April 1995): 263–86.

Flinn, Christopher J., and Heckman, James J. "New Methods for Analyzing Structural Models of Labor Force Dynamics." *J. Econometrics* 18 (January 1982): 115–68.

Gamson, William A. "A Theory of Coalition Formation." *American Sociological Rev.* 26 (June 1961): 373–82.

Johnson, Norman L., and Kotz, Samuel. *Continuous Univariate Distributions.* 2 vols. Distributions in Statistics. New York: Wiley, 1970.

Kennan, John. "Repeated Contract Negotiations with Persistent Private Information." Manuscript. Madison: Univ. Wisconsin, 1994.

Kennan, John, and Wilson, Robert B. "Strategic Bargaining Models and

Interpretation of Strike Data." *J. Appl. Econometrics* 4 (suppl; December 1989): S87–S130.

King, Gary; Alt, James E.; Burns, Nancy E.; and Laver, Michael. "A Unified Model of Cabinet Dissolution in Parliamentary Democracies." *American J. Polit. Sci.* 34 (August 1990): 846–71.

Laver, Michael, and Schofield, Norman. *Multiparty Government: The Politics of Coalition in Europe.* New York: Oxford Univ. Press, 1990.

Laver, Michael, and Shepsle, Kenneth A. "Coalitions and Cabinet Government." *American Polit. Sci. Rev.* 84 (September 1990): 873–90.

Lippman, Steven A., and McCall, John J. "Job Search in a Dynamic Economy." *J. Econ. Theory* 12 (June 1976): 365–90.

Merlo, Antonio. "An Econometric Analysis of Government Tenure Histories: The Italian Case." Working Paper no. 91-28. New York: New York Univ., C. V. Starr Center Appl. Econ., 1991.

Merlo, Antonio, and Wilson, Charles A. "Efficient Delays in a Stochastic Model of Bargaining." Manuscript. New York: New York Univ., C. V. Starr Center Appl. Econ., 1994.

———. "A Stochastic Model of Sequential Bargaining with Complete Information." *Econometrica* 63 (March 1995): 371–99.

Mershon, Carol A. "Expectations and Informal Rules in Coalition Formation: Lessons from Italian Governments." Working Paper no. 170. St. Louis: Washington Univ., 1991.

Osborne, Martin J., and Rubinstein, Ariel. *Bargaining and Markets.* San Diego: Academic Press, 1990.

Pasquino, Giuseppe. *Il Sistema politico italiano.* Bari: Laterza, 1985.

Presidenza del Consiglio dei Ministri. "I 52 ministeri dalla liberazione a oggi." *Vita Italiana* (December 1994), p. 119.

Riker, William H. *The Theory of Political Coalitions.* New Haven, Conn.: Yale Univ. Press, 1962.

Rubinstein, Ariel. "Perfect Equilibrium in a Bargaining Model." *Econometrica* 50 (January 1982): 97–109.

Strom, Kaare. "Party Goals and Government Performance in Parliamentary Democracies." *American Polit. Sci. Rev.* 79 (September 1985): 738–54.

———. *Minority Government and Majority Rule.* Cambridge: Cambridge Univ. Press, 1990.

Sutton, John. "Non-cooperative Bargaining Theory: An Introduction." *Rev. Econ. Studies* 53 (October 1986): 709–24.

Warwick, Paul. "Economic Trends and Government Survival in West European Parliamentary Democracies." *American Polit. Sci. Rev.* 86 (December 1992): 875–87.

Wolpin, Kenneth I. "Estimating a Structural Search Model: The Transition from School to Work." *Econometrica* 55 (July 1987): 801–17.