Electoral Uncertainty and the Stability of Coalition Governments

Daniela Iorio[*]

Universitat Autonoma de Barcelona

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Abstract

In multiparty parliamentary democracies government coalitions frequently reshuffle the allocation of cabinet posts, and cabinets terminate before the end of the legislature. I interpret these events as equilibrium outcomes of a strategic interaction among political parties. Parties' incentives to terminate the government and seek early elections depend on future electoral prospects, and electoral opinion polls convey information regarding possible shifts in the electoral support. I develop a dynamic strategic model of government formation and termination, and structurally estimate the model using newly collected data on eleven Western European parliamentary democracies over the period 1970-2002. Using the estimated model I conduct counterfactual experiments aimed to evaluate the effects of poll informativeness and institutional features on the survival probabilities of coalition governments.

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1 Introduction

In parliamentary democracies a crucial dimension of political instability is the frequent termination of governments before the end of the legislature. There is a large consensus among scholars that political instability may have severe consequences on economic performance and growth[1]. This observation has motivated a growing research interest in understanding the determinants of cabinet instability.

While the existing empirical literature abounds of studies of the political and economic factors affecting government termination (e.g., King et al. (1990), Warwick (1994), Merlo (1998)), the dominant approach does not consider that the dissolution of the cabinet is the outcome of a strategic interaction among political parties[2]. In fact, in multiparty parliamentary democracies the government is typically formed by a coalition of parties, and the stability of the government crucially depends on the ability of parties to maintain a political agreement within the coalition and retain a majority support in the Parliament. Moreover, in the political negotiation process, what determines the attractiveness of dissolving the current government (i.e. the value of the outside option) are the expected future electoral prospects, which can be predicted by electoral opinion polls.

Based on these considerations, I propose a framework for the study of government formation, reshuffle, and dissolution that emphasizes the role played by the strategic reaction of political parties to electoral polls. Intuitively, parties are uncertain about the outcome of the next scheduled election, but they receive information regarding potential shifts in the electoral support through opinion polls, so they can foresee their future electoral gains or losses. This may lead coalition parties to negotiate over

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[1] See, e.g., Alesina et. al (1996) and Barro (1991). For an extensive review of the theoretical and empirical works that examine the relationship between political instability and economic outcomes see Carimignani (2003).

[2] An exception is represented by Diermeier and Stevenson (2000). They derive a number of testable predictions from the bargaining model of government termination developed by Lupia and Strom (1995). They conclude that a strategic approach may prove useful in explaining cabinet terminations.

whether to preserve, dissolve, or reshuffle the current government.

Recent European political events provide anecdotal evidence that anticipated shifts in the electoral support affect the strategic interaction of cabinet parties, and therefore the likelihood of cabinet reshuffles and termination. For instance, in April 2005 the Italian Prime Minister's party suffered heavy losses in regional elections (which may be interpreted as a signal about the distribution of parliamentary seats if general elections were held), and one of the cabinet parties quit the coalition threatening the government's survival. The *New York Times* reported that the Italian Prime Minister "under pressure from his allies, said he was open to the idea of an early general election in October [...] but then he accepted to form a new government for the last year of the administration's term avoiding the need for a snap election he would probably lose. [...] He said he would face both houses of Parliament to determine whether he has the support to continue until his mandate expires in 2006 and that 'the reaction of Parliament' would determine whether new elections would be called or the cabinet reshuffled". In the end, the partisan composition of the cabinet did not change, although there was a reallocation of cabinet ministers within the ruling coalition, and the government lasted until the end of the legislature. This example seems to suggest that, following a shift in the electoral support, a renegotiation of office-holding benefits (in the form of a cabinet reshuffle) was necessary to avoid early elections and government termination.

There is also evidence that opinion polls may lead to government dissolution. In fact, parties may strategically decide to hold early elections if opinion-poll ratings are high. The *Keesings Record of World Events* reported that in the fall of 1982 "whereas (the German) Parliament's full four-year term was not due to expire until 1984, Dr. Kohl had declared his intention to seek an early general election in order to obtain a confirmation of broad national support for the new CDU-CSU/FDP coalition [...] the dissolution of the Bundestag and the calling of early elections could normally occur only if the Federal Chancellor requested, but failed to obtain, a vote of confidence from an absolute majority of the full membership of the Bundestag, thus obliging Dr. Kohl

deliberately to lose such a vote in order to achieve his aim [...]". The polls released in the Fall of 1982 can provide an explanation for Dr. Kohl's incentive to terminate the government. In particular, as reported in Table 1, a comparison of current and expected vote shares shows an electoral gain for the Prime Minister party and an electoral loss for the other coalition member. Furthermore, the results of the general election were remarkably close to the released polls.

Table 1

	old vote shares	released poll	new vote shares
CDU-CSU	45%	50%	49%
FDP	10%	5.6%	6.8%
SDP	43%	39.6%	39%

To empirically investigate the impact of electoral polls on government duration, I develop and structurally estimate a tractable dynamic model of government formation and termination. Following a general election and the selection of the prime minister[3], who proposes a ruling coalition, a government is formed. In any period prior to the end of the legislature, public opinion polls are released. After observing this (noisy) signal of the electoral outcome, the ruling coalition may need to renegotiate the distribution of office-holding benefits in order to preserve or dissolve the current government. After the renegotiation, all parties represented in the parliament decide whether or not to support the current government. If the ruling coalition retains the support of a parliamentary majority, then it stays in office. If not, then general elections are held at the end of the period. If the government lasts until the end of the legislature, regularly scheduled elections take place in the next period. After any elections, a new government formation process begins, and the game starts over again.

I characterize the subgame-perfect equilibrium of this game. The equilibrium out-

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[3]The probability of each party of being selected to be a *formateur* depends on the party's seat share and the identity of the previous prime minister.

comes are the sequence of ruling coalitions of parties, and the duration of their governments.

I estimate the model by the simulated method of moments using a newly collected data set from eleven Western European parliamentary democracies with a proportional electoral system (Austria, Belgium, Denmark, Finland, Germany, Ireland, Italy, Luxemburg, Netherlands, Portugal, and Spain) over the period 1970-2002. The estimated model fits the salient features of the data well. I find that the strategic reaction of coalition parties to electoral uncertainty plays a quantitatively important role in explaining the patterns of government duration observed in the data.

Using the estimated model I conduct counterfactual experiments aimed to evaluate the impact on government survival probabilities of i) polls informativeness, and ii) alternative institutional environments.

In the first experiment, I investigate how parties react to polls that are perfectly informative (rather than noisy signals of the electoral outcome). I find that in the absence of electoral uncertainty cabinets are more stable. This is due to an increase in the stability of majority governments, especially towards the end of the legislature. This impact is particularly large in the case of surplus governments. According to the model, when parties expect an electoral gain, the incentive to terminate the government increases if they can perfectly forecast future electoral prospects. Similarly, in the presence of an electoral loss, the attractiveness of remaining in power is higher without electoral uncertainty, especially for the party of the prime minister since the identity of the future prime minister is unknown. As a consequence, a prime minister that expects an electoral loss is well-motivated to find a compromise with the ruling coalition partners to ensure the survival of the government (even if it might be very costly when the coalition partners expect an electoral gain). With a surplus government, the likelihood of survival may increase because the prime minister does not need the support of all the coalition parties in order to retain a majority.

In the other experiments, I examine how the equilibrium decisions of forming and

dissolving a government vary in response to a change in the political environment where parties' renegotiations take place. The first experiment I consider consists of changing the length of the inter-election period. I find that a longer inter-election period increases the survival probability of governments over all cabinet ages. This is mostly due to an increase in the fraction of majority governments that form in equilibrium. Intuitively, given that majority governments are expected to last longer, the value of forming a majority coalition increases with the length of the inter-election period. Moreover, minority governments tend to be more stable when they approach the end of the legislature.

The second experiment consists of imposing that no new dissolution of Parliament may take place before a year has passed since the previous one. While this policy obviously increases the stability of the government when the legislature begins, the downfall probability increases after the first year over all future periods. A possible explanation is that the fraction of minority governments doubles since the prime minister may now want to form a government with a fewer parties (in order to increase the received proportion of current office-holding benefits), even though a smaller coalition decreases the expected probability of surviving after the first period.

Finally, I impose that the party with the highest seat share is selected to be the *formateur*. This in turn eliminates the uncertainty about the identity of the future prime minister. As a result, governments tend to be more unstable. This is due to an increase in the fraction of minority governments, and a decrease in the fraction of surplus governments formed in equilibrium. Moreover, the survival probability decreases over all ages and types of coalitions. A possible explanation is that this selection rule of the prime minister generates an incumbency effect, that is the party with the largest average seat share, and his most preferred coalitions, are selected more frequently. Hence, the prime minister, and also his coalition parties, tend to value less the benefits of being in office with the current government, given that the likelihood of being part of a ruling coalition is high in the future. This might explain why in equilibrium all

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coalition types are more unstable. In addition, since the prime minister expects to be in power more frequently, he may want to form a government with a fewer parties (in order to increase his proportion of current office-holding benefits), even though a smaller coalition size decreases the expected survival probability of his cabinet.

In the next section I discuss the relationship of my work with the existing literature. The remaining of the paper is organized as follows. In Section 2, I develop the model, I characterize the equilibrium, and I discuss the solution method. In Section 3, I describe the data, and the empirical procedure. In Section 4, I present the counterfactual experiments. In section 5, I conclude.

1.1 Related Literature

Starting with Lupia and Strom (1995), there is a strand of the theoretical literature that focuses on political uncertainty as an input into a coalition bargaining process. Lupia and Strom (1995) develop a one-period bargaining model where public opinion shocks determines the electoral prospects of all parties if election were held immediately. Since the model is static, government reshuffles or government termination depend on the size of transaction costs. Baron (1998) proposes a dynamic model of government stability, building on Dieremeier and Feddersen (1996). Baron shows that government dissolution emerges when the bargaining horizon is relatively short, and the discount factor is low. Diermeier and Merlo (2000) show that a two-periods dynamic model of government formation and termination can generate minority and surplus governments, cabinet reshuffles, and dissolution as equilibrium phenomena.

The existing literature is also rich with empirical studies of the political and economic factors affecting government duration (e.g., King et al. (1990), Warwick (1994) and citations therein, and Merlo (1998)). In general, they find that both the political environment (e.g., number of parties represented in the parliament, length of the negotiation period leading to the government formation, size of the ruling coalition, time horizon to the next scheduled election), and the economic conditions (e.g., current

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inflation, unemployment rate, number of workhours lost in strikes) affect the downfall probability of the government. My work differs from these empirical studies in several dimensions. First, in my framework both the formation and the dissolution of the government are endogenous. Second, I focus on the strategic interaction among parties, and I provide a systematic explanation of the mechanism by which electoral polls affect the endogenous outcomes. Third, the structural approach allows me to evaluate the impact on government stability of several institutional features, which will prove helpful for constitutional design.

The empirical paper that is most closely related to mine is Diermeier et al. (2003). They also study the relationship between political institutions and the formation and stability of governments. However, the main difference between their work and mine is in focus. They develop a dynamic stochastic bargaining model of government formation, where the level of surplus from being in office depends on the expected government duration that is treated as exogenous. In their framework, delayed agreements may occur in equilibrium since coalitions may have an incentive to wait for a state of the world that is associated with a longer expected duration. When the proto-coalition parties reach an agreement the game is over. They use their estimated model to investigate how the political environment affects the duration of the government formation process, and the equilibrium selection of coalitions. In addition, since the expected duration is assumed to depend upon the selected coalition, and institutional features, they can also infer the impact of the political institutions on the average government stability. In my study, I do not focus on the dynamic patterns of government formation (for instance, I impose that the agreement on the selected coalition must be reached at the first round), but a more stylized modeling of the coalition selection process allows me to fully endogeneize the later negotiation process that may lead to the termination of the government. By doing so, I can study the dynamic patterns of cabinet duration that we observe in the data, and investigate the role played by the strategic reaction of political parties to electoral polls in explaining cabinet reshuffles and terminations.

Finally, rather than measuring the government stability using its average duration, I exploit the survival probabilities because they provide a richer picture of government stability[4].

2 The Model

Consider a model where there are N (non-extremist) parties represented in the parliament, indexed by $h = 1, ..., N$. [5] Time is discrete and infinite. The decision period, t, is one year. Parties are infinitely-lived but, given the constitutional fixed inter-election period, a government coalition can stay in power at most $\overline{A}$ periods, where $a_t = 0, ..., \overline{A}$ is the age of the government at time t. I denote the vector of the parties' seat shares after an election by $\boldsymbol{\pi}_t \in \Pi_t = \{ (\pi_t^1, ..., \pi_t^N) : \pi_t^h \in (0, \frac{1}{2}], \sum_{h \in N} \pi_t^h \leq 1 \}$, and the seat shares controlled by the extremist parties by $\pi_t^e = 1 - \sum_{h \in N} \pi_t^h$. A ruling coalition, $\mathbf{c}_t \in C_t$, includes either two or three parties, and let $\Pi_{\mathbf{c}_t}$ be the size of the coalition.

Let $h = k$ denote the party that has been selected as the *formateur*. After an election, each party h is selected to be the formateur with probability,

$$\Pr(\boldsymbol{\pi}_t^h, k_{t-1}) = \begin{cases} 1 \text{ if } \pi_t^h \geq 0.5 \\ \frac{\exp(\alpha_0 \pi_t^h + \alpha_1 \mathbf{I}^h)}{\sum_{n \in N} \exp(\alpha_0 \pi_t^n + \alpha_1 \mathbf{I}^n)} \text{ if } \pi_t^h < 0.5, \forall h \in N \\ 0 \text{ if } \exists n \neq h : \pi_t^n \geq 0.5, \end{cases} \tag{1}$$

where $k_{t-1} \in N$ is the party of the former prime minister, and $\mathbf{I}^h$ is an indicator variable that takes value one if $k_{t-1} = h$, and zero otherwise. This specification reflects the idea that if no party controls the absolute majority of the parliamentary seats, the prime

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[4]For example, given that in Belgium governments last on average one year more than in Italy, we might infer that government coalitions are remarkably more stable in Belgium than in Italy. However, only about half of the governments survive more than one year in both countries. Furthermore, governments display a close average duration in Spain and in Netherlands, but in Spain governments always last more than eighteen months, and in Netherlands only 60% do so.

[5]I define an extremist party as a party that will never be part of a ruling coalition.

minister is more likely to be selected from relatively larger parties rather than from relatively smaller parties, but there could also be an incumbency effect.

Parties have linear preferences over the benefits from holding office, x_t^h. I assume that only the cabinet controls the allocation of perks, and when parties form a government, they agree on allocating office-holding benefits according to the relative strength of each party in the governing coalition (which is measured by the party's relative seat share).[6] Formally, letting i denote a coalition member and j an opposition party, the benefit of party h from holding office is,

$$
x_t^h = \begin{cases}
\frac{\pi_t^h}{\Pi_{\mathbf{c}_t}} (1-b) \phi_t (\mathbf{c}_t, \eta_t) & \text{if } h = i \\
\frac{\pi_t^h}{\Pi_{\mathbf{c}_t}} (1-b) \phi_t (\mathbf{c}_t, \eta_t) + b\phi_t (\mathbf{c}_t, \eta_t) & \text{if } h = k \\
0 & \text{if } h = j,
\end{cases}
$$

where $b \in [0,1)$ is a bonus for the prime minister's party, which can be interpreted as an advantage to this party from being the proposer, and ϕ_t is the level of surplus generated by office-holding benefits at time t.

The level of surplus, ϕ_t, is assumed to depend upon the government type: minority, minimum winning, and surplus governments.[7] This assumption captures the idea that the search for compromise between the government and the opposition may be more costly for coalitions of smaller size, and therefore it may decrease the total level of surplus generated by office-holding benefits. Moreover, the level of surplus depends upon the current state of the world (i.e. the political and economic conditions in which the negotiations take place), which is known to the political parties but it is unobservable to the econometrician. The state of the world is summarized by a random component η_t, which is assumed to be normally distributed, $\eta_t \sim N(0, \sigma^2)$, and serially

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[6]This particular sharing rule is an equilibrium outcome of several "demand-based" bargaining models (e.g., Morelli, 1999). Moreover, several empirical works (e.g., Browne and Frendreis, 1980) support this theoretical result.

[7]A minority coalition controls less than 50% of the seats. A minimum winning coalition controls more than 50% of the seats as long as no party withdraws from the coalition. A surplus coalition maintains the control of more than 50% of the seats even if a party withdraws from the coalition.

independent over time. Specifically, the parametrization of the surplus generated from being in office at time t is,

$$\phi_t = \exp\left(\left(\gamma_1 + \gamma_2 \Pi_{c_t}\right) MIN_t + \left(\gamma_3 + \gamma_4 \Pi_{c_t}\right) MW_t + \left(\gamma_5 + \gamma_6 \Pi_{c_t}\right) SURP_t + \eta_t\right),$$

where MIN is a variable that takes value one if the government is a minority, MW is a variable that takes value one if the government is a minimum winning coalition, $SURP$ is a variable that takes value one if the government is a surplus coalition.

After observing the electoral opinion polls, the coalition parties can renegotiate the allocation of the surplus within the ruling coalition. Hence, the current payoff of party h is,

$$U_t^h = \begin{cases} x_t^h + y_t^h & \text{if } h = k, i \\ 0 & \text{if } h = j, \end{cases}$$

where the transfers y_t^i are determined in equilibrium.

2.1 Timing

After a general election, following the end of a legislature or the resignation of the incumbent government, nature chooses a formateur that selects the proto-coalition parties. The formateur can either form a single-party government or announce a proto-coalition. If all parties in the proto-coalition accept the offer then a coalition government is formed, otherwise a single-party government is in power.

At each period an observable noisy signal about the distribution of parliamentary seats if elections were held in the next period $\tilde{\boldsymbol{\pi}}_t = \left(\tilde{\pi}_t^1, ..., \tilde{\pi}_t^N\right)$ is realized. After observing $\tilde{\boldsymbol{\pi}}_t$, the prime minister proposes a reshuffle of office benefits among the coalition parties. He makes a take-it-or-leave-it offer of transfers contingent on supporting the government or not. The coalition parties sequentially respond by either accepting or rejecting the offer. The order in which they respond is chosen by the prime minister. If a coalition party accepts the prime minister's offer, then they both commit to vote according to the new agreement. If a coalition party rejects the offer, then they vote as

if no transfers were allowed. After the proposal, all parties represented in the parliament decide whether to support or not the current government. If the ruling coalition retains a majority support, then it stays in office. If not, general elections are held next period.

At age $\overline{A}$ the government terminates and regularly scheduled elections take place next period. After any elections, the game starts over again, and the new electoral outcome is $\boldsymbol{\pi}_t = \tilde{\boldsymbol{\pi}}_{t-1} + \boldsymbol{\varepsilon}_t$, where $\boldsymbol{\varepsilon}_t$ denotes the noise in the electoral signal. The timing is summarized in the picture below.
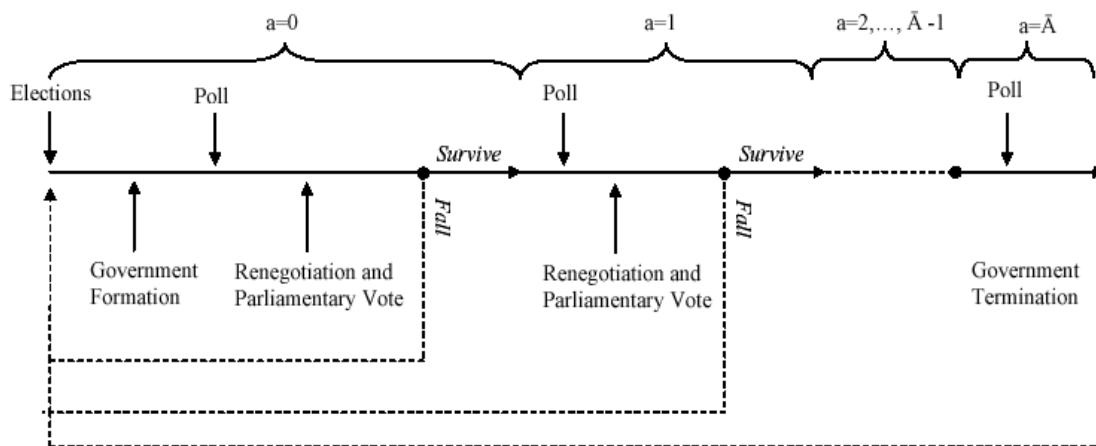
Timing

2.2   Recursive Formulation and Equilibrium

Each party h maximizes the expected present discounted value of utility over an infinite horizon. The value function at time t, $V_t^h(\Omega_t)$, is defined as the maximal expected present value given the state space Ω_t,

$$V_t^h(\Omega_t) = \max_{\{d_t^h\}} E\left[\Sigma_{\tau=t}^{\infty} \beta^{\tau-t} U_t^h\left(d_t^1, ..., d_t^N\right) | \Omega_t\right],$$

where β is the discount factor, and d_t^h is the action of player h. In the presence of constitutional fixed inter-election periods the value function is nonstationary because

the life time of the government is finite and players' actions depend on the age of the government.

To economize on notation, in the following sections I suppress the party index if a variable is defined in the same way for all parties, and the time index. I will first describe the coalition formation game, and then the renegotiation game.

2.2.1 The coalition formation game

After an election, the relevant information set includes the outcome of the elections, the identity of the proposer, and the current state of the world, that is $\Omega_0 = (\boldsymbol{\pi}, k, \eta)$. The formateur can either form a single-party government, $\mathbf{c} = \{k\}$, or announce a proto-coalition, $\mathbf{c} \in C$, and sequentially ask the selected parties to join the coalition. If all parties in the proto-coalition accept, then the coalition government is formed, and the expected payoff of each party i is,

$$E_{\tilde{\boldsymbol{\pi}}} V_0^i \left(\Omega_0, \tilde{\boldsymbol{\pi}}; \mathbf{c} \right),$$

where the expectation is taken over the realization of the electoral polls at the end of the period, $\tilde{\boldsymbol{\pi}}$. If at least one party included in the proto-coalition rejects, then $\mathbf{c} = \{k\}$, and the expected payoff of each party i is,

$$E_{\tilde{\boldsymbol{\pi}}} V_0^i \left(\Omega_0, \tilde{\boldsymbol{\pi}}; k \right).$$

The proposer chooses the proto-coalition that maximizes his expected payoff, subject to the participation constraint of the proto-coalition parties. For all states $(\boldsymbol{\pi}, k, \eta)$, the optimal $\mathbf{c}(\Omega_0)$ must solve the problem,

$$V_0^{k*}(\Omega_0) = \max_{\mathbf{c} \in C} EV_0^k \left(\Omega_0, \tilde{\boldsymbol{\pi}}; \mathbf{c} \right)$$

$$\text{s.t. } EV_0^i \left(\Omega_0, \tilde{\boldsymbol{\pi}}; \mathbf{c} \right) \geq EV_0^i \left(\Omega_0, \tilde{\boldsymbol{\pi}}; k \right) \ \forall i,$$

where V_0^* is the value of forming a government associated with the optimal $\mathbf{c}$.

Parties may value differently the potential coalition partners because the surplus generated from holding office varies across coalition types, its allocation depends on the number and size of the coalition partners, and the partisan composition of the coalition determines the number and identity of parties the proposer can renegotiate with in the future. In addition, when the formateur selects a coalition, he faces a trade-off between 'stability' (larger coalitions are expected to last longer) and 'control' (the fraction of benefits received by each member decreases with the number of coalition parties).

Notice that a part of the state space is determined when the government is formed, i.e. $a_t = 0$, and does not change during the life time of the government; namely the distribution of parliamentary seats, the identity of the prime minister, and the ruling coalition partners, $\bar{\Omega}_{0t} = (\boldsymbol{\pi}_t, k_t, \mathbf{c}_t)$.

2.2.2 The renegotiation game

In any period before the end of the legislature, parties receive information regarding possible shifts in the electoral support through electoral polls. Whether the government terminates depends on all the parties' incentives to seek early elections because the cabinet has to retain a majority support in the parliament, and the ruling coalition needs to maintain an agreement on the allocation of office-holding benefits.

Parties' incentives to terminate the government depend not only on the future electoral prospects, but also on the current distribution of parliamentary seats, the partisan composition of the ruling coalition, the age of the government, and the institutional features (such as the length of the legislature). In fact, coalition parties may differently value their current and potential coalition partners because the surplus generated from holding office varies across coalition types, and its allocation depends on the number and size of the coalition partners. In addition, coalition and opposition parties may evaluate differently the future electoral prospects because of the uncertainty about the identity of the future prime minister and the ruling coalition that will be formed. For example, if poll ratings are high the incentive of seeking early elections is lower for a

coalition party than for an opposition party, especially for the prime minister party. On the contrary, an opposition party may have an incentive to seek early elections even in the presence of an electoral loss, if the expected probability of being in a ruling coalition is high enough in the future. Finally, since the continuation value of surviving decreases as the legislative period approaches the end, smaller and smaller expected electoral gains will be sufficient to trigger the termination of the government.

The prime minister, after observing the electoral signal, may propose a reshuffle of office benefits among the coalition parties in order to preserve (or not) the current government. During the renegotiation process, the relevant information set includes the distribution of seat shares, the identity of the prime minister (the proposer), the ruling coalition, the current state of the world, the realization of the signal, and the age of the government, that is $\Omega = \left(\bar{\Omega}_0, \tilde{\boldsymbol{\pi}}, \eta, a \right)$.

Before transfers are implemented, the continuation value of the government conditional on the government's survival (s) is,

$$x\left(\bar{\Omega}_0, \eta\right) + \beta E(V'\left(\Omega'\right)|\Omega; s),$$

where $\Omega' = \left(\bar{\Omega}_0, \eta', \tilde{\boldsymbol{\pi}}', a+1\right)$, and x are the benefits from holding office. If the government falls (f), the continuation value of forming a new government is,

$$x\left(\bar{\Omega}_0, \eta\right) + \beta E\left(V_0^{*'}\left(\Omega'_0\right)|\tilde{\boldsymbol{\pi}}, k; f\right),$$

where $\Omega'_0 = \left(\boldsymbol{\pi}', k', \eta'\right)$, and the expectation is taken over the identity of the new formateur, the noise in the electoral signal, and the future state of the world. Hence, the transfer that would make a party indifferent is,

$$w = \beta \left[EV_0^{*'}\left(\Omega'_0\right) - EV'\left(\Omega'\right)\right].$$

Notice that the price a party is willing to pay depends on its continuation value in the two scenarios $(s$ and $f)$. For instance, if $w > 0$ then a party needs to be paid at least w in order to vote in favor of the current government, or a party might pay at

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most w in order to shut the current government down. On the contrary, if $w < 0$ then a party might pay at most $|w|$ in order to remain with the current government, or a party needs to be paid at least $|w|$ in order to vote against the current government. Finally, if $w = 0$ then a party is indifferent, and without loss of generality I assume that he chooses to support the current government. Since a party is able to transfer at most its current benefits (x) and it is willing to transfer at most $|w|$, then the upper bound of the transfer a party is able and willing to make is,

$$\hat{y} = \min \{|w|, x\}.$$

If only one party is in office, then no transfers can be implemented. The government will fall if the parties with an incentive to terminate the government can reach a simple majority. A more interesting case is the one in which parties can renegotiate their agreement.

To further explore how anticipated shifts in the electoral support affect the strategic interaction of cabinet parties, and hence the likelihood of cabinet reshuffles and termination, consider the following example. There are four non extremist parties, index by $h = 1, .., 4$, with seat's shares $\boldsymbol{\pi} = (0.38, 0.23, 0.2, 0.1)$. The remaining parliamentary seats are controlled by extremist parties, that is $\pi^e = 0.09$, and they are against the current government.[8] The prime minister belongs to party 2. The ruling coalition is formed by three parties (2, 3 and 4), and the proportion of office-holding benefits received by each coalition party is $x^2 = 2.196$, $x^3 = 1.703$, and $x^4 = 0.852$ respectively. Furthermore, suppose that the time horizon to the next schedule election is two years. After observing the electoral polls, $\tilde{\boldsymbol{\pi}} = (0.35, 0.19, 0.22, 0.15)$, parties 1 and 2 expect an electoral loss, and parties 3 and 4 an electoral gain. In this scenario, the values of the outside option (i.e., terminating the government) compared to the payoffs of staying

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[8]In numerically solving this dynamic model, the cost of computing the parties' expectations over all possible future states increases exponentially in the number of players. Therefore, the strategic behavior of extremist parties is not explicitly modelled, and it is summarized by a parameter e, which is the proportion of extremists that do not support the government.

with the current government are $w^1 = 0.09, w^2 = -1.19, w^3 = -0.35$,and $w^4 = 0.082$.

Notice that although the opposition party expects an electoral loss, it still has an incentive to terminate the government due to the expected probability of being in office in the future. On the contrary, even if party 3 expects an electoral gain of 2.5% it still supports the current government, because the future electoral prospects are not sufficiently high to compensate the uncertainty about the partisan composition of the future coalition.

Before transfers are implemented, the government does not retain a simple majority in the parliament. Therefore, parties 2 and 3 need to buy the support of party 4 to ensure the survival of the government. In the reallocation of office-holding benefits, the upper bounds of the transfers are $\hat{y}^2 = 1.19$ and $\hat{y}^3 = 0.35$. In order to induce party 4 to support the current government, the proposer has to offer at least $y^4 = 0.082$ to party 4. In this case, since $\hat{y}^2$ is sufficient to buy party 4's support, party 3 rejects any proposal to transfer part of his benefits to party 4. Therefore, in the SPNE outcome $\mathbf{y} = (-0.082, 0, 0.082)$, the prime minister transfers w^4 to party 4, and the government survives.[9]

If parties 2 and 3 were not able and willing to implement the transfer, then the government would fall without a renegotiation of the agreement.

Suppose now that the electoral loss of party 1 were sufficiently high to induce this opposition party to support the current government. In this case, the government would survive without a renegotiation of the agreement, because party 4 has to pay all the other coalition partners to induce the termination of the government, but it is not able and willing to do so, that is $\hat{y}^4 < 1.54$.

In this example, a renegotiation of office-holding benefits was necessary to avoid early elections and the termination of the government. For a characterization of the SPNE equilibrium outcome of the renegotiation game under all possible scenarios, see

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[9]A Nash Equilibrium outcome, which is not Subgame Perfect, is the one in which party 3 makes the transfer to party 4. This equilibrium is supported by a non-optimal behavior of the proposer off the equilibrium path.

Appendix A.

After the renegotiation process, at any given $\Omega_t = (\bar{\Omega}_0, \tilde{\boldsymbol{\pi}}, \eta, a)$, the value function of each party is,

$$V(\Omega) = \mathbf{I}_s V(\Omega; s) + (1 - \mathbf{I}_s) V(\Omega; f),$$

where $\mathbf{I}_s$ is an indicator function that takes value one if the government survives (s), and zero if it falls (f), and

$$V(\Omega; s) = x(\bar{\Omega}_0, \eta) + y(\Omega; s) + \beta E(V'(\Omega') | \Omega; s),$$
$$V(\Omega; f) = x(\bar{\Omega}_0, \eta) + y(\Omega; f) + \beta E(V_0^{*'}(\Omega_0') | \tilde{\boldsymbol{\pi}}, k; f).$$

At age $\overline{A}$ the government terminates and regularly scheduled elections will take place next period. The value function at the terminal age is,

$$V(\Omega) = x(\bar{\Omega}_0, \eta) + \beta E\left(V_0^{*'}(\Omega_0') | \tilde{\boldsymbol{\pi}}, k\right).$$

where $V_0^{*'}$ is the value of forming a new government in the next period.

2.3   The Solution Method

The solution of the model is not analytic. The numerical solution algorithm consists of the following steps. For each party h, given an initial guess of the value of forming a government V_0^{h*}, I compute the terminal-age value function $V_{\overline{A}}^h$. The nonstationary value functions V_a^{h*} and the decision rules for each age $a = 1, ..., \overline{A} - 1$ can be found by backwards recursion from $\overline{A} - 1$ (as in any finite horizon model). Next, I compute the new value of V_0^{h*}, and I iterate until I find the fixed point of the N value functions $V_0^{h*}, h = 1, .., N.$[10] To acknowledge that political institutions and party system vary

[10]In principle, the formation of a new government could also follow from the resignation of the incumbent one without the dissolution of the chamber. If I generalize the model in this direction, the challenge is that allowing for replacement governments increases the set of endogenous decisions, and affects the continuation values of forming and dissolving a government at each age. As a result, the

across countries, I solve the model for each country separately. In particular, I explicitly allow countries to differ in terms of i) the distribution of parliamentary seats [11], ii) the electoral rule (i.e. the mapping that transforms vote shares into seat shares), and iii) the maximum length of the legislative period, which it can be either four or five years in my sample.

Since parties are interested in the distribution of legislative seats, I need to transform the expected vote shares into expected seat shares. Following Besley and Preston (2005) I estimate the mapping of votes share v^h into seats share π^h for each country using the the following OLS model,

$$\ln\left(\frac{\pi^h}{1-\pi^h}\right) = \delta_0 + \delta_1 \ln\left(\frac{v^h}{1-v^h}\right) + u \tag{2}$$

where δ_0 measures the advantage that a party may have over another when they have the same vote shares, and δ_1 measures the deviation of the electoral system form proportional representation. Notice that if $\delta_0 = 0$ and $\delta_1 = 1$ the electoral system is perfectly proportional. The country-specific estimates of the parameters δ_0 and δ_1 are reported in Appendix B.

In order to solve and estimate the model I need to specify the distribution of the electoral signal, the noise of the signal, and the exogenous selection of the formateur. The transition probabilities of the electoral polls follow a Markov process, and they are computed directly from the data. The distribution of the noise in the electoral signal is also estimated directly from the data. See Appendix B for a discussion of the computation of the sample transition rates, and the estimation of the probability of being selected as the prime minister.

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fixed point becomes much more cumbersome to solve. In fact, the numerical solution of the model will require to recursively iterate not only over the value functions at age 0 for all parties and countries, given that there are $\bar{A}$ periods left, but also over the the value functions at age 0 for all parties and countries, at $\overline{A}, \overline{A} - 1, ..., 1$.

[11] For a detailed description of the parties structure see Appendix C.

3 Empirical analysis

3.1 Data

The unit of observation of the empirical analysis is a government, which is character-ized by the identity of the prime minister and his coalition parties.[12] I have collected data about 142 governments formed after a general election[13] in eleven Western European parliamentary democracies with a proportional electoral system (Austria, Belgium, Denmark, Finland, Germany, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain) over the period 1970-2002. The information about parties' vote and seat shares in each election were taken from the *European Journal of Political Research*.[14] The information about each government (i.e. the coalition size, coalition and opposition parties, the prime minister party, duration, etc.) were taken from Makie and Rose (1990), Woldendorp et al. (2000).

As for the coalition formation process, Figure 1 displays the relationship between the size of the party and the likelihood of being selected as the *formateur*. As we might expect, larger parties are more likely to be selected as the prime minister party than smaller parties. In about 60% of all governments the *formateur* party has been reappointed after an election. Parties tend to form different types of governments: in my sample 26% of the governments are minority governments, 42% are minimum winning coalitions, 23% are surplus coalitions, and the remaining 9% are single majority governments. On average the coalition controls about 53% of the seats. Most coalitions are formed by two and three parties (about 24% are single party governments, 40%

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[12]I do not count support parties as member of the cabinet.

[13]Given that the model does not allow parties to form a new coalition without holding an election, the replacement governments with changes in the party composition are excluded from the sample. If there is only a change in the allocation of cabinet portfolios, the two subsequent governments are treated as a unique observation. Finally, the sample does not include the governments that have failed to obtain the invenstiture vote. This selection procedure leads to a sample of 142 governments.

[14]See Appendix A for a list of parties that have been part of a coaltion.

has two coalition parties, 19% three coalition parties, 13% four coalition parties, and the remaining 4% five coalition parties), and 25% of the ruling coalitions have been reappointed after an election.
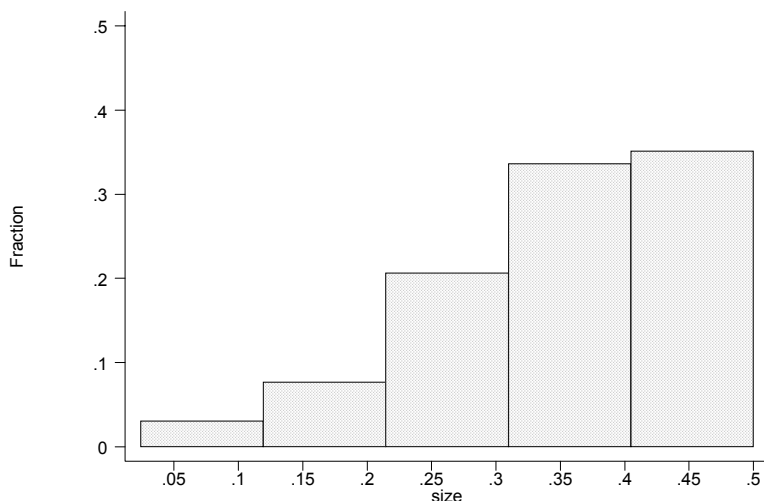

Figure 1: Histogram of Prime Minister Size

As for the cabinet stability, Figure 2 reports the fraction of type-specific governments terminating between year t and $t + 1$. It is interesting to notice that while on average a government lasts for two years and half, each coalition type displays different duration patterns. Minority governments tend to last shorter than majority governments. Minority governments either fall early or they reach at least the third year of tenure. Minimum winning coalitions are on average more stable than surplus coalition. This may be due to the fact that a single majority government (that is a minimum winning coalition) always lasts until the end of the legislature.

The survival probabilities of governments with maximal expected duration of four and five years are reported in Table 2. Governments tend to last longer when the fixed inter-election period is four years rather than five years. However, it is worth noticing that in the sample there are only three countries with a legislative period of five years, including Italy that displays the shortest average duration over all countries.
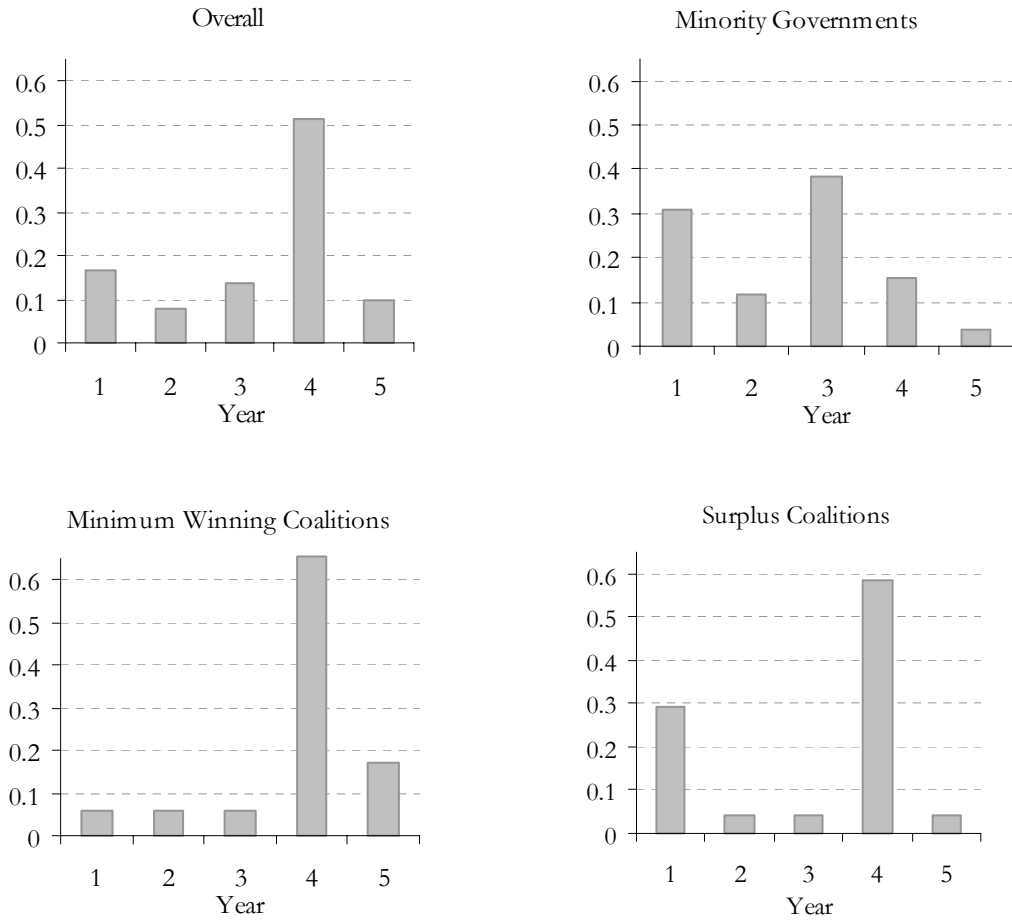
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Overall

Minority Governments

Minimum Winning Coalitions

Surplus Coalitions

Figure 2: Histogram of Government Termination

Table 2: Survival Probabilities

	Year	Survivor	Std. Err.
$A = 4$	1	.86	.04
	2	.78	.05
	3	.62	.06
$A = 5^*$	1	.74	.08
	2	.66	.09
	3	.59	.09
	4	.37	.09

*Ireland, Italy, and Luxemburg.

Regarding electoral polls, I have collected data about public opinion polls from the Eurobarometer Survey. This survey releases data twice a year (Spring and Fall). It is a repeated cross-sectional sample of persons aged 15 and over, residing in the EU member countries. Respondents are asked about their voting behavior, including their intention to vote in the next general elections, (if so) the party they would vote for, and the party they voted for in the last national elections.[15]

In the sample about 70 to 80 % of the respondents answer they would go to vote. This is consistent with the actual turnout in Western European Countries. Among those that have declared their intention to vote, 15% decided to cast their vote differently from the previous election. In order to measure the electoral polls I have used the survey question: "*If there were a general election tomorrow which party would you support?*", and I have simply calculated the proportion of respondents voting for each party.

Figure 3 shows the empirical distribution of the electoral shock, computed as the difference between the expected vote shares in two consecutive periods over all countries and parties. As expected, this distribution is symmetric around zero, and about 50%

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[15]Demographic and other background information provides respondents' age, gender, marital status, the household composition, education, occupation, religion, household income, region of residence, etc.

of the realized electoral shocks are in the range of -2% to 2%.
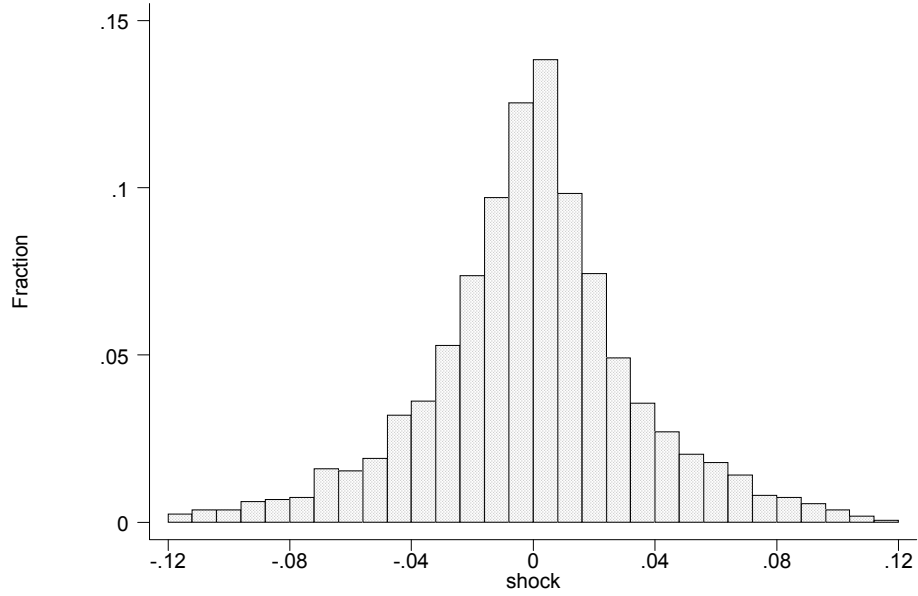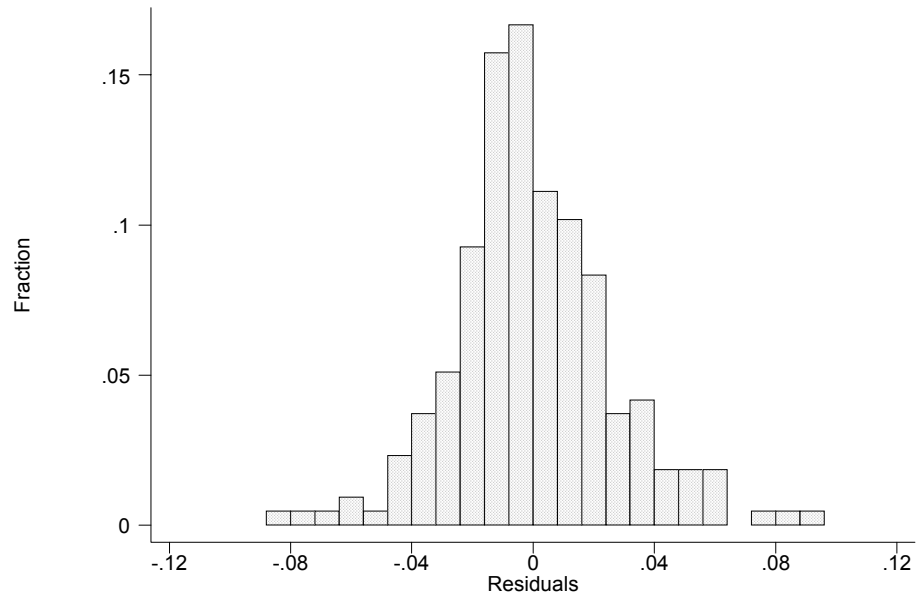

Figure 3: Histogram of Electoral Shock

Figure 4: Histogram of the Noise in the Electoral Signal

A natural question is how informative the polls are. In order to measure the noise

of the electoral signal, I first regress the realized vote shares on the electoral polls and party dummies using pooled OLS, and then I use the residuals as estimates of the noise.[16] Figure 4 shows the distribution of the noise over all countries and parties.

Figure 5 reports the fraction of governments terminating when the prime minister faces different electoral shocks. As seen in this picture, governments are more likely to fall when the prime minister party expects either a large electoral gain or a large electoral loss. A possible interpretation is that when the prime minister's poll ratings are high, the likelihood of being reappointed as the proposer increases (if the government falls). Hence, the future electoral gains are high enough to compensate for the uncertainty about the identity of the future prime minister. As a result, the incentive to terminate the current government increases. On the contrary, when the expected electoral loss is large, the prime minister is willing to transfer benefits to his coalition partners, but buying their support may be very costly if they are expecting a large electoral gain. Therefore, the likelihood of government termination increases.
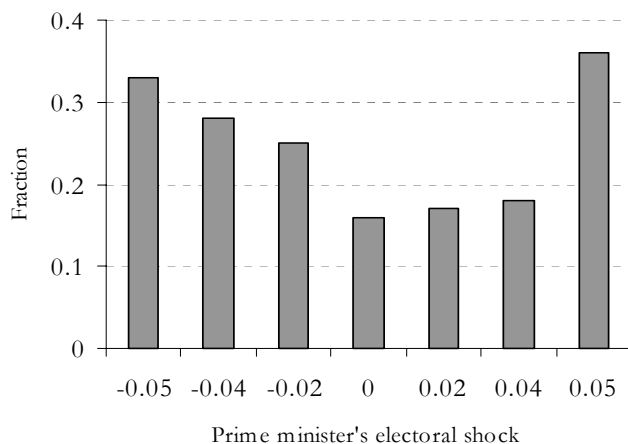

Figure 5: Electoral Shock and Government Termination

[16]I include party dummies to account for a systematic bias in the electoral poll ratings of some parties, such as the socialists in Italy and Portugal. The fact that their rating is constantly overstated can be interpreted as a 'stigma effect', because the fraction of voters supporting the communist party is constantly understated.

3.2 Estimation Method & Results

Since the cost of computing the parties' expectations over all possible future states increases exponentially in the number of players, I restrict the number of non extremist parties to four to maintain computational tractability. I focus on parties that have been in a coalition at least twice over the sample period, and I merge parties with similar characteristics. For instance, in the case of Belgium I classify the language subdivisions of a party into one category.

The estimation of the model is based on the simulated method of moments. The parameters are estimated to minimize the weighted distance between the sample moments and the moments that are predicted through the simulation of the model. The moments are: the proportion of minority, minimum winning, and surplus governments; the average coalition size; the fraction of ruling coalitions that have been reappointed after an election; the survival probabilities by coalition type at each age; and the survival probabilities given the government life span. Table 3 shows the estimated values of the structural parameters of the model.

Table 3

Parameter	Value	Parameter	Value
β	0.936	γ_1	-0.251
b	0.051	γ_2	3.761
e	0.754	γ_3	1.483
σ	0.059	γ_4	0.142
γ_5	3.362	γ_6	-2.56
α_0	11.978	α_1	1.801

I find there to be a bonus for the party of the prime minister in the allocation of office-holding benefits ($b = 0.051$), and a large fraction of extremist parties that do not support the current government ($e = 0.754$). To interpret the values of the surplus parameters $(\gamma_1, .., \gamma_6)$ consider the following example. There are four non extremist parties with seat's shares $\boldsymbol{\pi} = (0.38, 0.23, 0.2, 0.1)$, and fourteen possible ruling coalitions.

Table 3A reports the surplus associated with each possible coalition, and the estimated values of the surplus parameters. I find that on average the size of office-holding benefits of a majority government is larger than the one of a minority government. This result seems to suggest that when the coalition parties do not control a majority of the parliamentary seats, the search for compromise between the government and the opposition may be more costly for the ruling coalition. Therefore, the total level of surplus generated by office-holding benefits decreases. Notice that when the coalition size exceeds 0.70 the level of the surplus decreases. A possible explanation is that there is heterogeneity (e.g., ideology) within the coalition parties, and the level of surplus may also depend on the partisan composition of the ruling coalition. Moreover, in my sample the ruling coalition never controls more than 70% of the parliamentary seats.

Table 3A

Coalition Parties	Size	Type	Surplus
4	0.1	min	1.133
3	0.2	min	1.651
2	0.23	min	1.848
3,4	0.3	min	2.404
2,4	0.33	min	2.691
1	0.38	min	3.248
2,3	0.43	min	3.920
1,4	0.48	min	4.731
2,3,4	0.53	mw	4.751
1,3	0.58	mw	4.784
1,2	0.61	mw	4.805
1,3,4	0.68	surp	5.059
1,2,4	0.71	surp	4.685
1,2,3	0.81	surp	3.627

3.2.1 Within-Sample Fit

To assess how well the model reproduces the main features of the data, Figure 6 reports the actual and the model predicted fraction of type-specific governing coalitions. The model succeeded in reproducing closely the distribution of governments types. In addition, the average size of ruling coalitions is 0.535 in the data, and 0.538 in the prediction of the model.

Figure 7 shows the fit of the model of the survival probabilities for each coalition type. The model captures that minority governments tend to last shorter than majority governments, and minimum winning coalitions are more stable than surplus coalitions. The overall fit on duration patterns of minority governments is good, although the model overstates the cabinet stability at the third year of tenure. The duration patterns of minimum winning coalitions are captured generally well, especially at the beginning of the legislative period. The model is also capable to mimic the duration patterns of surplus coalitions, though the model underpredicts the stability of surplus coalitions especially in the third year of the legislature. Finally, the model is also able to replicate the average duration of governments across different fixed inter-election periods.
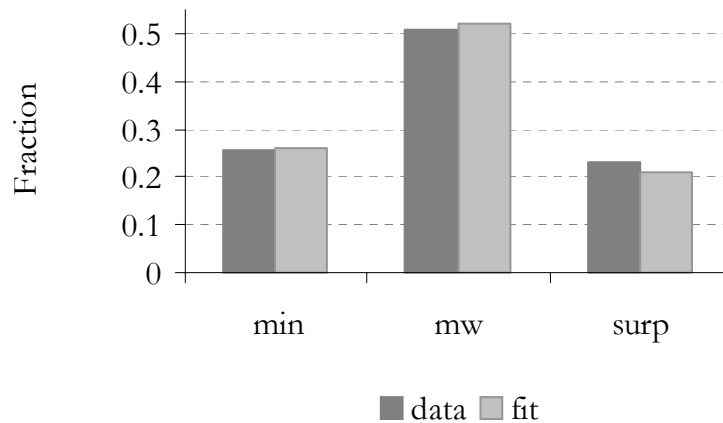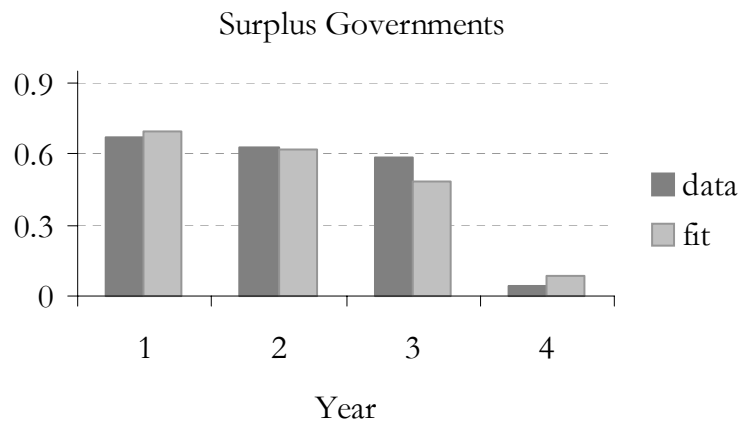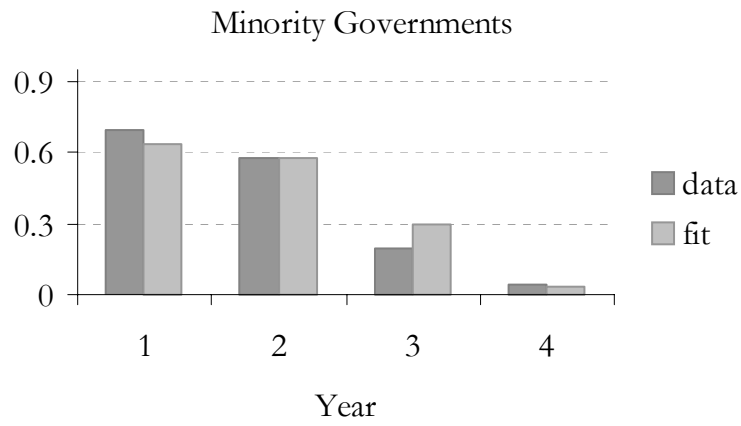

Figure 6: Distribution of Government Types

Minority Governments

Minimum Winning

Surplus Governments

Figure 7: Survival Probabilities

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4 Policy Experiments

4.1 The Role of Polls

I use the estimated model to conduct a counterfactual experiment to examine how parties would react to polls that are perfectly informative. The results of the experiment are presented in Tables 4 and 5. The changes in the distribution of coalition types is negligible. A possible explanation is that the *formateur* chooses the proto-coalition that maximizes his expected payoff , where the expectation is taken over the realization of future polls. Therefore, the decision of forming a government would not change if the electoral signal is unbiased. On the contrary, the equilibrium decision of dissolving a government depends on the level of informativeness of the electoral polls. The duration patterns of minority and minimum winning coalition are not remarkably different, but the stability of surplus governments increases sharply. According to the model, when parties can perfectly forecast future electoral prospects, each party's incentive to terminate the government increases if the party expects an electoral gain. Similarly, the attractiveness of currently being in office is even higher in the presence of an electoral loss, especially for the party of the prime minister, since the identity of the future prime minister is uncertain. As a consequence, a prime minister with an electoral loss is well-motivated to find a compromise with the ruling coalition partners to ensure the survival of the government (even though it might be very costly if they expect an electoral gain). In addition, the likelihood of survival may increase in the presence of a surplus government. In fact, when all the opposition parties are against the current government, the prime minister does not need to renegotiate and obtain the support of all the coalition parties in order to retain a majority in the parliament.

Table 4

Experiment1: Distribution of coalition governments

	Baseline Model	Experiment 1
min	26.28	27.87
mw	52.5	50.51
surp	21.22	21.62

Table 5

Experiment 1: Survival Probabilities

	Baseline Model				Experiment 1			
	Year				Year			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
min	.63	.58	.29	.03	.65	.59	.34	.03
mw	.90	.86	.71	.23	.91	.88	.82	.25
Surp	.70	.62	.48	.08	.83	.81	.70	.14

Next I evaluate the impact of institutional features of parliamentary democracies on the formation and dissolution of coalition governments.

4.2   The Institutional Background

The features of the electoral system play an important role in the termination of parliaments and governments. In all parliamentary democracies elections are held on a regular basis. The maximum term of the Lower House varies between three and five years. In Spain and Portugal no new dissolution of Parliament may take place before a year has passed since the previous one. My goal is to evaluate the effect of these specific institutional features. As one might expect, the equilibrium decisions of forming and dissolving a government coalition might vary in response to a change in the environment where the government renegotiations take place.

The first experiment I consider consists of changing the length of the inter-election period, which reflects a change in the number of bargaining periods left with the same coalition parties. To implement this experiment, I fix the structural parameters to their estimated values and then solve the model with an inter-election period of five and six years. The results of the experiment are presented in Tables 6 and 7. I find that a longer inter-election period increases the survival probability of governments over all cabinet ages. This is mostly due to an increase in the fraction of majority governments that form in equilibrium. Intuitively, given that majority governments are expected to last longer, the value of forming a majority coalition increases with the length of the inter-election period. Moreover, minority governments tend to be more stable in the last ages.

Table 6

Experiment1: Distribution of coalition governments

	Baseline ($\bar{A} = 4, 5$)	$\bar{A} = 5, 6$	$\bar{A} = 6, 7$
	Model		
min	26.28	21.03	19.36
mw	52.5	56.35	58.14
surp	21.22	22.62	22.5

Table 7

Experiment 1: Survival Probabilities

	Baseline Model				$\bar{A} = 5, 6$					$\bar{A} = 6, 7$					
	Year				Year					Year					
	1	2	3	4	1	2	3	4	5	1	2	3	4	5	6
min	.63	.58	.29	.03	.63	.57	.31	.15	0	.65	.59	.35	.17	.08	0
mw	.90	.86	.71	.23	.90	.87	.82	.69	.09	.90	.87	.83	.77	.64	.10
sur	.70	.62	.48	.08	.68	.60	.46	.33	.06	.67	.58	.47	.44	.31	.07

The second experiment I consider consists of imposing that no new dissolution of Parliament may take place before a year has passed since the previous one. In this scenario, no renegotiation of the agreement can take place in the first year. While this policy obviously increases the stability when the legislature begins, the downfall probability (over all governments) increases after the first year because the fraction of minority governments doubles. Intuitively, since the prime minister faces a trade-off between 'stability' (larger coalitions produce larger cake) and 'control' (larger coalitions imply lower proportion of the cake eaten by each member), he may now want to form a government with a fewer parties, in order to increase the received proportion of current office-holding benefits, even though a smaller coalition decreases the expected probability of surviving after the first period. The predicted distribution of coalition types and the predicted survival probabilities are reported in Tables 8 and 9.

Table 8

Experiment 2: Distribution of coalition governments

	Baseline Model	Experiment 2
min	26.28	57.94
mw	52.5	34.48
surp	21.22	0.08

Table 9

Experiment 2: Survival Probabilities

	Baseline Model				Experiment 2			
	Year				Year			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
min	.63	.58	.29	.03	1	.61	.31	.03
mw	.90	.86	.71	.23	1	.88	.78	.26
surp	.70	.62	.48	.08	1	.77	.61	.25

Finally, as in Greece, I impose that the party with the highest seat share is selected to be the formateur. As a result, governments tend to be more unstable. This is due to

an increase in the fraction of minority governments, and a decrease in the fraction of surplus governments formed in equilibrium. In addition, all government types become more unstable (over all years). Intuitively, this rule of selecting the prime minister eliminates the uncertainty about the identity of the future formateur, and generates an incumbency effect (i.e., the party with the largest average seat share, and his most preferred coalitions, are selected more frequently). This incumbency effect leads the prime minister, and also his coalition parties, to value less the attractiveness of being in office with the current government, given that the expected probability of being part of a ruling coalition in the future is high. This might explain why in equilibrium all coalition types are more unstable. Finally, since the prime minister expects to be in power more frequently, he may want to form a government with a fewer parties (in order to increase his proportion of current office-holding benefits), even though a smaller coalition size decreases the expected survival probability of his cabinet. The predicted distribution of coalition types and the predicted survival probabilities are reported in Tables 10 and 11.

Table 10

Experiment3: Distribution of coalition governments

	Baseline Model	Experiment 3
min	26.28	35.48
mw	52.5	48.56
surp	21.22	15.96

Table 11

Experiment 3: Survival Probabilities

	Baseline Model				Experiment 3			
	Year				Year			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
min	.63	.58	.29	.03	.54	.47	.29	.02
mw	.90	.86	.71	.23	.82	.75	.47	.16
surp	.70	.62	.48	.08	.61	.51	.32	.04

5 Conclusion

In multiparty parliamentary democracies cabinets often terminate before the end of the legislature, and government coalitions frequently reshuffle the allocation of cabinet posts. In this work, I interpret these events as equilibrium outcomes of a strategic interaction among political parties. Parties' incentives to terminate the government and seek early elections depend on future electoral prospects, and electoral opinion polls convey information regarding possible shifts in the electoral support.

To empirically investigate the impact of electoral polls on government termination, I develop and structurally estimate a dynamic game-theoretic model of government formation and termination, using a newly collected data set from eleven Western European parliamentary democracies over the period 1970-2002. The estimated model fits the salient features of the data well. I find that the strategic reaction of parties to electoral uncertainty plays a quantitatively important role in explaining the patterns of government duration observed in the data.

Using the estimated model I conduct counterfactual experiments aimed at evaluating the impact on government survival probabilities of polls informativeness and alternative institutional environments. The main findings are that in the absence of electoral uncertainty (i.e., electoral polls are perfectly informative) cabinets are more stable, and the equilibrium decisions of forming and dissolving a government vary in response to a change in the political environment where parties' renegotiations take place. For instance, a longer inter-election period increases the survival probability of governments over all cabinet ages. If no dissolution of Parliament can take place in the first year of the legislative period, then the stability of the government increases when the legislature begins, but the downfall probability increases after the first year over all future periods. Finally, if the party with the highest seat share is selected to be the party of the prime minister, then governments tend to be more unstable.

In my model, to acknowledge the fact that in parliamentary democracies the cabinet is responsible to the parliament, I impose that the ruling coalition must always retain

the support of a parliamentary majority while in office. However, the extent to which the parliament controls governments varies across countries. For instance, although constitutions generally state that the government must resign if the Parliament withdraws its confidence, they regulate differently the rules for tabling and carrying a vote of (no) confidence. In particular, the tabling quorum ranges from a minimum of one tenth to a maximum of one third of deputies, and signers' requisites may differ as well. In Spain and Portugal for example if a motion of censure is not approved, its signers cannot table another one during the same legislative session. In Greece a motion of censure cannot be submitted before six months from a previous rejection. A special requirement to table such a motion exists in Belgium, Germany and Spain, where an alternative government must be ready to take over if the previous government has lost the parliamentary confidence (constructive vote of no-confidence). Countries also differ in the way they count abstentions to fix the quorum and to carry the confidence vote. An interesting issue is the extent to which different institutional arrangements, such as simple versus constructive vote of confidence, different quorums, and tabling requirements, affect the bargaining process that occurs between the birth and death of governments. The exploration of this issue constitutes the specific object of present and future research.

6   Appendix A

In describing the equilibrium outcome of the renegotiation game, I consider different scenarios separately. If only one party is in office, then no transfers can be implemented. The government will fall if the parties with an incentive to terminate the government can reach a qualified majority. Consider now the case in which parties can renegotiate their agreement. First, I characterize the SPNE outcome with two coalition parties, and then with three coalition parties. Without loss of generality I assume that the prime minister makes an offer only if accepted, and I follow this convention in the specification of the SPNE outcome. If $\mathbf{c}_0 = \{k, i\}$, first k makes a take-it-or-leave-it offer of a renegotiation of benefits (y^k, y^i) contingent on supporting or not the government, then i either accepts (A) or rejects (R) the offer. Hence, the actions of k and i are (y^k, y^i) and $\{A, R\}$, respectively. Let $\Pi^{j+} = \sum_j \pi^j I \left(w^j > 0 \right) + e\pi^e$ denote the size of opposition parties that will vote against the current government, and $\Pi^{j-} = \sum_j \pi^j I \left(w^j \leq 0 \right) + (1 - e)\pi^e$ the size of opposition parties that will vote in favor of the current government.

Proposition 1 *Suppose that* $\mathbf{c}_0 = \{k, i\}$, *and* $w^k > 0, w^i \leq 0$.

If $\pi^i + \Pi^{j-} > q$:

1. if $\Pi_{c_0} + \Pi^{j+} > q$ *and* $|w^i| \leq \hat{y}^k$, *then the SPNE outcome is* $\{(w^i, |w^i|), A\}$ *and the government falls;*

2. if $\Pi_{c_0} + \Pi^{j+} < q$ *or* $|w^i| > \hat{y}^k$, *then the government survives with no transfers implemented.*

If $\pi^i + \Pi^{j-} \leq q$:

1. if $\Pi_{c_0} + \Pi^{j-} > q$ *and* $\hat{y}^i \geq w^k$, *then the SPNE outcome is* $\{(\hat{y}^i, -\hat{y}^i), A\}$ *and the government survives;*

2. if $\Pi_{c_0} + \Pi^{j-} \leq q$ *or* $\hat{y}^i < w^k$, *then the government falls with no transfers implemented.*

The intuition is as follows. Suppose that i reaches the qualified majority with the other parties supporting the current government, that is $\pi^i + \Pi^{j-} > q$. Since i does

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not need to buy k's support to survive, he rejects any offer of transferring benefits to k in order to survive. On the other hand, k needs i's support to fall (because $\pi^k + \Pi^{j+} < q$) and the lowest price he needs to pay is $|w^i|$, that is the amount of transfer that makes i's indifferent. It follows that k will offer a set of transfers $(w^i, |w^i|)$ if: i) k is willing and able to do so $(|w^i| \leq \hat{y}^k)$ and, ii) a qualified majority to fall is reached $(\Pi_{c_0} + \Pi^{j+} > q)$.

Suppose now that k reaches a qualified majority with the other parties that do not support the current government, that is $\pi^k + \Pi^{j+} > q$. It follows that i needs to buy k's support to survive, and accepts to pay any price $y^i \leq \hat{y}^i$ if $\Pi_{c_0} + \Pi^{j-} > q$. Hence, k will extract all the surplus from i, that is $(\hat{y}^i, -\hat{y}^i)$, if it makes him better off than falling $(\hat{y}^i \geq w^k)$. Otherwise, k does not propose a renegotiation of the agreement and the government falls.

A similar argument applies if $w^k \leq 0$ and $w^i > 0$.

Proposition 2 *Suppose that* $\mathbf{c}_0 = \{k, i\}$ *and* $w^k > 0, w^i > 0$.

The government terminates if $\Pi_{c_0} + \Pi^{j+} > q$. *Otherwise the government survives. In both cases, no transfers are implemented.*

In this scenario both coalition parties have an incentive to terminate the current government. The government falls if the coalition parties can reach a qualified majority with the opposition parties that have a $w > 0$. A similar argument applies if $w^k \leq 0$ and $w^i \leq 0$.

Next, I characterize the SPNE outcome when the coalition is formed by three parties. Let $\Pi^{i+} = \sum_i \pi^i I\left(w^i > 0\right)$ and $\Pi^{i-} = \sum_i \pi^i I\left(w^i \leq 0\right)$.

Proposition 3 *Suppose that* $\mathbf{c}_0 = \{k, i_1, i_2\}$ *and* $w^k > 0, w^{i_1} > 0, w^{i_2} > 0$.

The government terminates if $\Pi_{c_0} + \Pi^{j+} > q$. *Otherwise the government survives. In both cases, no transfers are implemented.*

In this case the same argument as in Proposition 2 applies. A similar argument also applies if $w^k \leq 0, w^{i_1} \leq 0$ and $w^{i_2} \leq 0$.

Proposition 4 *Suppose that* $\mathbf{c}_0 = \{k, i_1, i_2\}$ *and* $w^k \leq 0, w^{i_1} > 0, w^{i_2} > 0$.

If $\Pi^{i+} + \Pi^{j+} > q$:

1. *if* $\hat{y}^k \geq \min\{w^{i_1}, w^{i_2}\}$, $\pi^k + \pi^{i_1} + \Pi^{j-} > q$, *and* $\pi^k + \pi^{i_2} + \Pi^{j-} > q$ *then* $y^k = -\min\{w^{i_1}, w^{i_2}\}$ *and the government survives;*

2. *if* $\hat{y}^k \geq w^{i_1}$, $\pi^k + \pi^{i_1} + \Pi^{j-} > q$, *and* $\pi^k + \pi^{i_2} + \Pi^{j-} \leq q$ *then* $y^k = -w^{i_1}$ *and the government survives;*

3. *if* $\hat{y}^k \geq w^{i_2}$, $\pi^k + \pi^{i_1} + \Pi^{j-} \leq q$, *and* $\pi^k + \pi^{i_2} + \Pi^{j-} > q$ *then* $y^k = -w^{i_2}$ *and the government survives;*

4. *if* $\hat{y}^k \geq w^{i_1} + w^{i_2}$, $\pi^k + \pi^{i_1} + \Pi^{j-} \leq q$, $\pi^k + \pi^{i_2} + \Pi^{j-} \leq q$, *and* $\Pi_{c_0} + \Pi^{j-} > q$ *then* $y^k = -(w^{i_1} + w^{i_2})$ *and the government survives;*

otherwise the government falls without transfers being implemented.

If $\Pi^{i+} + \Pi^{j+} \leq q$:

1. *if* $\hat{y}^{i_1} + \hat{y}^{i_2} < |w^k|$ *or* $\Pi_{c_0} + \Pi^{j+} < q$ *then the government survives without transfers being implemented;*

2. *if* $\Pi_{c_0} + \Pi^{j+} > q$, *and* $\max\{\hat{y}^{i_1}, \hat{y}^{i_2}\} \geq w^k$ *then* $y^k = \max\{\hat{y}^{i_1}, \hat{y}^{i_2}\}$ *and the government falls;*

3. *if* $\Pi_{c_0} + \Pi^{j+} > q$, $\hat{y}^{i_1} + \hat{y}^{i_2} > |w^k|$, *and* $\max\{\hat{y}^{i_1}, \hat{y}^{i_2}\} < w^k$ *then* $y^k = \hat{y}^{i_1} + \hat{y}^{i_2}$.

The intuition is as follows. If $\Pi^{i+} + \Pi^{j+} > q$, then k needs to transfer benefits to one or both coalition parties in order to survive. For instance, if k reaches a qualified majority with either i^1 or i^2, then k will buy the support of the cheapest coalition party, provided that the price is lower than his willingness to pay, that is $\hat{y}^k > \min\{w^{i_1}, w^{i_2}\}$, and the government will survive. On the contrary, if k needs to buy the support of both in order to reach a qualified majority, he will offer to pay $w^{i_1} + w^{i_2}$, provided that the price is lower than his willingness to pay, that is $\hat{y}^k \geq w^{i_1} + w^{i_2}$. Finally, if parties are not willing to renegotiate the agreement, the government falls.

Now suppose that $\Pi^{i+} + \Pi^{j+} \leq q$. In this case, k can ask one or both coalition parties to transfer benefits to him in order to fall, and the coalition party/parties accept to pay only if $\Pi_{c_0} + \Pi^{j+} > q$. If $\hat{y}^{i_1} + \hat{y}^{i_2} > |w^k|$, then it would be optimal for

k to ask to be paid in order to fall. In particular, if both parties are able to buy k's support alone, then it is optimal for k to start renegotiating with the party i that has the lowest $\hat{y}^{i}$[17]. In fact, since the proposal is sequential, the first coalition party that gets the offer will always reject to pay it if the second player is able to buy k's support alone. Notice that if both i_1 and i_2 accept to renegotiate with k, then the order of the offers is irrelevant. Finally, if parties are not willing to renegotiate, the government will survive.

A similar argument applies if $w^k > 0, w^{i_1} \le 0$ and $w^{i_2} \le 0$.

Proposition 5 *Suppose that $\mathbf{c}_0 = \{k, i_1, i_2\}$ and $w^k \le 0, w^{i_1} \le 0, w^{i_2} > 0$.*

If $\pi^{i_2} + \Pi^{j+} > q$:

1. if $\hat{y}^k \ge w^{i_2}$, and $\Pi_{c_0} + \Pi^{j-} > q$, then $\mathbf{y} = (-w^{i_2}, 0, w^{i_2})$ and the government survives;

2. if $\hat{y}^k < w^{i_2}$, $\hat{y}^k \ge y^k$, and $\Pi_{c_0} + \Pi^{j-} > q$, then $\mathbf{y} = (\hat{y}^{i_1} - w^{i_2}, \hat{y}^{i_1}, w^{i_2})$ and the government survives;

otherwise the government falls without transfers being implemented.

If $\pi^{i_2} + \Pi^{j+} \le q$:

1. if $\pi^k + \pi^{i_2} + \Pi^{j+} \le q, \Pi_{c_0} + \Pi^{j+} > q$, and $w_k \le \hat{y}^{i_2} - \left| w^{i_1} \right|$, then $\mathbf{y} = (\hat{y}^{i_2} - \left| w^{i_1} \right|, \left| w^{i_1} \right|, -\hat{y}^{i_2})$ and the government falls; otherwise the government survives without transfers being implemented.

2. if $\pi^k + \pi^{i_2} + \Pi^{j+} > q$ and $\hat{y}^{i_1} + \left| w^k \right| < \hat{y}^{i_2}$, then $\mathbf{y} = (\hat{y}^{i_2}, 0, -\hat{y}^{i_2})$ and the government falls.

3. if $\pi^k + \pi^{i_2} + \Pi^{j+} > q$, $\hat{y}^{i_2} > \left| w^k \right|$ and $\hat{y}^{i_1} + \left| w^k \right| \ge \hat{y}^{i_2}$ then $\mathbf{y} = (\hat{y}^{i_1}, -\hat{y}^{i_1}, 0)$ and the government survives. However if $\hat{y}^{i_2} < \left| w^k \right|$ then the government survives without transfers being implemented.

The intuition is as follows. Suppose that $\pi^{i_2} + \Pi^{j+} > q$. In this case, if $\hat{y}^k$ is sufficient to buy i_2's support, then i_1 will refuse to transfer part of his utility to i_2. However, if

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[17]If the offers were simultaneous there could be multiple equilibria because of free-riding.

k is not able or willing to buy i_2's support, then i_1 has to pay i_2, and k pays or gets the residual, to survive. Let $y^k = \hat{y}^{i_1} - w^{i_2}$. If $y^k \geq 0$ it means that $\hat{y}^{i_1}$ is sufficient to repay i_2 and k gets the residual transfer y^k. If $y^k < 0$, also k needs to transfer part of his utility to i_2 to survive and he does so if and only if $\hat{y}^k \geq y^k$.

Finally, if none of them is able and willing to implement the transfer, then the government will fall without a renegotiation of the agreement.

Now suppose that $\pi^{i_2} + \Pi^{j+} \leq q$. Here, there are two subcases that need to be considered: $\pi^k + \pi^{i_2} + \Pi^{j+} > q$ and $\pi^k + \pi^{i_2} + \Pi^{j+} \leq q$.

If $\pi^k + \pi^{i_2} + \Pi^{j+} \leq q$, either i_2 pays k and i_1 to fall or the government survives without a renegotiation of the agreement.

If $\pi^k + \pi^{i_2} + \Pi^{j+} > q$, k can ask to be paid either from i_2 to fall or from i_1 to survive. However if $\hat{y}^{i_2} < |w^k|$, that is $\hat{y}^{i_2}$ is not sufficient to repay k, then the government survives without transfer[18].

Finally, note that the same argument applies if $w^k \leq 0, w^{i_1} > 0$ and $w^{i_2} \leq 0$, and a similar one if $w^k > 0, w^{i_1} > 0$ and $w^{i_2} \leq 0$.

Notice that the equilibrium of the whole game is a SPNE, because parties behave optimally at each node.

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[18]Recall that if i_1 rejects the offer they vote as if no transfers are allowed.

7   Appendix B

The empirical distributions of electoral polls and noise in the electoral signal

I recover the transition probabilities $\Pr\left(\tilde{\boldsymbol{\pi}}_t | \tilde{\boldsymbol{\pi}}_{t-1}\right)$ and $\Pr\left(\boldsymbol{\pi}_t | \tilde{\boldsymbol{\pi}}_{t-1}\right)$ directly from the data. First I order all parties on a scale from the largest one to the smallest one according to each party's average seat share over time. In symbols, let μ_h denote the average seat share of party h, then $\mu_1 > \mu_2 > ... > \mu_N$. Second, I calculate $\triangle_t = \left(\triangle_t^1, \triangle_t^2, ..., \triangle_t^N\right)$, where $\triangle_t^h = \left| \tilde{\pi}_t^h - \tilde{\pi}_{t-1}^h \right|$. Finally, I calculate the relative frequency of observing $\triangle_t$ in the data. This way of computing the sample transition rates accounts for the fact that it is very unlikely that one party, relatively to its size, gains (or loses) significant electoral shares in a short period of time.

The selection of the formateur

The probability of party h being selected to be a *formateur* $\Pr(\boldsymbol{\pi}_t^h, k_{t-1})$ is assumed to be a logistic function of the electoral outcome, and the identity of the previous prime minister. Table B.1 reports the maximum likelihood estimates of α_0 and α_1 in equation 1 (Section 2),

Table B.1: ML Estimates of α

Parameter	Estimate	Standard Error
α_0	11.978	1.148
α_1	1.801	0.285

Likelihood $=$-192.436

The mapping of votes share v_t^h into seats share π_t^h

$$\ln\left(\frac{\pi_t^h}{1 - \pi_t^h}\right) = \delta_0 + \delta_1 \ln\left(\frac{v_t^h}{1 - v_t^h}\right) + u. \qquad (2)$$

Table B.2 reports the country-specific estimates of the parameters δ_0 and δ_1.

Table B.2: OLS estimates of δ_0 and δ_1

	δ_1	δ_0
Austria	1.03 (.03)	.07 (.03)
Belgium	1.13 (.02)	.23 (.03)
Denmark	1 (.005)	.04 (.01)
Finland	1.2 (.018)	.37 (.03)
Germany	1.01 (.007)	.06 (.01)
Ireland	1.08 (.02)	.14 (.03)
Italy	1.11 (.005)	.19 (.01)
Luxemburg	1.21 (.05)	.32 (.07)
Netherlands	1.02 (.005)	.07 (.008)
Portugal	1.34 (.04)	.39 (.06)
Spain	1.09 (.02)	.27 (.03)

Standard Errors in parenthesis

Table B.3 reports the estimates of the structural parameters of the model.

Table B3

Parameter	Value	Parameter	Value
β	0.936 (0.032)	γ_1	-0.251 (0.609)
b	0.051 (0.013)	γ_2	3.761 (0.281)
e	0.754 (0.056)	γ_3	1.483 (0.920)
σ	0.059 (0.025)	γ_4	0.142 (0.207)
γ_5	3.362 (0.343)	γ_6	-2.56 (0.109)

Standard Errors in Parenthesis

8 Appendix C

The sample includes multiparty parliamentary democracies, which differ in terms of the number of parties represented in the parliament and the average number of coalition members. Table C.1 reports the cross-national variation in the number of *non extremist* parties represented in the parliament with an average seats share greater than 0.03.

Table C.1	Number of Parties	Number of Coalition Parties
Overall	5.27	2.43
Austria	5	1.56
Belgium	7	2.56
Denmark	7	2.27
Finland	6	3.93
Germany	4	2
Ireland	4	1.63
Italy	6	3.1
Luxemburg	6	2
Netherlands	5	2.7
Portugal	4	1.17
Spain	4	1.1

Table C.2 reports the identity of parties that have been at least twice in a cabinet coalition.

Table C.2: Coalition parties

Country	Party 1	Party 2	Party 3	Party 4
Austria	Social Democ (SPO)	Austr. People (OVP)	Freedom (FPO)	
Belgium*	Chatolic (CVP/PSC)	Liberal (PVV/ PLP/PRL/PRLW)	Socialist (BSP/PSB/PS)	Volksunie (VU)
Denmark	Conservative (KF)	Social Dem (SD)	Liberals (LIB)	Centre Dem (CD)
Finland	Social Democ (SDP)	AgrarianUnion (KESK)	National Coal (KOK)	FinnishPeople (SKDL)
Germany	Social Democ (SPD)	Christ. Dem (CDU/CSU)	Free Democ (FDP)	
Ireland	Fianna Fail (FF)	Fine Gael (FG)	Labourist (LAB)	
Italy*	Christ. Dem (DC)	Socialist (PSI/PSDI)	Republic (PRI)	Liberals (PLI)
Luxemburg	Socialist SLAP	Social Dem (SPD)	Liberals (DP)	CretienSocial (CSV/KSV)
Netherlands	Chatolic (KVP)	Labourist (PvdA)	Liberal (VVD)	Democrats'66 (D'66)
Portugal	Popular Dem (PPD)	Socialist (PSP)	Centre Soc Dem (CDS)	
Spain	Socialist (PSOE)	Popular All. (AP)		

*until 1995

Table C.3 shows the average seat shares of the parties with an average seats share greater than 0.03.

Table C.3: Average Seat Shares

Country	Party	Mean	St. Dev.	Min	Max
Austria	SPO	.441	.067	.355	.519
	OVP	.375	.077	.284	.479
	FPO	.134	.095	.03	.284
Belgium	CVP	.324	.051	.213	.387
	PLP	.174	.039	.141	.245
	PS	.285	.025	.22	.34
	VU	.074	.024	.033	.104
Denmark	KF	.161	.061	.057	.24
	SD	.339	.039	.263	.397
	LIB	.149	.044	.109	.24
	CD	.05	.018	.022	.086
Finland	SDP	.271	.021	.24	.351
	KESK	.206	.031	.175	.275
	KOK	.214	.035	.17	.265
	SKDL	.142	.043	.095	.2
Germany	SPD	.459	.033	.366	.49
	CDU	.417	.038	.361	.461
	FDP	.086	.019	.06	.119
Ireland	FF	.487	.046	.41	.568
	FG	.337	.046	.271	.422
	LAB	.118	.037	.072	.199

Average Seat Shares (cont.)

Country	Party	Mean	St. Dev.	Min	Max
Italy	DC	.387	.033	.327	.421
	PSI	.130	.041	.022	.176
	PRI	.029	.012	.014	.046
	PLI	.024	.012	.008	.049
Luxemburg	SLAP	.284	.039	.217	.328
	SDP	.059	.036	.034	.085
	DP	.219	.027	.183	.254
	CSV	.362	.038	.305	.407
Netherlands	KVP	.280	.068	.18	.36
	PvdA	.304	.036	.247	.353
	VVD	.184	.043	.107	.253
	D'66	.075	.038	.04	.155
Portugal	PPD	.445	.117	.3	.592
	PSP	.368	.115	.228	.495
	CDS	.051	.031	.016	.12
Spain	PSOE	.466	.054	.357	.526
	AP	.389	.080	.29	.523
	CiU	.047	.005	.034	.051

Table C.4 present the cross-national variation in the types of governments that have been formed after an election.

Table C.4: Coalition Size and Distribution of Government Types

%	Size (Mean)	Minority	Min. Win.	Surplus
Overall	53.5	25.74	51.49	22.77
Austria	59.8	33.33	55.56	11.11
Belgium	60.02	9.09	63.64	27.27
Denmark	37.31	92.31	7.69	
Finland	64.85	10		90
Germany	53.77		100	
Ireland	51.69	50	50	
Italy	49.74	40	10	50
Luxemburg	59.14		100	
Netherlands	53.29		40	60
Portugal	50.5		100	
Spain	49.27	33.33	66.66	

This sample does not include replacement governments with changes in the party composition. If there is no change, I treat the two subsequent governments as a unique observation (i.e., I do not count a cabinet as having terminated if there is only a change in the allocation of cabinet portfolios, but not in its membership. Finally, the sample does not include the governments that have failed to obtain the invenstiture vote. Table

C.5 displays the cross-national variation in the cabinet duration.

Table C.5: Duration (year)

	Mean	St. Dev.	Min	Max
Overall	2.97	1.36	.13	5
Austria	3.46	.81	1.52	4.05
Belgium	2.38	1.39	.13	4.05
Denmark	2.13	.98	.67	3.71
Finland	2.67	1.46	.41	4
Germany	3.58	.68	1.89	4.03
Ireland	2.97	1.52	.63	4.94
Italy	1.51	1.27	.62	3.94
Luxemburg	4.98	.17	4.6	5
Netherlands	3.21	1.3	67	4.55
Portugal	3.27	1.16	1.42	4
Spain	3.61	.43	2.85	4.05

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