Radical Moderation: Recapturing Power in Two-party Parliamentary Systems

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Radical Moderation: Recapturing Power in Two-party Parliamentary Systems*

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Abstract

We estimate the parameters of a reputational game of political competition using data from five two-party parliamentary systems. We find that latent party preferences (and party reputations) persist with high probability across election periods, with one exception: parties with extreme preferences who find themselves out of power switch to moderation with higher probability than the equivalent estimated likelihood for parties in government (extreme or moderate) or for moderate parties in opposition. We find evidence for the presence of significant country-specific differences. Notably, we estimate that in the long-term, Australia is less than half as likely to experience extreme policies and Australian governments enjoy significantly longer spells in office as compared to their counterparts in Greece, Malta, New Zealand, and the United Kingdom. The model outperforms alternative naive models on a battery of goodness-of-fit tests.

Keywords: Party Reputations; Policy Extremism; Two-Party Competition; Westminster Systems.

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1 Introduction

How fast can political parties shed a reputation for being out of line with the wishes of the pivotal segment of the electorate? In a two party system, the speed of this adjustment can largely determine the nature of political competition and the outcome of the policy process. If adjustment to a better reputation is uniformly slow, then political competition may remain lopsided for long periods of time once either party acquires a 'bad name' (intentionally or not). On the other hand, vigorous competition is possible if parties can instantaneously build a new reputation (e.g., through the ability to commit to a platform, as in stylized models of political competition a la Downs (1957)).

Casual empiricism suggests that reality lies somewhere in between the two extremes outlined above. For example, it took the British Labour party almost twenty years to effectively re-brand itself as the 'New Labour', a version of the left far more popular with "middle England" than the party that was defeated by Margaret Thatcher's Tories in 1979 or 1983. Similarly, largely as a consequence of the policy choices of the conservative Mitsotakis government of 1990-93, the Greek electorate remained unconvinced of the right-wing party's overt attempts to position itself as 'a party of the center' until the 2004 elections.

Despite its importance for the functioning and performance of two-party systems, it is quite hard to move beyond anecdotal evidence of the type above in order to quantify the persistence of party reputations. These reputations amount to the electorate's perceptions or beliefs about the parties' true policy preferences, and such beliefs are hard (or ex post impossible) to elicit systematically across a sufficiently long period of time. Even if available, data on party reputations is not readily interpretable, as the evolution of these reputations is intermediated by the strategic behavior of the parties that stand to benefit from successful manipulation of the electorate's perception of the party. Finally, beliefs about latent party preferences are derived from assessments of intangible or complex features of the competitive environment within parties, such as the relative power of various groups or coalitions of partisans, the rate at which senior party members retire or cease exercising influence within their party, etc. For that reason, we take the stance that the central question in this study can best be answered if empirical evidence is combined with the discipline imposed by theoretical equilibrium arguments. We pursue such a line of attack by structurally estimating a theoretical model of party reputations in this paper.

The theoretical model we use is due to Kalandrakis (Forthcoming) and features two parties that compete repeatedly and at any point in time may be controlled by either extremists or moderates. Because all party members benefit when the party has a reputation for being moderate, true party preferences are private information. The electorate, modeled as a pivotal voter, chooses between the two parties on the basis of their reputations, which evolve endogenously in equilibrium. In particular, voters dynamically update their beliefs about parties' extremism in light of past performance, the rate of persistence of latent party preferences when parties are in opposition or in government, and from the new information that arises from the policy process. The probabilities with which latent party preferences persist are exogenous in the model and constitute the central focus of our estimation efforts. Specifically, since beliefs about party extremism are formed rationally using all available information, party reputations cannot improve quickly unless latent party preferences shift at a sufficiently high rate. Thus estimates of these structural parameters, along with the equilibrium choices of governing parties, determine the overall speed with which party reputations adjust.

Under the relevant assumption that partisans care sufficiently about office, the model has a unique equilibrium. In ways more subtle than the intuition we outlined in the introductory paragraph, the equilibrium exhibits radically different predictions regarding the pattern of alternation in office between the two parties, the expected duration of spells in office for the government, and the incidence of extreme policies. All of these forecasts depend on the values of the structural parameters that determine the persistence of latent party preferences. Importantly for our purposes, the equilibrium induces a likelihood over the observed sequence of victorious parties, which we use along with data from five countries with two-party parliamentary systems (Australia, Greece, Malta, New Zealand and the United Kingdom) in order to recover model parameters estimated with a Bayesian approach.

We find that latent party preferences (and reputations) are quite persistent across election periods: parties in government (extreme or moderate) and moderate parties in the opposition maintain their preferences across consecutive election periods with probabilities that exceed 80% (or with an annualized rate that exceeds 95%). Importantly, the exception to this pattern are extreme parties in the opposition, which we estimate are almost half as likely to remain extreme and tend to be more likely to switch to moderate latent preferences than to remain extreme. These findings provide mixed support for the interpretation that political parties are able to strategically shift in order to achieve electoral success, as this incentive is triggered *only* when the parties are in the opposition. Furthermore, in accordance with the anecdotal evidence we presented, the adjustment of opposition parties to moderation is neither instantaneous nor guaranteed: the hypothesis that the shift occurs with probability one can be rejected.

Despite the fact that these general patterns are shared by all countries in our sample, we find evidence for the presence of significant country-specific differences, notably, a distinct pattern of equilibrium electoral and policy dynamics in Australia. In the main version of the model we estimate, we find that a significant source for this difference can be traced to the smaller (estimated) value of government office in Australia compared to the remaining countries in our study. As a result of country-specific differences, we estimate that in the long-term Australia is less than half as likely to experience extreme policies and that those in power in that country enjoy significantly longer spells in office as compared to their counterparts in Greece, Malta, New Zealand, and the United Kingdom. In all cases, the model predicts alternation of parties in government in the long-run and limited incidence of policy extremism by the government. By way of comparison, the UK case provides the maximum frequency of extreme policies in the long-run, where they occur in one of every ten elections.

We also estimate an extension of the main model in which we allow for the possibility of electoral surprises occurring at a fixed rate across elections. In that model we recover the Australian exceptionalism noted above, and obtain an alternative interpretation for its emergence, namely, we trace Australia's distinct pattern of electoral competition to the (estimated) tendency of Australian parties to remain/become moderate with higher probability while in government compared to their counterparts in the other countries. In all cases the estimated formal models outperform naive alternatives in a battery of goodness-of-fit tests, with the model without electoral shocks having an edge over the model extension.

The connections of the theoretical component of our study with the formal theoretic literature of two-party competition are discussed by Kalandrakis (Forthcoming). Our study is also related to a large literature in comparative politics concerned with the logic by which political parties arrive at their policy positions, and with the measurement of these positions. This work is exemplified by the theoretical contributions of Ian Budge (e.g., Budge, 1994) and by the data generated from the Manifesto project (Budge et al., 2001). Besides our distinct methodological approach that marries observables with a game-theoretic model, our study is distinguished from this literature in two additional respects. First, our concern is with the persistence oof political parties' real (but unobserved) policy preferences as these are determined from the balance of power between disagreeing groups within the party, as opposed to the *stated* preferences of political parties as typically documented in party platforms or manifestos. Significantly, in our analysis the stated positions of a party need not coincide with the reputation of that party, because voters realize that parties vying to win elections are not necessarily forthcoming when it comes to their platform declarations. As a result, observed platform announcements do not enter into our empirical analysis and such announcements constitute cheap talk (and are hence omitted) in the theoretical model. Second, our study is focused exclusively on two-party parliamentary systems while the above literature encompasses multiparty systems of government.

On the broader methodological front, a number of politics scholars have recently pursued an approach similar to this study by combining a likelihood derived from the equilibrium of a game-theoretic model along with data for the purposes of estimation. Contributions in that vein using experimental data are ably reviewed in Palfrey (2006). Among studies that use observational data, this approach has been used in comparative politics (Diermeier, Eraslan and Merlo, 2003; Merlo, 1997), international relations (e.g., Signorino, 1999; Smith, 1999), and American politics (e.g., Diermeier, Keane and Merlo, 2005; Duggan and Kalandrakis, 2009). Besides the distinct substantive focus, one difference of the present study from this literature is that the above models typically make use of action-specific preference shocks (as in McKelvey and Palfrey (1995)) in order to ensure that all actions have positive probability of occurring, whereas in the present study we do not rely on such shocks in order to rationalize the data. Also, among models that focus on some aspect of the political process in democracies the present model is, to our knowledge, the first in which both the electoral outcomes and policy-making are determined endogenously.

We organize our presentation as follows. First we briefly overview the theoretical model and state its equilibrium in Section 2. We then discuss how this equilibrium induces a likelihood over observed data, and we present our data and estimation strategy in Section 3. We state our main results in Section 4. In Section 5 we present results from an extension of the main model that allows for electoral shocks. We conclude in Section 6.

2 Theoretical Overview

2.1 Model

Two political parties, party L of the left and party R of the right, and an electorate interact over a sequence of periods indexed by $t = 1, 2, \ldots$. The electorate is modeled as a pivotal voter M. We denote a generic party by $P \in \{L, R\}$, and use -P to denote the party competing with party P. Each of the two parties contains individuals with two different ideological convictions, call them *moderates* and *extremists*. These two groups/types disagree as to the optimal government policy. In each period one of the two groups holds the prevailing ideological position of the party. We emphasize that the prevailing policy preferences within the party are not the result of an explicit strategic choice in the model. Specifically, the parties cannot commit to a platform, and individuals within each party cannot choose their own preferences. Thus, if extremists hold the upper hand in party P in period t, then we say that party P is an extreme type, e, and it is a moderate type, m, otherwise. As becomes clear in what follows, these latent party preferences do not determine the policy choices of the party: extremists can strategically choose which policy to implement if elected in office.

The game starts in period $t = 1$ with *Nature* choosing the type of each party according to a pair of probabilities $(b_L^1, b_R^1) \in (0,1)^2$, $b_L^1 \neq b_R^1$, and revealing that information to the respective parties but not to the remaining players. Thus, party P is drawn to be an extreme type with probability b_P^1 and a moderate type with probability $1-b_P^1$. For our purposes the pair of these initial probabilities (b_L^1, b_R^1) are exogenously given and commonly known, and constitute the common beliefs of the voter about the latent preferences within each of the two parties and of the two parties for each other, at the beginning of period 1. As we discuss shortly, these beliefs are endogenously updated in each of the subsequent periods, and constitute the two parties' *reputations*.

Given reputation levels (b_L^t, b_R^t) at the beginning of period $t = 1, 2, \ldots$, elections take place at the beginning of the period and the voter M chooses one of the two parties to be in government.[1] We denote the governing party in period t by $P^t \in \{L, R\}$. Once elected, the party in government then chooses and implements a policy x^t that is publicly observed. There are three possible policies drawn from a set $X = \{x_L, x_M, x_R\}$. Moderate party types always pursue the moderate policy,

[1] In Section 5 we extend the model to allow for electoral shocks such that either of the two parties may be elected in government with some positive probability, independent of the voter's choice.

x_M. If the government party P^t's type is extreme, it chooses between a moderate policy, x_M, or the extreme policy that corresponds to that party $x_{P^t} \in X$. Thus, while parties cannot commit to a platform or choose their own preferences, they can strategically choose whether to pursue their ideal policy or follow a moderate policy in order to manipulate the party's reputation.

We assume that latent partisan preferences change between periods due to the influx of a new generation of partisans with unknown preferences and the retirement of the 'old guard,' or due to unmodeled shifts in intraparty coalition formation, or merely due to stochastic shifts in the identity of members of influence within the party. We also assume that the mix of prevailing preferences within party populations displays inertia, more so when the party is in government. Specifically, if party P is the governing party and is of type τ in period t, then it is of the same type in period $t+1$ with probability π_τ^g. We preclude the singular case $\pi_e^g = 1$ that implies perpetual extremism and require that $\pi_e^g < 1$, so that there is some (possibly very small) probability that an extreme party in government switches to a moderate type. We denote the corresponding probabilities for a party in the opposition by π_τ^o. These probabilities, π_e^g, π_m^g for parties in government, and π_e^o, π_m^o for parties in the opposition, satisfy

$$\pi_e^g > \pi_e^o > 1 - \pi_m^o > 1 - \pi_m^g. \tag{1}$$

Note that $1-\pi_m^g$ and $1-\pi_m^o$ are the probabilities that a moderate party in government or the opposition, respectively, becomes extreme in the next period. Thus, the new party type is extreme with higher probability (π_e^g or π_e^o) if the party was controlled by extremists in the previous period. The analogous statement is true for the case where the party was moderate in the previous period (e.g., $\pi_m^g > 1 - \pi_e^o$). In addition to this serial correlation in latent party preferences, assumption (1) also states that parties are less likely to change type while in government compared to parties in the opposition ($\pi_\tau^g > \pi_\tau^o$). This is a natural assumption as parties in the opposition are more likely to undergo the kind of internal restructuring that results in an ideological shift within the party. On the other hand, the prevailing ideological group within a party in government is more likely to maintain control of the party.

After *Nature* chooses the type of each of the parties at the beginning of period $t+1$,[2] and

[2]It is immaterial when the lottery over party types occurs as long as it takes place after the choice of policy in period t and before the policy choice in period $t+1$.

given party reputations (b_L^t, b_R^t) and publicly observable information (P^t, x^t) in period t, the voter M rationally updates beliefs about the probability that either party is extreme, and the parties do the same for the type of the opposition party, so that a new pair of reputation levels (b_L^{t+1}, b_R^{t+1}) corresponding to period $t+1$ is obtained. Then the voter elects a new party in government, P^{t+1}, given beliefs (b_L^{t+1}, b_R^{t+1}); this party then sets a new policy x^{t+1}, and so on. Thus, the interaction of the players in the game determines a sequence of publicly observable outcomes (P^1, x^1), (P^2, x^2), $\ldots$, (P^t, x^t), $\ldots$, as well as a sequence of beliefs or reputation pairs for the two parties b^1, b^2, $\ldots$, b^t, $\ldots$.

Extremists of party P receive a utility of one when they implement their favorite policy $x_P \in X$, a payoff of zero when the opposition party implements an extreme policy $x_{-P} \in X$, and a payoff of one half when a moderate policy $x_M \in X$ is implemented. In addition to these policy payoffs, extremists of party P receive an office benefit G when their party is elected in government, where

$$G \geq \frac{1}{2}. \tag{2}$$

Extreme parties care about the electoral and policy outcome in two periods, the current period t as well as period $t+1$, so that their payoff is the sum of the utilities accrued from these two periods. Thus, with condition (2) we restrict the analysis to the case partisans are sufficiently motivated by office. This is the interesting scenario, as when the value of winning office, G, is smaller than one-half, the game becomes strategically trivial in that extreme party types always pursue an extreme policy when in government. The voter M strictly prefers the moderate policy, x_M, over the two partisan policies, and is indifferent between policies x_L, x_R. The voter's payoff depends only on the policy outcome implemented immediately following the election, that is, partisans look further into the future, compared to the electorate, when making strategic decisions.

We focus on strategies in which political parties choose policies while in government by conditioning on the level of competition between the two parties as reflected by the reputation level of the two parties. Hence, the strategy for the extreme type, e, of party P is given by a function that maps the pair of party reputations to the probability of an extreme policy choice:

$$\sigma_P : [0,1]^2 \rightarrow [0,1]. \tag{3}$$

Accordingly, $\sigma_P(b_L, b_R)$ is the probability that the extreme type of party P implements an extreme policy x_P in a period with party reputations given by (b_L, b_R). The strategy of the voter is given by a function that maps the pair of party reputations and the identity of the incumbent party in government to a re-election probability

$$\sigma_M : [0,1]^2 \times \{L, R\} \to [0,1]\,. \tag{4}$$

Thus, the probability that the incumbent party P is re-elected when party reputations are given by $b \in [0,1]^2$ is $\sigma_M(b, P)$.

2.2 Equilibrium

An equilibrium in our analysis is a trio of strategies $\sigma = (\sigma_L, \sigma_R, \sigma_M)$ for the two parties and the voter, and a belief updating rule

$$b' : [0,1]^2 \times \{L, R\} \times X \to [0,1]^2, \tag{5}$$

that maps reputations b^t and observables P^t, x^t in period t to updated reputations $b^{t+1} = b'(b^t, P^t, x^t)$ in period $t+1$, such that for all reputations for the parties in period t: The voter chooses optimally between the incumbent and the opposition party in the elections; extreme party types (if in control of their party) optimally choose which policy to implement if their party is elected in government; and, the belief updating rule b' in (5) satisfies Bayes' rule whenever possible.[3] Note that the belief updating rule b' takes as input the current period reputations b^t, which serve as the voter's prior beliefs about the type of the two parties, along with the publicly observed information in period t, namely the party in government P^t and the implemented policy x^t. The posterior obtained from these priors and the observed data become the updated reputation pair b^{t+1} in period $t+1$. In addition to the above standard equilibrium conditions, we focus on equilibria in which the strategy of the voter takes the following intuitive form:

$$\sigma_M(b, P) = \begin{cases} 1 & \text{if} \quad b_P < b_{-P} \\ 0 & \text{if} \quad b_P > b_{-P}. \end{cases} \tag{6}$$

[3]There is only a minimal additional restriction on out-of-equilibrium beliefs, namely players infer that the type of the government is extreme whenever they observe an extreme policy.

Condition (6) introduces a refinement that ensures that the voter chooses the party with the best reputation.[4] Kalandrakis (Forthcoming) refers to such equilibria as *responsive*, and shows[5] the following:

Proposition 1 *There exists a unique*[6] responsive *equilibrium. It is such that:*

1. *The strategy of extreme type of party P is given by*

$$\sigma_P(b) = \begin{cases} \dfrac{\mathcal{T}_g(b_P) - \mathcal{T}_o(b_{-P})}{b_P(\pi_e^g - \mathcal{T}_o(b_{-P}))} & \text{if} \quad \mathcal{T}_g(b_P) > \mathcal{T}_o(b_{-P}) \\ 0 & \text{otherwise.} \end{cases} \tag{7}$$

2. *The strategy of voter M satisfies (6) and*

$$\sigma_M(b, P) = \frac{1 + b_R\left(\sigma_R(b) - \sigma_R(\pi_e^g, b_R)\right)}{2G + \sigma_R(b)(\pi_e^g + b_R)} \text{ if } b_P = b_{-P} \in [1 - \pi_m^o, \pi_e^o]. \tag{8}$$

3. *The updated reputation of party P following a period with government party P' and implemented policy x satisfies*

$$b'_P(b, P', x) = \begin{cases} \mathcal{T}_o(b_P) & \text{if} \quad P \neq P' \\ \mathcal{T}_g\left(\frac{(1-\sigma_P(b))b_P}{1-\sigma_P(b)b_P}\right) & \text{if} \quad P = P',\ x = x_M,\ \text{and } b_P < 1 \\ \mathcal{T}_g(1) & \text{if} \quad P = P' \text{ and } x = x_P. \end{cases} \tag{9}$$

The functions $\mathcal{T}_o, \mathcal{T}_g$ in Proposition 1 are defined as $\mathcal{T}_o(b) = \pi_e^o b + (1 - \pi_m^o)(1 - b)$ and $\mathcal{T}_g(b) = \pi_e^g b + (1 - \pi_m^g)(1 - b)$, respectively. The first line of the updating rule in (9) reflects the updated reputation of a party in the opposition, $\mathcal{T}_o(b_P)$. Indeed, given prior b_P, the opposition party is extreme with probability $\pi_e^o b_P$, by maintaining previous period's preferences, and with probability $(1 - \pi_m^o)(1 - b_P)$, by switching from moderate preferences in the preceding period. The second line corresponds to the updated reputation of the governing party following a moderate policy choice, so that application of $\mathcal{T}_g$ is intermediated by the application of Bayes' rule which yields an interim

[4] As discussed in Kalandrakis (Forthcoming), this refinement can be motivated by standard trembling-hand arguments.

[5] Existence of the equilibrium follows from Proposition 3 of Kalandrakis (Forthcoming), uniqueness by Proposition 4 therein.

[6] The equilibrium is unique up to the specification of the voter's strategy for a null set of reputations that are never visited along the path of play.

posterior belief $\frac{(1-\sigma_P(b))b_P}{1-\sigma_P(b)b_P}$, and the third line corresponds to that reputation when the governing party implements an extreme policy (thus revealing that it is extreme with probability one). Note that all the endogenous quantities that determine the probabilities of different choices by players in the game, that is, the strategies σ and the belief updating rule b', are available in closed form as functions of the exogenous parameters. Given that we identify a unique equilibrium, we can then derive a likelihood over observed data and use that likelihood to recover model paramaters. Before we elaborate on the details of this estimation strategy, we discuss a number of qualitative properties of the equilibrium that are relevant for the substantive interpretation of our empirical findings.

We start with the probability that a government of party P implements an extreme policy at different reputation levels for the two parties. This probability is plotted in Figure 1(a) for the case of a government by party L. Note that this probability is equal to $b_L\sigma_L(b)$ at the pair of reputations $b \in [0,1]^2$, since extreme policies are implemented with probability $\sigma_L(b)$ only by extreme types of party L, and party L is extreme with probability b_L. As is evident from Figure 1(a), parties implement an extreme policy with positive probability when in office if their party's reputation is *relatively* worse than that of the opposition. This is because, by assumption (2), partisans care sufficiently about office such that they would rather implement a moderate policy when in government if such a policy ensures reelection. But parties with a relatively bad reputation that happen to be in government cannot deceive the electorate into thinking that their party is moderate by always implementing a moderate policy, as the government's policy choice conveys no new information about the governing party's type with such strategies.[7] Similarly, these parties cannot implement an extreme policy with probability one: If the electorate expects different party types to implement different policies, then an extreme governing party can convince the electorate that it is moderate with probability one by deviating to a moderate policy. Thus, when the government party's reputation is relatively worse than that of the opposition, the government mixes between extreme and moderate policies. The mixing probability is such that it makes the government party barely competitive against the opposition in the next elections when the realization of the governing party's lottery is a moderate policy.

[7] This is because both party types implement the same policy with probability one.

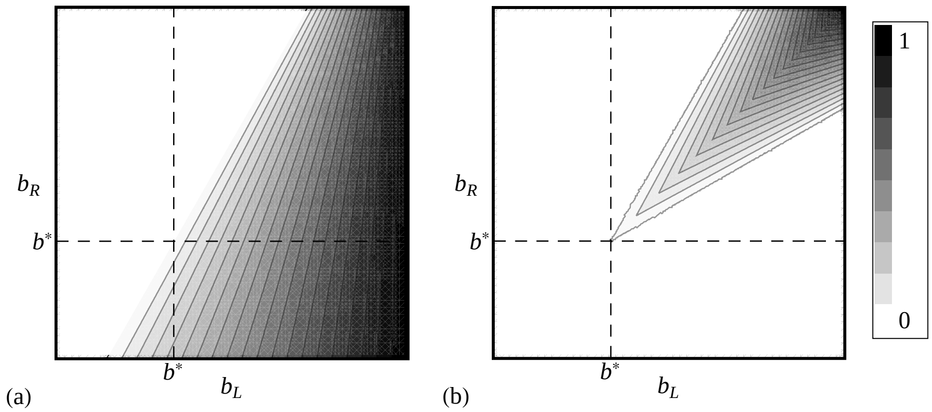

Figure 1: Probability of an extreme policy

(a) Probability of an extreme policy by a government of party L, $b_L \sigma_L(b)$. (b) Probability of an extreme policy by the government elected in equilibrium, $\min\{b_L\sigma_L(b), b_R\sigma_R(b)\}$.

Observe that parties with a relatively bad reputation are less likely to be elected in government as is certainly implied by condition (6). As a result, the equilibrium probability of an extreme policy, accounting for the endogenous choice of governing party by the electorate, is confined to the area of reputations for the two parties in which both parties would implement an extreme policy with positive probability, if elected. This area is depicted in Figure 1(b) and is characterized by two conditions: (a) The two parties' reputations are close to each other; and, (b), these reputations are above a fixed benchmark level, b^*, given by

$$b^* = \frac{\pi_m^g - \pi_m^o}{\pi_m^g - \pi_m^o + \pi_e^g - \pi_e^o}.$$

When both parties are perceived to be extreme with high probability, their reputation tends to improve due to a straightforward *regression to the mean* effect. Since by assumption (1) opposition parties are more likely to change policy preferences in comparison to parties in government, they tend to benefit more than the government from the fact that their reputation regresses towards average levels. Thus, when the voter chooses between two parties with similar reputations (as in condition (a)), and the two parties are perceived to be relatively extreme (as in condition (b)), the voter elects a party in government that is likely to suffer a worse reputation than the opposition party in the next election. In these cases, a government elected with a bare reputational advantage has a reputational (and electoral) disadvantage at the end of its tenure in office. As we have already discussed, governments facing such an electoral disadvantage are likely to implement an extreme policy in equilibrium.

The above discussion ensures the existence of certain joint reputation levels for the two parties at which extreme policies occur in equilibrium, but does not imply that these reputation levels are *reached* in equilibrium. According to the above discussion, this will depend on whether the opposition party's reputation tends to a level of perceived extremism that is lower than that of the government. If that is the case, then no matter how bad the opposition's reputation is at the first period it became the opposition, its reputation will eventually improve relative to the reputation of the government, triggering the government party's incentive to pursue extreme policies. We can succinctly quantify the comparative progress of the two parties in terms the electorate's views by gauging the speed with which the opposition party's latent preferences switch relative to those of the government. We do this using the following inequality:

$$\frac{1-\pi_e^g}{1-\pi_m^g} < \frac{1-\pi_e^o}{1-\pi_m^o}. \tag{10}$$

Inequality (10) compares the odds ratio, $\frac{1-\pi_e^o}{1-\pi_m^o}$, for the opposition party's type to switch from being extreme to being moderate versus switching from being moderate to being extreme, with the corresponding odds for parties in government, $\frac{1-\pi_e^g}{1-\pi_m^g}$. Kalandrakis (Forthcoming) shows that when inequality (10) holds the reputations of the two parties are eventually confined in the dark gray area in the upper quadrant of the space of beliefs illustrated in Figure 2(a). This area is demarcated by three reputation levels: π_e^g that corresponds to the reputation of the incumbent party in a period following a choice of an extreme policy by this party, and b^o

$$b^o = \frac{1-\pi_m^o}{2-\pi_e^o-\pi_m^o}, \tag{11}$$

and b^g

$$b^g = \frac{1-\pi_m^g}{2-\pi_e^g-\pi_m^g}, \tag{12}$$

which are the non-equilibrium long-run steady state levels of reputation for parties in opposition or in government, respectively, assuming these parties perpetually stay out of (in) office, respectively, and their observable choices reveal no information about their type. In particular, Kalandrakis

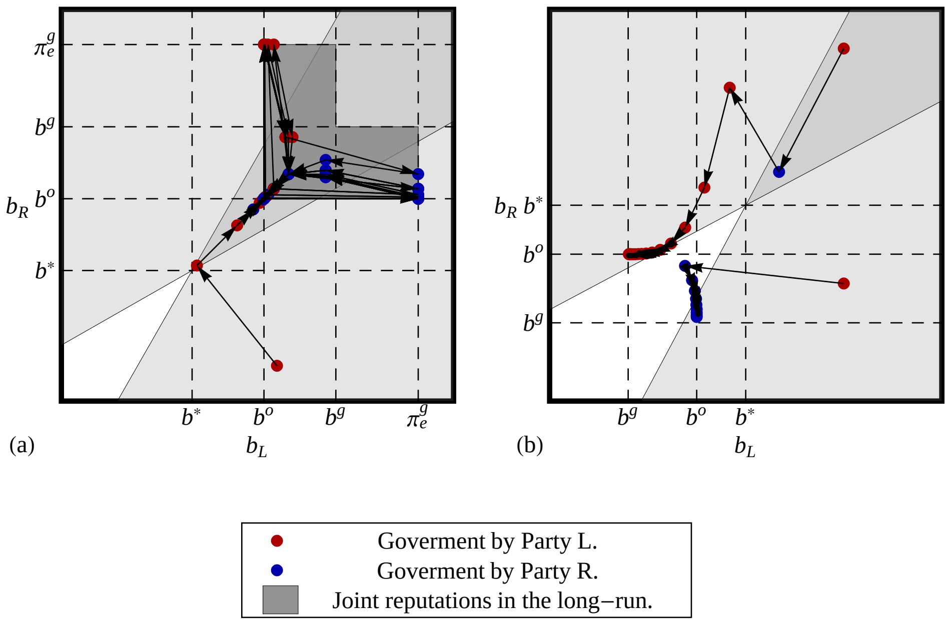

Figure 2: Policies and party reputations in the long-run

The points indicate the pair of reputations of the two parties and the party in government in each period. Arrows indicate reputation changes in consecutive periods induced by possible equilibrium play. In subfigure (a), the inequality (10) holds, and thus $b^* < b^o < b^g$ and the equilibrium produces regular turnover of government parties and extreme policies. In the long-run, party reputations are confined to the dark gray area. Conversely, for subfigure (b), the inequality (10) is reversed, and thus $b^* > b^o > b^g$. Here, in the long-run, either a government of the left prevails at reputations (b^g, b^o), or a government of the right prevails at reputations (b^o, b^g), and these governments pursue moderate policies with probability one.

(Forthcoming) shows that inequality (10) is equivalent to $b^* < b^o < b^g$. Because the reputation of the opposition party tends to a lower level, b^o, compared to the corresponding level for the government party, b^g, when (10) holds, all governments are eventually guaranteed to make policy choices having a reputational disadvantage vis-a-vis the opposition and implement extreme policies with positive probability. Hence, extreme policies and alternation of the two parties in government occur infinitely often along the path of play. On the other hand, when the inequality in (10) is reversed, then $b^* > b^o > b^g$ and, eventually, the governing party enjoys a persistent reputational advantage over the opposition and moderate policies are implemented with probability one.[8]

We summarize the above discussion of the equilibrium in Proposition 1 as follows:

Proposition 2 *The equilibrium in Proposition 1 is such that*

[8]These stark long-run predictions are qualified when we introduce electoral shocks in Section 5.

1. *If Inequality (10) holds, then $b^* < b^o < b^g$, government parties eventually lose any reputational advantage to the opposition party, extreme policies occur infinitely often along the equilibrium path, and parties alternate in office.*

2. *If Inequality (10) is reversed, then $b^* > b^o > b^g$, and in the long-run the government party enjoys a persistent reputational advantage to the opposition and moderate policies prevail with probability one.*

In this section, we briefly described the model and its equilibrium. Our aim was to provide sufficient background for the analysis in subsequent sections, rather than provide comprehensive motivation and development of the model.[9] As is evident from Proposition 2 and the preceding discussion, while the model induces a unique equilibrium for any single set of parameters, it produces radically different predictions for different parameter values. It is thus reasonable to ask what parameter values are the most empirically relevant; that is, what sets of parameter values generate data patterns that best conform with actual observations? To answer this question, in the following section, we show how the model induces a likelihood over the observed data, as a function of the model parameters. We then use this likelihood to obtain estimates of these parameters.

3 Estimation Strategy

3.1 Likelihood

In this section we develop notation and discuss how the equilibrium in Proposition 1 induces a likelihood over observed outcomes. We aim to estimate model parameters using both data from a single country as well as data with observations pooled from several countries. For ease of exposition, we first describe the likelihood in the case of single country data, and then extend to the case of observations from multiple countries. Assuming observations from periods $t = 1, ..., T$, we denote the corresponding sequence of parties in government by a vector $\mathbf{P} = (P^1, P^2, \ldots, P^T)$ and the sequence of implemented policies by a vector $\mathbf{x} = (x^1, x^2, \ldots, x^T)$.[10] We use the notation $\mathbf{P}^t$ and $\mathbf{x}^t$, to indicate a data sequence truncated up to period t, for example, $\mathbf{P}^t = (P^1, \ldots, P^t)$.

[9] For that purpose the interested reader may consult Kalandrakis (Forthcoming).

[10] Such data for parties in government $\mathbf{P}$ are readily available. We proceed in this subsection assuming the existence of the corresponding data on implemented policies $\mathbf{x}$, although for practical purposes we later treat these policies as unknowns to be included in the estimation.

We assume that these observations are generated from the equilibrium in Proposition 1 that corresponds to a given set of (unknown) values for the exogenous parameters. For notational sanity, we compactly represent the exogenous parameters by (θ, b^1) where

$$\theta = (\pi_e^g, \pi_m^g, \pi_e^o, \pi_m^o, G).$$

The parameters in θ are the primary focus of our estimation efforts. Parameters b^1 constitute the pair of the initial probabilities with which the two parties are drawn to be extreme (and also amount to the initial reputations of the two parties), and are also included in the estimation. Note that due to (6) and the fact that $b_L^1 \neq b_R^1$ the probability of observing a government by party P^1 in period 1 is given by

$$\mathsf{Pr}(P^1|\theta, b^1) = \begin{cases} 1 & \text{if} \quad b_{P^1}^1 < b_{-P^1}^1 \\ 0 & \text{if} \quad b_{P^1}^1 > b_{-P^1}^1. \end{cases} \tag{13}$$

Since it is possible that $b_L^t = b_R^t$ in periods $t = 2, \ldots, T$, the probability of a government by party P^t in period $t > 1$ is

$$\mathsf{Pr}(P^t \mid \mathbf{P}^{t-1}, \mathbf{x}^{t-1}, \theta, b^1) = \begin{cases} \sigma_M(b^t, P^{t-1}) & \text{if} \quad P^{t-1} = P^t \\ 1 - \sigma_M(b^t, P^{t-1}) & \text{if} \quad P^{t-1} \neq P^t. \end{cases} \tag{14}$$

The function σ_M that appears in (14) is defined in (8), while the party reputations, b^t, that enter as its arguments are obtained inductively using the initial exogenously given reputations b^1 by repeated application of (9).[11] As a result, $\mathsf{Pr}(P^t \mid \mathbf{P}^{t-1}, \mathbf{x}^{t-1}, \theta, b^1)$ is a function of all past observations $\mathbf{P}^{t-1}, \mathbf{x}^{t-1}$. We can similarly obtain the probability that the governing party, P^t, implements policy x^t in period $t = 1, \ldots, T$, as

$$\mathsf{Pr}(x^t \mid \mathbf{P}^t, \mathbf{x}^{t-1}, \theta, b^1) = \begin{cases} b_{P^t}^t \sigma_{P^t}(b^t) & \text{if} \quad x^t = x_{P^t} \\ 1 - b_{P^t}^t \sigma_{P^t}(b^t) & \text{if} \quad x^t = x_M, \end{cases} \tag{15}$$

and we use the convention of rewriting the probability of the policy choice in the first period by $\mathsf{Pr}(x^1|P^1, \theta, b^1) = \mathsf{Pr}(x^t|\mathbf{P}^1, \mathbf{x}^0, \theta, b^1)$. The function $\sigma_{P^t}(b^t)$ in (15) is defined in (3). Note that the

[11] Note that (14) specifies $\sigma_M(b, b)$ only for values of $b \in [1 - \pi_m^o, \pi_e^o]$ which is sufficient since the reputation of the opposition party is confined in $[1 - \pi_m^o, \pi_e^o]$ in all periods $t > 1$ by (9). Similarly, although (9) does not specify how to update the governing party P's reputation when $b_P = 1$ and a moderate policy is implemented, such reputations never occur along any path of play.

probability of an extreme policy choice in (15) is the product of the probability that an extreme party type pursues an extreme policy, times the probability the party in government is extreme in period t, $b^t_{P^t}$, given past observations $\mathbf{P}^{t-1}, \mathbf{x}^{t-1}$. Note that the latter probability, $b^t_{P^t}$, coincides with the players' belief about party P^t, or this party's reputation, in the equilibrium of the game with parameters θ, b^1.

We can now combine the probabilities in (13), (14), and (15) in order to write the likelihood as a product of conditional probabilities as follows:

$$\begin{aligned}\mathcal{L}(\theta, b^1 \mid \mathbf{P}, \mathbf{x}) \quad = \quad & \mathsf{Pr}(P^1 \mid \theta, b^1)\mathsf{Pr}(x^1 \mid P^1, \theta, b^1) \times \\ & \prod_{t=2}^{T} \mathsf{Pr}(P^t \mid \mathbf{P}^{t-1}, \mathbf{x}^{t-1}, \theta, b^1)\mathsf{Pr}(x^t \mid \mathbf{P}^t, \mathbf{x}^{t-1}, \theta, b^1). \end{aligned} \tag{16}$$

The likelihood in (16) can be used for estimation purposes with data from a single country. If data from a total of C countries is available, we index countries by $c = 1, \ldots, C$ and denote data from the c-th country as a vector $\mathbf{P}_c$ and $\mathbf{x}_c$. If we assume that all countries in a subset $\mathcal{C} \subseteq \{1, \ldots, C\}$ share the same structural parameters θ, but not necessarily the initial reputations— which we denote by b^1_c for the c-th country—then we can pool data for estimation purposes using (16) to obtain the combined likelihood

$$\mathcal{L}(\theta, \{b^1_c\}_{c\in\mathcal{C}} \mid \{\mathbf{P}_c, \mathbf{x}_c\}_{c\in\mathcal{C}}) \quad = \quad \prod_{c\in\mathcal{C}} \mathcal{L}(\theta, b^1_c \mid \mathbf{P}_c, \mathbf{x}_c). \tag{17}$$

3.2 Data and Estimation Method

We confine our empirical analysis to parliamentary systems of government in which two parties alternate in power controlling a majority of seats in parliament. This excludes a number of two party systems, including the US, that do not have a parliamentary form of government and in which victorious parties cannot implement a policy without the consent of extra-party institutional players, such as the president. Among two party parliamentary systems we focus on a subset of five developed countries,[12] namely Australia, Greece, Malta, New Zealand, and the UK. Excluded from the analysis are a large number of smaller former British colonies governed in the Westminster

[12] These uniquely meet the criterion of an advanced economy according to the IMF (2009) and high income countries according to the World Bank (2008).

Australia		Greece		Malta		New Zealand		United Kingdom	
t	P^t	t	P^t	t	P^t	t	P^t	t	P^t
1946	L	1977	R	1966	R	1946	L	1945	L
1949	R	1981	L	1971	L	1949	R	1950	L
1951	R	1985	L	1976	L	1951	R	1951	R
1954	R	1990	R	1981	L	1954	R	1955	R
1955	R	1993	L	1987	L	1957	L	1959	R
1958	R	1996	L	1992	R	1960	R	1964	L
1961	R	2000	L	1996	L	1963	R	1966	L
1963	R	2004	R	1998	R	1966	R	1970	R
1966	R	2007	R	2003	R	1969	R	1974	L
1969	R			2008	R	1972	L	1979	R
1972	L					1975	R	1983	R
1974	L					1978	R	1987	R
1975	R					1981	R	1992	R
1977	R					1984	L	1997	L
1980	R					1987	L	2001	L
1983	L					1990	R	2005	L
1984	L					1993	R		
1987	L								
1990	L								
1993	L								
1996	R								
1998	R								
2001	R								
2004	R								
2007	L								

Table 1: Election years and party in government. For ease of exposition Right party is offset (R).

tradition.[13] Many of these countries feature too small a number of elections with a consolidated party system, while some among those with a larger number of potential observations, such as Jamaica and the Barbados, feature idiosyncratic forms of two party competition in which, for example, both of the two competing parties are Labour parties traditionally on the left of the policy spectrum. Among countries that meet our development criteria but are excluded is Canada which, despite falling in the Westminster tradition, has a high frequency of minority governments. Spain is excluded for the same reason.

Our data consist of a sequence of binary observations encoding the victorious party in the five countries included in the analysis. The available data series are listed in Table 1. The data series start immediately after WWII for all countries except Greece and Malta. In Greece, immediate post-WWII politics involved multiparty systems and political instability leading to a coup in 1967. Thus, the Greek data start with the 1977 election, the first election in which the first two vote

[13]E.g., Bahamas, Barbados, Belize, Jamaica, St. Kitts & Nevis, St. Lucia, St. Vincent, etc.

receiving parties coincide with the two parties that governed the country following restoration of democracy in 1974. We include in the analysis all the Maltese elections starting with the first election following independence. With the exception of New Zealand, where the data series was interrupted in 1996 due to electoral reforms,[14] the remaining data series extended to the present day. Thus, our data vary in length from a maximum of 25 periods (Australia) to a mere 9 elections in the Greek case. These data exhibit considerable alternation in power over time within each of the four countries. Note that competition between the two parties appears to be more balanced in Greece, Malta, and the UK, compared to New Zealand and Australia both of which seem to experience longer spells in power for the right party.

A major difficulty in our analysis is the fact that, unlike data on the sequence of the governing parties, it is much harder to objectively determine the nature of the policy choices, x^t, made by the governments in these countries, even for the coarse binary distinction between extreme and moderate policies that we wish to make. Recall that a moderate policy in the model corresponds to the most preferred policy of a pivotal voter in the left-right policy dimension. These moderate policies differ both over time and across countries, so that reasonable people may disagree about the classification (moderate or extreme) of even objectively identical policy bundles implemented by two different governments in two countries, or in different periods within the same country. Instead of pretending to be able to determine the nature of government policy choices across our diverse sample, we pursue an estimation strategy that consistently treats the implemented policies as unknown quantities generated from the equilibrium of the model. This choice does not preclude the possibility of a more systematic attempt to obtain more information on policy choices in future research. Indeed, our estimation approach allows us to incorporate such evidence either directly or by use of appropriate prior specifications, where these priors may be elicited from country experts.

Given that the sequence of implemented policies, $\mathbf{x}_c$, is unavailable, we can proceed in one of two ways. A first possibility, is to integrate the unobserved policies out of the likelihood in (16) and use a maximum likelihood estimator based on this integrated likelihood function. Unfortunately, this approach is numerically impractical in our context. The probabilities in (16) condition on the

[14] Both the UK and Greece experienced an apparent discontinuity in the data sequence in our sample because of an episode of inconclusive elections that occurred in each. In the UK this occurred in the first of the dual 1974 elections, while in Greece in the first two of the trio of elections in 1989-90. In these cases, we ignore the initial inconclusive elections that produced short inter-election periods, continuing the sequence with the first ensuing election that produced a single party majority in parliament. In all the inconclusive elections, the plurality party became the eventual majority party in the ensuing election.

entire past history of policy choices, so that performing this integration involves a summation with as many as 2^T terms, that is, the total number of all possible policy choice sequences. We thus opt for a data augmentation scheme, (Tanner and Wong, 1987), which we implement in the context of a Markov Chain Monte Carlo (MCMC) Bayesian estimator. The exact sampling scheme used is described in detail in Appendix A.

We conducted a series of (fairly expansive) Monte Carlo experiments using datasets generated from equilibria of the model for various values of the parameters. These simulations suggested quite good performance of our estimator in recovering the structural parameters θ in sample sizes comparable to those we have available. In particular, we obtain better point estimates and sharper inferences (i.e., increasingly smaller standard errors) as either the number of periods T increases for a specific country or, for fixed T, when countries are pooled for estimation.[15] Encouraged by these computations, in the next section we report on the results of our estimation strategy.

4 Results

We are able to draw several interesting conclusions from the structural estimation of the formal model. As a brief preview, on which we will expand substantially, we find that latent preferences within parties are quite stable over time, although extreme parties do tend to moderate after a spell out of office. Related to this observation, the value of government is generally high for partisans, though noticeably lower for Australian politicians. We find evidence for significant country specific structural differences, and against pooled models in which groups of countries share structural parameters. Most notably in that regard, Australia emerges as a distinct case in our data: On the basis of the estimated structural coefficients we find that Australian parties enjoy much longer predicted spells in office and they enact more moderate policies in the long-term than in the other countries. Finally, the formal model easily outperforms less structured heuristic forecasting rules in terms of fit.

[15] One caveat, of course, is that in order for these asymptotics to take effect (without much stronger assumptions on the initial reputations b^1) the data must be generated from parameter values that yield alternation of parties in government in the long-run, i.e., when inequality (10) holds. If the data do not exhibit such alternation, i.e., inequality (10) fails, then structural parameters can only be pinned down up to an area of the posterior space. In some sense, this problem is not unlike the problem of recovering probit or logit coefficients from binary data that take only the value one or zero. But note that we can still evaluate the hypothesis that inequality (10) holds using the posterior distribution, independently of the exact conditioning of the data.

	Australia	Greece	Malta	New Zealand	UK	Pooled	Pooled(4)
π_e^g	0.84	0.88	0.86	0.86	0.87	0.81	0.81
	(0.15)	(0.14)	(0.15)	(0.14)	(0.14)	(0.17)	(0.16)
π_m^g	0.89	0.86	0.88	0.87	0.83	0.94	0.92
	(0.09)	(0.12)	(0.12)	(0.10)	(0.12)	(0.06)	(0.07)
π_e^o	0.44	0.46	0.43	0.46	0.53	0.25	0.29
	(0.18)	(0.18)	(0.19)	(0.18)	(0.18)	(0.13)	(0.14)
π_m^o	0.77	0.76	0.78	0.77	0.74	0.89	0.87
	(0.14)	(0.15)	(0.15)	(0.14)	(0.15)	(0.08)	(0.09)
G	0.59	0.95	0.85	0.80	0.79	0.66	0.75
	(0.10)	(0.57)	(0.50)	(0.29)	(0.34)	(0.11)	(0.17)

Table 2: Parameter estimates

Point estimates are posterior medians, with posterior standard deviations in parenthesis. The first five columns correspond to country-specific estimates. The 'Pooled' model pools observations across the five countries, and 'Pooled(4)' pools observations across the four countries, excluding Australia.

4.1 Persistence of latent party preferences

In Table 2 we report the parameter estimates for both the country-specific models (first five columns) and the models that pool observations across countries (last two columns). Recall that π parameters are conditional probabilities of parties maintaining the same latent preferences; the superscript g or o refers to parties in government and opposition respectively, while m and e refer to their preferences/types—either moderate or extreme. Looking across the first two rows, we observe that the estimated probabilities for the persistence of preference of parties in government are consistently at or above the 0.8 to 0.9 range. These estimates are quite large,[16] implying parties in government maintain the same latent preferences with high probabilities across electoral periods.

Note that by assumption (1), parties in the opposition switch preference with higher probability than parties of the same type in government. Nevertheless, we estimate the probability that opposition parties remain moderate, π_m^o, to also be consistently high, with a minimum estimated value of 0.74 for the UK, and values as high as 0.89 in the case of the pooled model. On the other hand, the estimates reported in the third row of Table 2 corresponding to the probability that opposition parties remain extreme, π_e^o, are relatively low. In particular, according to Table 2, extreme parties in opposition are more likely to switch preferences to moderation (with probability $1-\pi_e^o$) than to remain extreme, with the UK being the only exception ($1-\pi_e^o = 0.47 < 0.53 = \pi_e^o$).

[16]For example, converting these per inter-election period probabilities to annual rates we obtain values between $0.95 - 0.98$.

	Australia	Greece	Malta	New Zealand	UK	Pooled	Pooled(4)
$\pi_e^o > \pi_m^o$	0.20	0.22	0.18	0.19	0.36	0.00	0.01
$\pi_e^g > \pi_m^g$	0.65	1.19	0.81	0.97	1.53	0.20	0.29
$b^o > b^g$	0.00	0.01	0.03	0.00	0.00	0.00	0.00

Table 3: Bayes factors & hypothesis tests for probabilities of persistence of party preferences.

Inequality $b^o > b^g$ is equivalent to inequality (10). The inequalities as expressed in the table can be treated as 'model 1' while the alternative, with the inequality reversed, is 'model 2'. Following the classification given by Jeffreys (1961), a value B (or B^{-1} for model 2) can be interpreted as follows:
$1 > B \geq 10^{-\frac{1}{2}}$: Minimal evidence against model 1;
$10^{-\frac{1}{2}} > B \geq 10^{-1}$: Substantial evidence against model 1;
$10^{-1} > B \geq 10^{-2}$: Strong evidence against model 1;
$10^{-2} > B$: Decisive evidence against model 1.

Furthermore, the estimates of persistence of preferences for extreme parties in the opposition are (much) lower than the corresponding estimates for moderate parties, that is, $\pi_e^o < \pi_m^o$. No such pattern is apparent for the corresponding inequality ($\pi_e^g < \pi_m^g$) for parties in government.

Despite the evidence from the point estimates reported in Table 2, a proper test of the hypothesis that the persistence of preference probabilities satisfy the inequality $\pi_e^o < \pi_m^o$ (or $\pi_e^g < \pi_m^g$) must take account of the correlation among these variables in the posterior distribution. We properly evaluate the evidence in support of these comparisons using Bayes factors, and report the relevant figures in Table 3. With the exception of the UK, there is substantial evidence against the hypothesis that $\pi_e^o > \pi_m^o$ implying that, indeed, the claim that moderation is stickier than extremism is supported for oppositions. By contrast, the claim about governments being more likely to remain extreme than moderate is merely supported, or there is 'minimal evidence' against it, for all the country-specific models; that said, there appears to be substantial evidence against that hypothesis on the basis of pooled data excluding Australia.

Over all, the estimates in the first four rows of Table 2 portray a mixed picture of internal party politics. On the one hand, Table 2 suggests that latent partisan preferences are fairly persistent, especially when parties are in government. On the other hand, parties with extreme preferences in the opposition tend to switch preferences with much higher probability, which sensibly suggests that opposition parties become more competitive after a spell out of power. Perhaps contrary to the first finding, the second finding suggests that there are forces within political parties that trigger or permit a possibly strategic shift that enhances the party's electoral prospects. A success story of this type—wherein an opposition party moves towards moderation—is Tony Blair's

'New Labour' in Britain (e.g. Jones, 1996). Nevertheless, Labour's transformation took place only after four consecutive electoral defeats. In addition, note that all estimates of the relevant parameter π_e^o are larger than zero: that is, even if political parties consciously attempt a shift in preferences from extremism to moderation, we find no support for the hypothesis that they can effect that shift with probability one.[17] Thus, it appears that the ability of the parties to strategically move towards moderation is tempered either by certain collective action failures within the party, or simply because parties do not possess the perfect institutional instruments that can bring about reform and a credible shift in latent party preferences. In fact, using only the estimates proffered here, it is impossible to rule out a 'survival of the fittest' institutional story; that is, that partisan institutions have evolved in such a way that they induce *self*-correction after defeat.

4.2 Value of office and country-specific differences

Turning to the last row of Table 2, consider the estimates of the value of government (G). Recall that a value of one implies that party extremists would be willing for *their* party to enact the policies of the *opposition's* extremists so long as they could remain in government. That is, as G grows large, even hardcore party ideologues are willing to 'sell out' to hold power. According to our estimates, Greek politicians are keenest on office rents ($G = 0.95$) with Malta, New Zealand, and the UK following suit, while Australians seem relatively uninterested in the trappings of high office ($G = 0.59$). In fact, looking at the first five columns of Table 2, the value of office appears to be the only structural parameter that strongly suggests a difference in estimated values across the five countries. The fact that Australia stands out when it comes to the estimated smaller value of office is consistent with the fact that it is the only country with a significant federal structure, which makes holding central office somewhat less valuable *ceteris paribus* than in a unitary state like Greece, Malta, or Britain.

This general similarity in the estimated parameters across the five countries in our sample raises a question: Is political competition across these countries characterized by common structural parameters? To investigate this possibility we fit *pooled* models, wherein the structural parameters $\pi_e^o, \pi_m^o, \pi_e^g, \pi_m^g, G$ are assumed identical across a set of countries. As already mentioned, estimated parameters from two such models are reported in Table 2, in the far right columns. While the

[17] Specifically, the left boundary of the 95% highest posterior density or credible interval is well above zero in all cases with a minimum value of 0.11 for the country-specific estimates and 0.05 for the pooled models.

Model	No Electoral Shocks	Extension $s = 0.1$	Extension $s = 0.2$
Country-specific	150.28	181.19	183.82
Pooled	171.64	224.63	246.29
Country-specific(4)	109.82	140.04	146.08
Pooled(4)	119.12	167.94	183.08

Table 4: Country-specific vs pooled estimation.

Deviance Information Criterion (DIC) for pooled and country-specific models. Lower DIC implies better fit. The country-specific models outperform the pooled alternative.

model labeled 'Pooled' includes all five countries, model 'Pooled(4)' excludes Australia which, as we already discussed, appears to be the only country with different country-specific parameter estimates, notably with regard to the value of office. As to be expected, the pooled models that combine more data observations lead to sharper inferences as is evident by the smaller standard errors in Table 2, or the Bayes factors in the last two columns of Table 3. For both pooled models with and without Australia, we note that the probabilities of persistence of preferences pertaining to moderate parties (in opposition and government) are lower than those estimated for the countries individually while the probabilities for remaining extreme are higher than in the country-specific cases. The value of government (G) is somewhere between the maximum and minimum of that for the individualized estimates in the pooled model that includes Australia.

Whether we should prefer this pooled arrangement requires a comparison of models with different numbers of parameters. In the Bayesian framework of our study, the Deviance Information Criterion (DIC) (Spiegelhalter et al., 2002) is suitable for the purposes of this comparison.[18] This statistic is reported in Table 4, with the relevant figures for the country-specific model we are discussing appearing in the first column of that table. The country-specific estimation with five countries certainly does better than the pooled model (DIC difference is greater than 20). The four-country pooled model (excluding Australia) is also outperformed by the corresponding country-specific model, although the contest is closer in this case. Hence, we conclude that, though the pooled model is certainly theoretically plausible, there appears to be substantial evidence to the effect that national political idiosyncracies apparently account for the variation in the observed data,

[18] For a model with data from any set of countries $\mathcal{C} \subseteq \{1, \ldots, C\}$, denote the deviance as $D(\theta, \{b^1_c, \mathbf{x}_c\}_{c\in\mathcal{C}}) = -2\log \mathcal{L}(\theta, \{b^1_c, \mathbf{x}_c\}_{c\in\mathcal{C}} \mid \{\mathbf{P}_c\}_{c\in\mathcal{C}})$. DIC is the expected deviance, computed as the average of the posterior sample of size M, $\bar{D} = \frac{1}{M}\sum_{i=1}^{M} D(\theta_i, \{b^1_{c,i}, \mathbf{x}_{c,i}\}_{c\in\mathcal{C}})$, plus a penalty for the effective number of parameters, p_D. Thus $DIC = \bar{D} + p_D$, with the implication that models with lower DIC are preferred. We approximate p_D by $p_V = \frac{\text{var}(D(\theta,\{b^1,\mathbf{x}_c\}_{c\in\mathcal{C}}))}{2}$ (see Gelman et al. (2004)), which is very straightforward to calculate from the posterior sample.

	Australia	Greece	Malta	New Zealand	UK	Pooled	Pooled(4)
	0.044	0.083	0.072	0.077	0.099	0.036	0.053
	(0.042)	(0.100)	(0.090)	(0.070)	(0.081)	(0.039)	(0.051)

Table 5: Predicted probability of extreme policies in the long-run

Probability is median obtained from distribution of long-term probabilities of extreme policies based on the posterior sample. Standard errors in parenthesis.

and that a significant component of this country-specific variation is associated with Australia. And according to the point estimates in Table 2, at least part of the reason why Australia is different might be due to the lower value of the prize that comes from winning power.

4.3 Policy and electoral dynamics

We now turn our attention to the implications of the reported estimates for the policy and electoral dynamics of the countries in our sample. Recall that from Section 2 and Proposition 2, we expect extreme policies and alternation of parties in government when inequality (10) holds, and policy moderation and a strong incumbency advantage in countries in which it does not. Inequality (10) is actually equivalent to $b_g > b_o$, and using the posterior sample and equations (11) and (12), we compute the Bayes factor for the hypothesis $b_g > b_o$. As reported at the bottom of Table 3, the data overwhelmingly support the hypothesis that $b_g > b_o$ across all models, so that both extreme policies and alternation of parties in government are guaranteed to occur in the long-term in the countries of our sample. This finding is not particularly surprising, in view of part (ii) of Proposition 2. In the absence of 'surprise' election victories, as we have assumed in the estimation so far, the model predicts a persistent incumbency advantage in the long-run when $b_g < b_o$. Hence, values of the π parameters that support this inequality yield an inferior fit for the observed alternation of parties in government in the data.

The fact that we find support for the hypothesis that $b_g > b_o$, such that Proposition 2 permits extreme policies in the long term across countries, does not imply that these policies must occur at equal rates in these countries. Using the model and the posterior sample for each specification, we can estimate the *long run* probability of an extreme policy. This is done by simulating long sequences of equilibrium play (5,000 periods) for the model corresponding to each point in the posterior sample separately, and then averaging the frequency of extreme policies across periods in

	Australia	Greece	Malta	New Zealand	UK	Pooled	Pooled(4)
Model	3.44	1.77*	1.92*	2.06	2.05	2.63	2.20
	(1.33)	(0.76)	(0.81)	(0.59)	(0.59)	(0.42)	(0.37)
Observed	4.17	2.25	2.50	2.43	2.67	2.85	2.48
T	25	9	10	17	16	77	52

Table 6: Long-run predicted duration of spells in office

Probability is median obtained from distribution of long-term probabilities of average spells in office based on the posterior sample. Standard errors in parenthesis. Observed duration is the average of the duration of spells in office in the sample.

* Computed conditional on inequality (10) being satisfied.

this long data sequence (discarding the first 1,000 periods as burn-in). The relevant predictions are displayed in Table 5. These calculations suggest none of the nations under study are exceedingly likely to undertake radical policies in the long-run, with the frequency of such policies ranging roughly between one in every twenty to one in every ten elections. Notice that the model predicts Australia has the lowest long-run probability of witnessing such extreme policies—just 0.044. This is considerably lower—almost half—than that of the nearest country-specific case, which is Malta. The highest probability is that for the UK which, at 0.099, suggests an extreme policy may occur roughly one in every ten elections.

In keeping with this pattern, we might well expect Australian governments to stay in power longer, since they do not tend to jag away from the centrally placed voter as quickly or as severely as those of the remaining countries. To verify this claim we generate predictions for the duration of an average government's spell in the long-run for the various countries using the same calculations as those that yielded the estimates of the long-term probabilities of extreme policies in Table 5. Since parameter values in the posterior sample that fail inequality (10) yield infinite spells of office in the long-run, we exclude the small fraction of such cases occurring in the posterior samples for Greece and Malta. Table 6 contains the computed long-run average government's spell information. Unlike the case of extreme policies for which we have no evidence in the data, we can contrast these predictions with the observed average duration of spells in office. This is reported in the third and fourth row of Table 6. Note that the long-run prediction from the estimated model matches the observed data quite well in that there is both a high correlation between predicted and observed

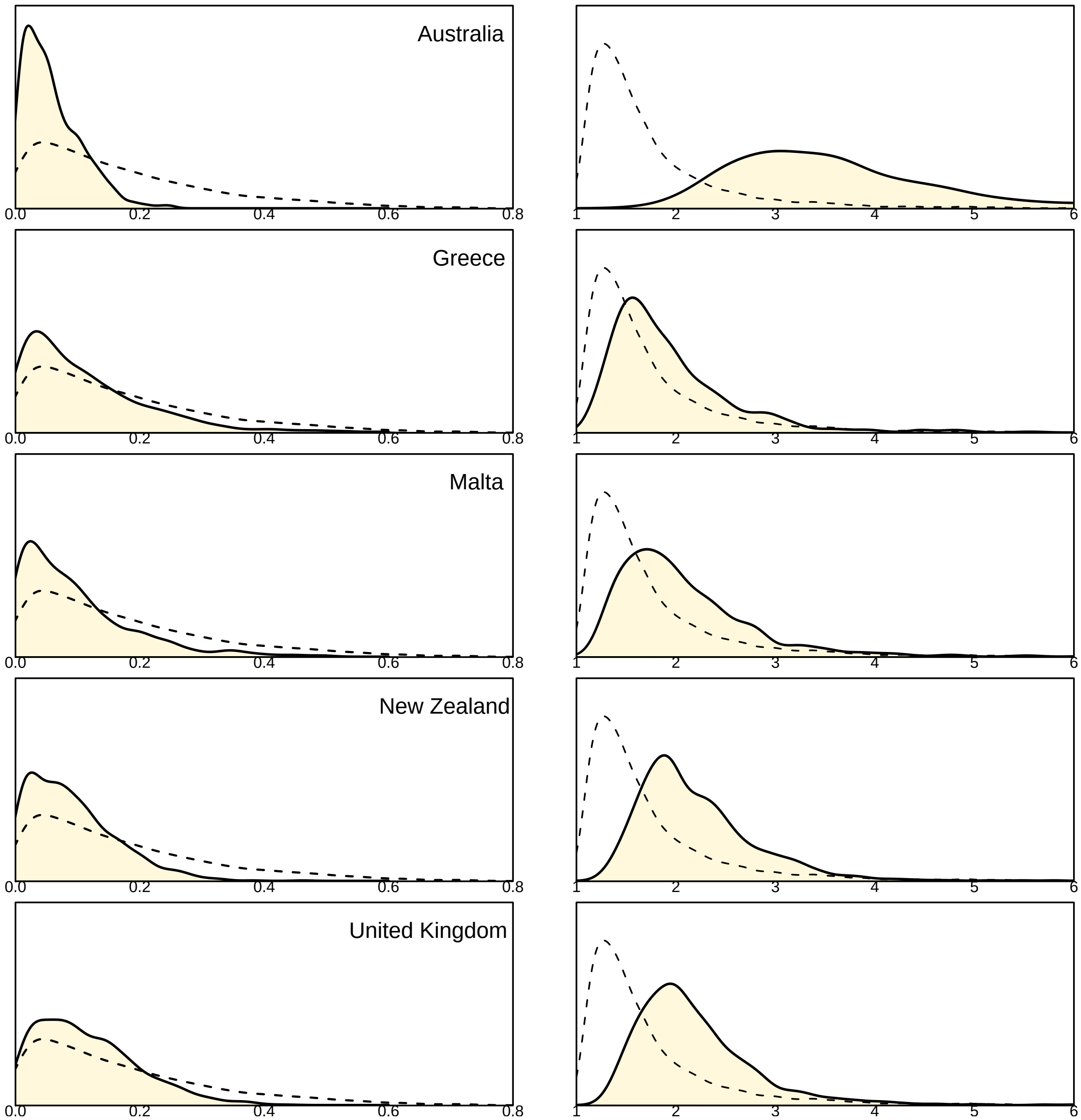

Figure 3: Prior and posterior distribution of the probability of extreme policies and predicted spells in office

Posterior distribution of the probability of extreme policies from the country-specific models appear on the left column, those of average duration of spells in office on the right. Prior distributions are depicted using dashed lines and are computed conditional on (10) being met.

mean spells, and each prediction is within about one standard error of the observed mean duration.[19]

Once again, notice that Australia stands out from the remaining countries with its governments enjoying much longer life in power, some 3.44 periods compared to, say, just 1.77 in Greece. The longer duration of spells in office in Australia can be attributed—through the formal model's equilibrium forces—to the smaller estimated value for office in that country. On the one hand, as we already noted, Australian governments tend to pursue extreme policies less frequently and governments that pursue extreme policies are ousted from office in equilibrium. On the other hand, whenever a government mixes between moderate and extreme policies (as all five countries eventually do given that inequality (10) holds for all countries) and chooses a moderate policy, the voter mixes between ousting and reelecting that government. In equilibrium, this mixing by the voter must render the government indifferent between moderate and extreme policies. Thus, to compensate a government that chooses a moderate policy, reelection rates must be higher when a government values office less; otherwise, the government would strictly prefer to implement an extreme policy, instead of mixing between moderate and extreme policies. This comparative static is immediately apparent from the expression for the voter's re-election probability reported in equation (8) of Proposition 1. Thus, all else equal, governments enjoy longer (expected) spells in power in equilibrium when office is valued less.

Figure 3 provides a more detailed graphical view of the information contained in Tables 5 and 6, by plotting the entire posterior distribution of the long-run probability of extreme policies and average spells in office for each of the five countries. These distributions suggest that the range of possible values for the two quantities of interest is quite wide compared to what the reported point estimates may suggest. The distributions depicted with the dashed line in Figure 3 are the priors (to enhance comparability of these priors with the posterior distributions, we report the priors conditional on (10) holding, as is overwhelmingly the case in the posterior samples) and, when contrasted with the posteriors, demonstrate the added information updating from the data. As expected, the Australian distributions stand out when compared with those from the other countries.

[19] Of course, this comparison should not be taken to imply that we assume the observations in the sample coincide with long-run patterns for government duration.

		Formal Model	Static Naive	Formal Model (Adj)	Dyn Naive
Australia	Corr Pred	0.80	0.64	0.80	0.75
	R^2	0.37	0.00	0.32	0.19
	λ	0.33	0.00	0.29	0.21
Greece	Corr Pred	0.78	0.56	0.75	0.63
	R^2	0.35	0.00	0.23	-0.17
	λ	0.30	0.00	0.20	0.27
Malta	Corr Pred	1.00	0.50	1.00	0.33
	R^2	0.30	0.00	0.22	0.01
	λ	0.26	0.00	0.16	0.01
NZ	Corr Pred	0.88	0.71	0.88	0.75
	R^2	0.10	0.00	-0.06	0.00
	λ	0.20	0.00	0.10	0.00
UK	Corr Pred	0.88	0.50	0.87	0.60
	R^2	0.25	0.00	0.19	0.04
	λ	0.16	0.00	0.11	0.04
Pooled	Corr Pred	0.71	0.60	0.70	0.65
	R^2	0.21	0.04	0.20	0.11
	λ	0.21	0.04	0.20	0.16
Pooled (4)	Corr Pred	0.79	0.58	0.65	0.60
	R^2	0.20	0.05	0.18	0.07
	λ	0.19	0.05	0.17	0.12

Table 7: Goodness-of-fit of formal and naive models

Corr Pred: Fraction correctly predicted. R^2: Efron's (1978) pseudo-R^2. λ: Cramer's (1999) λ. The static naive model predicts according to observed frequency, the dynamic naive model according to observed frequency conditional on previous period's government. For comparability with the dynamic naive model, the first observation of each data series is not included in the computation of these statistics in the third column corresponding to the formal model. 'Pooled(4)' refers to estimates with observations pooled across four countries, excluding Australia.

4.4 Goodness-of-fit

While our findings so far have yielded interesting interpretations, it is also important to inquire whether the formal model adequately *fits* the data, specifically whether it outperforms heuristic alternatives. We label two such naive competitors 'static' (based on simple winning rates) and 'dynamic' (based on an AR(1) process). We record goodness-of-fit with standard criteria such as the 'proportion of elections correctly predicted' and the metrics designed by Efron (1978) (pseudo-R^2) and Cramer (1999) (λ). Appendix B provides extensive details of these measurement strategies and the competing alternatives to our model. Table 7 reports the relevant figures; the fit for the formal model is given in columns 1 and 3, and the appropriate contrast is to columns 2 and 4 respectively. A larger number implies a better fit and, as is obvious from the table, the formal model outperforms the alternatives in *every one* of the twenty-one pairwise comparisons, bar two (Greece [dynamic,λ], New Zealand [pseudo-R^2]). And in the rare cases where the naive models do better, the absolute difference is very small. Of note, the pooled formal models outperform the dynamic naive model, even though we use country-specific predictive probabilities for the naive model (i.e., we do not impose the restriction that conditional predictive probabilities for the dynamic naive model must coincide across the countries. See Appendix B).

5 Election Shocks and Australian exceptionalism

We conclude our analysis by considering an extension of the model, in which we allow elections to be probabilistic. That is, rather than assuming that election victories are determined *entirely* by the voter's comparison of the two parties' reputations, we allow electoral 'surprises' to occur with probability captured by a parameter $s \in [0, \frac{1}{2})$. Technically, we derive the equilibrium in a modified model in which, accounting for the probability of electoral surprise s, the probability that incumbent party P is reelected when party reputations are given by b is

$$(1-s)\sigma_M(b,P) + s(1-\sigma_M(b,P)).$$ [20]

Substantively, if elections are probabilistic, then governments with reputations for more policy extremism than oppositions might, in fact, win (and moderate governments might lose). The 'rally-round-the-flag' effect that returned the British Tories to power after the 1983 Falklands conflict is perhaps an example of the kind of electoral surprise that we wish to capture with this extension.

The introduction of the new parameter s requires certain modifications in our assumptions and equilibrium analysis, which we detail in Appendix C, but it does not otherwise alter the essence of the equilibrium results detailed in Propositions 1 and 2. In particular, party strategies are still given by Equation (7) in equilibrium. Furthermore, the spirit of the distinction between the two types of equilibrium dynamics described in Proposition 2 is preserved: government parties tend to stay in power longer and implement moderate policies with higher probability when Inequality (10) fails. Nevertheless, the model with probabilistic elections does bring about two important qualitative differences. First, the possibility of electoral shocks means extreme policies can occur in

[20] Given that M's choice is still summarized by $\sigma_M(b,P)$, electoral surprises can be rationalized in the model as representing the unusual alignment of the choices of groups of voters different than the typically pivotal electorate captured by voter M.

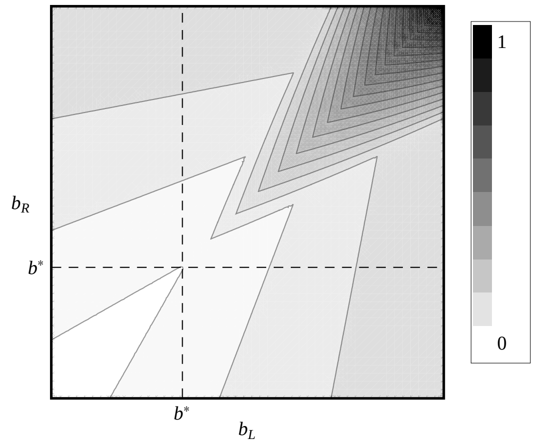

Figure 4: Probability of Extreme Policies and Electoral Shocks

When $s > 0$, extreme policies may occur at a larger set of reputation pairs (b_L, b_R), since both parties may win the election with positive probability.

a larger subset of the space of party reputations, exactly because parties with a reputation for being more extreme than the opposition may win elections with positive probability. The probability of extreme policies in the presence of electoral shocks is illustrated in Figure 4. Second, amending part (ii) of Proposition 2, it is no longer the case that incumbents hold an absolute electoral advantage in the long-run when Inequality (10) does not hold. These two modifications in equilibrium outcomes, especially the second, allow us to conduct a more powerful empirical test of the hypothesis that long-run dynamics are governed by one of the two regimes identified in Proposition 2.

Naturally, the parameter s can take different values, reflecting contrasting levels of stochastic fluctuation in the political environment. The fact that probabilistic elections introduce additional noise in model predictions, does not permit us to estimate the new parameter with the available data. An additional complication is that in order to ensure conditions for existence of the same equilibrium, we must introduce a parameter restriction (Inequality (18) in Appendix C). This affects the comparability of estimates of the value of office across different values of the parameter s, even if estimation of this parameter were obtained from our small sample. With these caveats, we proceed by estimating the modified model for two fixed values for the probabilistic election parameter: $s = 0.1$, meaning that one election in ten is decided by factors other than electorate beliefs of relative extremism and $s = 0.2$ which corresponds to the one in five elections case.

		Australia	Greece	Malta	New Zealand	UK	Pooled	Pooled(4)
$s = 0.1$	π_e^g	0.77	0.88	0.86	0.88	0.88	0.83	0.85
		(0.18)	(0.13)	(0.14)	(0.13)	(0.14)	(0.16)	(0.15)
	π_m^g	0.89	0.83	0.85	0.84	0.83	0.92	0.90
		(0.12)	(0.13)	(0.12)	(0.12)	(0.13)	(0.07)	(0.09)
	π_e^o	0.53	0.51	0.54	0.54	0.54	0.32	0.38
		(0.21)	(0.20)	(0.21)	(0.21)	(0.19)	(0.17)	(0.17)
	π_m^o	0.67	0.72	0.71	0.72	0.71	0.86	0.83
		(0.19)	(0.17)	(0.17)	(0.17)	(0.17)	(0.11)	(0.12)
	G	1.03	1.31	1.22	1.10	1.04	0.87	1.00
		(0.93)	(0.76)	(0.79)	(0.55)	(0.45)	(0.14)	(0.27)
$s = 0.2$	π_e^g	0.73	0.86	0.84	0.86	0.86	0.83	0.86
		(0.18)	(0.16)	(0.17)	(0.15)	(0.16)	(0.16)	(0.15)
	π_m^g	0.91	0.83	0.86	0.85	0.85	0.91	0.87
		(0.12)	(0.15)	(0.14)	(0.13)	(0.13)	(0.08)	(0.11)
	π_e^o	0.53	0.54	0.58	0.58	0.56	0.39	0.45
		(0.20)	(0.20)	(0.21)	(0.21)	(0.20)	(0.19)	(0.19)
	π_m^o	0.65	0.68	0.67	0.68	0.68	0.82	0.77
		(0.20)	(0.19)	(0.18)	(0.17)	(0.19)	(0.14)	(0.15)
	G	1.66	1.73	1.67	1.60	1.58	1.23	1.39
		(1.05)	(0.92)	(0.94)	(0.76)	(0.77)	(0.40)	(0.44)

Table 8: Parameter estimates (models with $s = 0.1$, $s = 0.2$)

Point estimates are posterior medians, with posterior standard deviations in parenthesis. The first five columns correspond to country-specific estimates. The 'Pooled' model pools observations across the five countries, and 'Pooled(4)' pools observations across the four countries, excluding Australia.

		Australia	Greece	Malta	New Zealand	UK	Pooled	Pooled(4)
$s = 0.1$	$\pi_e^o > \pi_m^o$	0.61	0.43	0.48	0.50	0.48	0.05	0.07
	$\pi_e^g > \pi_m^g$	0.47	1.46	1.07	1.50	1.80	0.33	0.59
	$b^o > b^g$	1.61	0.12	0.21	0.04	0.03	0.00	0.00
$s = 0.2$	$\pi_e^o > \pi_m^o$	0.71	0.60	0.72	0.70	0.68	0.16	0.24
	$\pi_e^g > \pi_m^g$	0.27	1.18	0.86	1.14	1.32	0.49	0.97
	$b^o > b^g$	9.71	0.43	0.82	0.37	0.30	0.10	0.02

Table 9: Bayes Factors for model extensions

Inequality $b^o > b^g$ is equivalent to inequality (10). The inequalities as expressed in the table can be treated as 'model 1' while the alternative, with the inequality reversed, is 'model 2'. Following a classification of Jeffreys (1961), a value B (or B^{-1} for model 2) can be interpreted as follows:
$1 > B \geq 10^{-\frac{1}{2}}$: Minimal evidence against model 1;
$10^{-\frac{1}{2}} > B \geq 10^{-1}$: Substantial evidence against model 1;
$10^{-1} > B \geq 10^{-2}$: Strong evidence against model 1;
$10^{-2} > B$: Decisive evidence against model 1.

We report the summary of posterior estimates for the models with positive probability of electoral shocks in Table 8. Looking at the point estimates, the patterns are roughly similar to those appearing in Table 2. Once again, parties in opposition are more likely to remain moderate than extreme, while the comparison is less clear-cut for parties in government. When it comes to estimates of the value of office (G) the difference between Australia and the remaining countries is less marked in the case of the model with $s = 0.1$, and is not detectable in the case of the model with $s = 0.2$. There is also a uniform increase in the point estimates for the value of office, G, that becomes more marked as we increase the probability of electoral shocks s. It should be emphasized that these point estimates are not comparable across specifications with different values of s, because of the fact that we have to introduce more severe *a priori* bounds on the minimum value of this parameter (the relevant restriction is stated in Inequality (18) in Appendix C) in order to ensure the conditions for existence of the equilibrium.[21] Finally, as expected due to the presence of the added noise from electoral shocks, our estimates are not quite as precise as previously, with standard errors being larger and inferences being generally weaker. Corroborating this claim are the Bayes factors reported in Table 9. For example, while the data still support the hypothesis that $\pi_e^o < \pi_m^o$, the evidence is now minimal for the country-specific estimates, although the hypothesis is still substantially supported in the two pooled models.

What is perhaps more significant regarding the estimates from the models that allow for electoral surprises is that they provide an alternative interpretation of Australian 'exceptionalism.' In particular, it is quite clear from Table 9 that estimated party preference dynamics in Australia differ from those of the other nations when we assume positive electoral shocks. This difference is most prominent when it comes to the persistence of preferences for parties in government: The probability π_m^g of moderate governments remaining moderate tends to be higher than in other countries, and the probability for extreme governments remaining extreme, π_e^g, tends to be much lower, over all lending more support for the hypothesis that $\pi_m^g > \pi_e^g$. This difference suggests that Australian parties are better equipped to effect a favorable shift in the party's reputation while in government. Moreover, these differences in individual parameter estimates result in a startling disparity when we consider the (naive) long-term reputations of the government and opposition comparing $b^o > b^g$ (or, equivalently, Inequality (10)): For Australia *alone*, the long-term

[21] Another way to interpret this restriction is that the equilibrium is obtained when partisans are sufficiently motivated by office, and what constitutes sufficient value for office increases in the presence of electoral shocks.

governmental reputation advantage over the opposition is profound—the Bayes factors (in the third rows of the upper and lower portions of the table) are an order of magnitude larger than the other countries in the sample! Assuming this finding corresponds to actual quantities in Australian politics, and recalling part (ii) of Proposition 2, we discern a radically distinct pattern of political competition in this country: Equilibrium dynamics are characterized by moderate policies and a large incumbency advantage for the party in power.

Earlier, assuming minimal electoral shocks, we speculated that Australia's federal system—and thus the relatively low value of office seen for that nation—explains its distinctiveness relative the rest of our cases. Assuming positive electoral shocks, an alternative explanation that emerges from Table 8 and the evidence presented in Table 9 is that Australian exceptionalism is due to the superior ability of Australian governing parties to shed a reputation for being extreme, or maintain a reputation for being moderate. If Australian governing parties are indeed better equipped to promote ideological moderation, then an obvious direction for further research, which is beyond the scope of our present study, is a detailed account of the distinct institutional or other features of Australian intra-party politics that would account for that discrepancy. Note that both of the possible accounts we have obtained from the model (either low value of office, or reputation adjustment advantage for the governing parties) treat the two parties symmetrically. Thus, these accounts differ from other explanations in the literature that point to a fundamental asymmetry between the left and right Australian parties, e.g., due to the fact that the ruling Liberals faced a fractured left (Jaensch, 1994, 18–37) in the period following the Second World War, or due to the more than typical right-wing leanings of the Australian median voter (McDonald and Budge, 2005).

Of course, from a comparative perspective, it is obvious that the Australian exceptionalism we and other scholars are concerned with is under-identified: there are many dimensions on which Australia differs from other countries in order for us to be able pin-point the single most responsible for its distinct pattern of electoral competition. Thus, we take no stance as to which of the two explanations arising from this analysis, or others posited in the literature, may be the most accurate. What we can do on the basis of the available data, is rule out more direct threats to our findings. For instance, the reader may speculate that the different point estimates we obtain for Australia are due to the larger number of observations we have available for this country (25 compared to 17 for the immediately smaller sample size). To dispel this possibility, we re-estimated all models using only the first 17 or only the last 17 Australian observations. These estimates are reported in Appendix D and are almost identical to those reported for the complete 25 period data; otherwise put, more data is not the explanation for Australia's distinctiveness. Importantly, the other antipodean country in our sample (New Zealand) also has a sample size of 17 periods and, while sharing many features with Australia (besides geographical location, both countries have the same inter-election period length of three years), does not stand out from the remaining three countries when it comes to estimated model quantities.

The value of the above substantive insights notwithstanding, we have not systematically explored whether or not the model extensions allowing for electoral surprises explain our data more coherently, although we have pointed out that these extensions yield generally weaker inferences. One way to achieve this comparison is via the goodness-of-fit statistics for the model extensions, which we report in Table 11 of Appendix E. In general, the numbers reported in the first two columns of that table are smaller, implying worse fit, than those in the first column of Table 7. Nevertheless, the Australian numbers for the case $s > 0$ are comparable if not better than the corresponding figures for the baseline model. Another way to systematically compare the various versions of the formal models is via the DIC. We do this in Table 4 for the pooled and aggregated country-specific models. Recalling that a lower DIC implies a better fit, we see that the original model (in which s is set to zero) consistently outperforms the extensions by wide margins. Furthermore, focusing on each of the second or third column of Table 4 we see that the country-specific approaches outperform the pooled models, as was the case for the original model. Lastly, although these numbers are not reported directly in Table 4, there is only one country-specific model for which the computed DIC is comparable or smaller for the models with electoral shocks ($s = 0.1, s = 0.2$) than the original case: Australia alone. Over all, with the possible exception of the Australian case, the model extension's performance as documented above does not give us cause to abandon the original model.

6 Conclusion

At the time of writing, David Cameron's Conservative Party look poised to win the next British general election. Yet it has taken three defeats, and no less than five different leaders, to rid the "nasty party" of its reputation as an unelectable organization. Meanwhile, in Australia the Labour

Prime Minister is riding high in the polls two years after defeating a Liberal Party that had been in government for a decade. These long bouts in and out of power seem common in parliamentary systems, and this paper sought to explore the dynamics by which such swings arise.

In particular, we obtained estimates for the persistence of latent party preferences on a number of countries using the observable sequence of election winners and a likelihood derived from a dynamic model of two party competition. We showed that latent party preferences are sticky, suggesting the presence of significant inertia within party organizations, but at the same time found that extreme parties that lose elections are able to switch to moderate preferences relatively swiftly (but not with probability one), a finding consistent with the presence of strategizing forces within political parties. Our estimates suggested a healthy level of long-run equilibrium competition between the two political parties in our sample, with reasonably short spells of control of the government by each party, and predominantly moderate policies in the long-run. Despite these common general patterns, we found significant country-specific differences, with an especially distinct pattern of political competition emerging for Australia.

On the methodological front, our study showcases the advantages of estimation by matching the data with an equilibrium model. This approach enabled us to estimate parameters that regulate inherently unobservable quantities such as the true (as opposed to stated) party preferences, and allowed us to generate novel alternative hypotheses for the exceptional pattern of competition observed in one of the countries in our sample. Thus, we view this study as a first step in a fruitful research direction. Future research can benefit significantly from the enrichment of both the theoretical model, and the data that is used for estimation. In the case of the former component, we might want to account for finer distinctions in the policy preferences of various party groups. In terms of data, we would seek to add more information about the policy choices of the governments that are assumed publicly observable in the model.

APPENDIX

A MCMC and implementation details

We construct priors by assuming independent uniform distribution in the open unit interval for the probabilities π^g_τ, π^o_τ, and b^1 . For the value of office parameter G we assume a vague independent Gamma prior distribution with unit parameters, $\Gamma(1,1)$. These distributions are then truncated according to the inequality restrictions (1) and (2).[22] For any model comprising data from a subset of countries $\mathcal{C} \subseteq \{1,\ldots,C\}$, we use a Gibbs sampling scheme to obtain a sample from the posterior distribution, i.e., we specify initial values for the parameters $\theta^0, \{b^{1,0}\}_{c\in\mathcal{C}}$, and the unobserved policies $\mathbf{x}^0$, and then at the m-th iteration, we first sample $\theta^m, \{b^{1,m}\}_{c\in\mathcal{C}}$ from the posterior distribution of the parameters conditional on policies $\mathbf{x}^{m-1}_c, c \in \mathcal{C}$. We then sample from the distribution of policies $\mathbf{x}$ conditional on the parameter values $\theta^m, \{b^{1,m}\}_{c\in\mathcal{C}}$ and the remaining policies. To sample from the conditional distribution of the policies we complete several inner iteration cycles by successively sampling individual policies $x^{t,m}_c, t = 1,\ldots,T_c, c \in \mathcal{C}$. We use the Metropolis algorithm in order to sample from the conditional distribution of the parameters $\theta, \{b^1\}_{c\in\mathcal{C}}$. We ran the chains for $30,000$ outer iterations each, using a large number (500 to 1500 in the pooled specifications) of inner iterations for the Metropolis subchains used to sample from the non-standard distribution of the parameters $\theta, \{b^1\}_{c\in\mathcal{C}}$, and up to 50 inner iteration cycles for the policies. We removed the first $5,000$ as 'burn-in,' and we thinned the remaining $25,000$ outer iterations, taking one in every 25 posterior draws in order to reduce dependence, thus obtaining a sample of $1,000$ from which the relevant statistics were computed. These choices were rather conservative compared to the recommended 'burn-in' and 'thinning' choices suggested by standard convergence diagnostics such as Raftery and Lewis (1992).

B Goodness-of-Fit Measures

We assess model fit by how well the model predicts the winner of each election. To compute predictive probabilities for a formal model with data from any set of countries $\mathcal{C} \subseteq \{1,\ldots,C\}$, for each of the parameter vectors $\theta_i, \{b^1_i, \mathbf{x}_{c,i}\}_{c\in\mathcal{C}}, i = 1,\ldots,M$, in the posterior sample of size M,

[22] Due to this truncation, the parameters are not independently distributed *a priori*.

we calculate probabilities of victory for the left, $\hat{P}^t_{c,i}$, for each period t and country c applying equations (13) and (14), and then obtain the predictive probability $\hat{P}^t_c$ for period t and country c by computing the posterior sample median

$$\hat{P}^t_c = median\{\hat{P}^t_{c,1}, \ldots, \hat{P}^t_{c,M}\}.$$

We compare the predictive ability of the formal model against two null models. First, we consider a naive *static* model in which the predicted probability of a victory for the left is simply the number of victories that the left achieved during the time series, divided by the number of elections. A more sophisticated 'dynamic' model posits that the election winner follows a two-state Markov chain summarized by two probabilities, $\Pr[P^t = L|P^{t-1} = L]$ and $\Pr[P^t = L|P^{t-1} = R]$, that condition on the identity of the winner in the previous period. We compute these probabilities on the basis of the empirical frequency of these events for each country $c = 1, \ldots, C$ in the sample. Since this model involves prediction on the basis of the winner in the previous election, it does not yield a prediction for the first election in each country, and we calculate goodness-of-fit statistics with the remaining periods. In sum, each of the three models, the formal model along with the static and dynamic naive models, yield an estimated probability, $\hat{P}^t_c$, of a left government for country c and period t.

We then evaluate model fit by using three different measures of goodness-of-fit for binary outcomes. The first measure of fit is the 'proportion of elections correctly predicted' which is simply the count of those periods that the model predicts correctly as leftist, plus those it correctly predicts as rightist, divided out by the total number of periods. In keeping with standard practice, a left government is predicted if $\hat{P}^t_c \geq \frac{1}{2}$, and a right government is predicted otherwise. Such metrics are often over-interpreted in favor of the fitted model for binary data (see Greene, 2002, 685), so, in addition, we compute a pseudo-R^2 suggested by Efron (1978), and a more nuanced measure that accounts for the model's ability to predict both types of winners proposed by Cramer (1999).

We calculate all of the above goodness measures for the country specific and pooled models separately. In the case of the pooled models, a difficulty arises in setting up suitable null models for comparison: that is, in generating appropriate predicted probabilities for the 'pooled' static and dynamic naive models. In order to subject the formal model to the least favorable comparison, we employ the same country-specific probabilities in order to predict the pooled data for the static and dynamic null models as those that are used for the country-specific comparisons . As a consequence, the pooled formal model generates predictive probabilities by assuming common structural parameters θ across countries, which must then compete against null models that allow for variation in the predictive probabilities as we move across countries.

C Model with Probabilistic Elections

Equilibrium analysis with the probabilistic elections parameter $s \in (0, \frac{1}{2})$ requires a strengthening of the restriction on the value of office, G, replacing inequality (2) with

$$G \geq \frac{1 + s(\pi_e^o + \pi_e^g)}{2(1 - 2s)}. \tag{18}$$

Note that (18) reduces to (2) when $s = 0$. Assuming this restriction, the equilibrium of Proposition 1 remains as is with the only exception a modification of the voter's strategy so that equation (8) is replaced by

$$\sigma_M(b, P) = \frac{1+s\pi_e^g\big(\sigma_R(b_R,\pi_e^g)-\sigma_R(b)\big)+(1-s)b_R\big(\sigma_R(b)-\sigma_R(\pi_e^g,b_R)\big)}{(1-2s)\big(G+\sigma_R(b)(\pi_e^g+b_R)\big)}, \text{ if } b_P = b_{-P} \in [1 - \pi_m^o, \pi_e^o]. \tag{19}$$

Thus, for any fixed value of s, we can derive a likelihood as in Section 3, modifying the probability expressions in (13) and (14), respectively, so that

$$\mathsf{Pr}(P^1|\theta, b^1) = \begin{cases} 1 - s & \text{if} \quad b_{P^1}^1 < b_{-P^1}^1 \\ s & \text{if} \quad b_{P^1}^1 > b_{-P^1}^1, \end{cases} \tag{20}$$

and

$$\mathsf{Pr}(P^t \mid \mathbf{P}^{t-1}, \mathbf{x}^{t-1}, \theta, b^1) = \begin{cases} (1-s)\sigma_M(b^t, P^{t-1}) + s(1 - \sigma_M(b^t, P^{t-1})) \text{ if } P^{t-1} = P^t \\ s\sigma_M(b^t, P^{t-1}) + (1-s)(1 - \sigma_M(b^t, P^{t-1})) \text{ if } P^{t-1} \neq P^t. \end{cases} \tag{21}$$

D Australian distinctiveness is not due to data length

We have more observations available for Australia than for any other country in our data set (25 elections). Readers may be concerned that Australia's marked estimated 'different-ness' comes in large part from the fact that the time series is longer for this country. This is false. To support this claim, we re-estimated all models (baseline, and $s > 0$) with subsets of the Australian data. In particular, we took the first and last 17 periods of the entire Australian sequence as two new pseudo-data-sets which are identical in length to the data used for New Zealand. The parameter estimates, and their variances, are almost identical to those reported for the original 25 period case, as can be readily seen from Table 10.

	model	π_e^g	π_m^g	π_e^o	π_m^o	G
full 25		0.84	0.89	0.44	0.77	0.59
		(0.15)	(0.09)	(0.18)	(0.14)	(0.10)
periods 1–17	$s = 0$	0.83	0.88	0.44	0.77	0.61
		(0.15)	(0.10)	(0.17)	(0.15)	(0.13)
periods 9 – 25		0.87	0.84	0.55	0.74	0.66
		(0.13)	(0.11)	(0.18)	(0.14)	(0.22)
full 25		0.77	0.89	0.53	0.67	1.03
		(0.18)	(0.12)	(0.21)	(0.19)	(0.93)
periods 1–17	$s = 0.1$	0.76	0.90	0.53	0.67	1.15
		(0.18)	(0.11)	(0.22)	(0.19)	(0.92)
periods 9 – 25		0.85	0.84	0.55	0.71	0.99
		(0.16)	(0.12)	(0.19)	(0.17)	(0.58)
full 25		0.73	0.91	0.53	0.65	1.66
		(0.18)	(0.12)	(0.20)	(0.20)	(1.05)
periods 1–17	$s = 0.2$	0.74	0.91	0.54	0.65	1.66
		(0.18)	(0.13)	(0.20)	(0.19)	(0.90)
periods 9 – 25		0.79	0.88	0.56	0.64	1.51
		(0.18)	(0.13)	(0.20)	(0.20)	(0.85)

Table 10: Parameter estimates: medians (standard deviations) for Australia, data split and models re-estimated. Note separation into first 17 and last 17 periods (of 25). Both estimates and their variances are very similar to those resulting from estimation using full data.

E Goodness-of-fit for models with electoral shocks

		$s = 0.1$	$s = 0.2$	Static Naive	$s = 0.1$ adjusted	$s = 0.2$ adjusted	Dyn Naive
Australia	Corr Pred	0.80	0.76	0.64	0.79	0.75	0.75
	R^2	0.24	0.20	0.00	0.19	0.15	0.19
	λ	0.42	0.29	0.00	0.39	0.26	0.21
Greece	Corr Pred	0.78	0.56	0.56	0.75	0.50	0.63
	R^2	0.00	0.07	0.00	-0.18	-0.08	-0.17
	λ	0.10	0.11	0.00	0.02	0.04	0.27
Malta	Corr Pred	0.70	0.60	0.50	0.67	0.56	0.33
	R^2	0.07	0.05	0.00	-0.04	-0.05	0.01
	λ	0.12	0.18	0.00	0.05	0.12	0.01
NZ	Corr Pred	0.88	0.65	0.71	0.88	0.63	0.75
	R^2	0.15	0.07	0.00	0.00	-0.08	0.00
	λ	0.19	0.13	0.00	0.11	0.06	0.00
UK	Corr Pred	0.81	0.63	0.50	0.80	0.60	0.60
	R^2	0.25	0.17	0.00	0.20	0.13	0.04
	λ	0.16	0.13	0.00	0.12	0.10	0.04
Pooled	Corr Pred	0.71	0.69	0.60	0.70	0.68	0.65
	R^2	0.23	0.16	0.04	0.21	0.14	0.12
	λ	0.21	0.19	0.04	0.20	0.19	0.16
Pooled(4)	Corr Pred	0.79	0.71	0.58	0.65	0.61	0.60
	R^2	0.23	0.11	0.05	0.21	0.09	0.07
	λ	0.18	0.10	0.05	0.17	0.09	0.12

Table 11: Goodness-of-fit of formal and naive models ($s > 0$)

Corr Pred: Fraction correctly predicted. R^2: Efron's (1978) pseudo-R^2. λ: Cramer's (1999) λ. The static naive model predicts according to observed frequency, the dynamic naive model according to observed frequency conditional on previous period's government. For comparability with the dynamic naive model, the first observation is not included in the computation of these statistics in the third column corresponding to the formal model.

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