Estimating a Dynamic Game of Gubernatorial Elections to Evaluate the Impact of Term Limits*

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Abstract

We estimate a dynamic game of gubernatorial elections to provide a new empirical evaluation of the impact of term limits on electoral competition and economic policies in the U.S. Building on recent theoretical advances in modeling repeated elections, we consider a model in which candidates from two parties compete in statewide elections. Politician cannot credibly commit to policies prior to an election. Candidates are drawn from different distributions of ideological positions, which share a large common support. Equilibria can be characterized by asymmetric election standards, which depend on the party of the candidate and the history of the game. We show that our model is non-parametrically identified and propose a semi-parametric estimator. The empirical analysis draws on data from U.S. gubernatorial elections between 1950 and 2012. Our findings suggest that term limits provide strong incentives for a moderate governors to move towards the center of the ideological spectrum during his first term in office. We also find evidence that the distribution of voter ideal points is similar to the distribution of political candidates providing support for citizen-candidate type models.

1 Introduction

One prominent branch of recent research in political economy focuses on the impact of institutional design on electoral outcomes and economic policies. This paper focuses on the design of electoral rules in elections with two candidates belonging to competing parties. Term limits restrict the ability of incumbents to run for reelection and, therefore, potentially increase turn-over among politicians in office. Term limits also affect the incentives that politicians face for policy moderation. Binding two-term limits are prominent and have been adopted by 23 states in the U.S. The purpose of this paper is to estimate a dynamic game of gubernatorial elections to provide a new empirical evaluation of the impact of term limits on political competition and policy outcomes.[1]

We develop and implement a new approach that builds on recent theoretical advances in modeling political competition as the outcome of a dynamic game. We consider competition among two political parties.[2] There is a sequence of elections. An election either pits two untested candidates against each other or an incumbent against an untested challenger. Our model maintains the key assumption that a politician cannot credibly commit to a policy prior to an election. An elected politician, therefore, has a tendency to implement his or her preferred policy when in office. Policy moderation only arises due to the desire of politicians to be reelected.

We assume that voters cannot observe the ideological positions of an untested

[1] Our approach is, therefore, in the tradition of the seminal paper by Besley and Case (1995), who were the first to estimate the impact of term limits on policy outcomes based on a formal political-economic model. Other recent studies of the effects of term limits include Johnson and Crain (2004) and Smart and Sturm (2013).

[2] Since our empirical application is based on Gubernatorial elections in the U.S., we refer to these parties as Democrats and Republicans.

politician, who has not served in office. Priors for untested challengers only depend on the party of the candidate. Voters observe the policy implemented by the governor in office, which serves as a signal regarding the unobserved ideological type of the incumbent. Voters updated their beliefs based on the observed policies and vote accordingly. Previous theoretical models often assume, for simplicity, that candidates are drawn from the same distribution. Alternatively, candidates are from opposing political parties, assuming no common support in ideological position of both parties. We show in the empirical analysis of this paper that both assumptions are not consistent with the U.S. political system. We, therefore, consider a model that allows for two parties with different distributions of ideological positions, but a large common support. Hence, equilibria are not symmetric with respect to both parties. There are fiscal liberals and conservatives in both parties. Republicans tend to be more fiscally conservative, on average, than Democrats.

We define and characterize a Perfect Bayesian Equilibrium of the dynamic game. We show that our model generates unique reelection thresholds for both parties. These election standards imply ideological thresholds for politicians which characterize politicians' strategies. Politicians from each party can be characterized as belonging to one of three groups. Centrists always implement their preferred policies and are reelected to a second term. Extremists also implement their preferred policies in the first period, but are not reelected to a second term. Term limits do not have a direct impact on these types of politicians. The third group of politicians are moderates. They have incentives to moderate their policies in the first term to win reelection to a second term. The main objective of this paper is then to test the key prediction of policy moderation and estimate the game.

One challenge encountered in empirical analysis is that there are a variety of policy outcomes. Following Besley and Case (1995), we consider four such outcomes: ex-

penditures per capita, taxes per capita, workers compensations and minimum wages. We assume that observed policies are noisy measures of the policy implemented by the governor.[3] Differences may arise due to the complexities of the legislative process or shocks during the implementation process. Recall that extremists will implement their preferred policy in the first period. Centrists and Moderates will implement their preferred policies in the second period. As long as we observe, at least, three different policy outcomes we can treat the distribution of ideology as latent and identify the factor loadings associated with each policy. Moreover, we can appeal to Kotlarski's Theorem to non-parametrically identify the underlying distribution of ideology based on the observed outcomes. We implement this procedure separately for each party, thus identifying the distributions of ideological positions for Democratic and Republican candidates as well as the distributions of measurement or implementation error.

We use the observed probabilities of extremism in each party together with the equilibrium properties of the model to identify the election thresholds and the benefits that candidates from each party assign to holding office. Once we have identified the underlying distribution of ideological ideal points as well as the benefits from holding office, we can predict the degree of policy moderation implied for periods in which term limits are not binding. We can, therefore, construct additional over-identifying restrictions based on the observed first period policy choices by centrists and moderates to test the validity of our model specification. Finally, we show how to identify the underlying distribution of voter preferences based on the observed aggregate vote shares. Our proofs of identification are constructive and can be used to design a semi-parametric estimator of our model.

Our data set consists of all gubernatorial elections in the U.S. held between 1950

[3]See, for example, Carneiro, Hansen, and Heckman (2003) Hu and Schennach (2008), Cunha, Heckman, and Schennach (2010) and Krasnokutskaya (2011).

and 2012. As expected we can replicate the key findings of Besley and Case (1995). We show that their results are still valid using the longer panel that we have assembled. To implement our new estimator we collect additional data on election outcomes such as voter shares and decisions to run for reelection. We then implement our new estimator.

Our findings suggest that term limits provide strong incentives for moderate governors to move towards the center of the ideological spectrum during the first term in office. The benefits from holding office are significant and large in economic magnitude. We also find that the distribution of voter preferences is similar to the distribution of political candidates providing support for citizen-candidate type models (Osborne and Slivinski, 1996, Besley and Coate, 1997). If anything, voters tend to be more extreme than candidates. Term limits lead to tighter election standards. As a consequence, incumbents are more likely to get reelected in an electoral system without term limits. Term limits also lead to more variation in economic policies over time.

The rest of the paper is organized as follows. Section 2 discusses how our work relates to the relevant literature. Section 3 presents our model which is based on the recent literature on dynamic games of electoral competition. Section 4 discusses identification and estimation. Section 5 introduces our data set and replicates the key findings in Besley and Case. Section 6 presents our new empirical results. Section 7 discusses the policy implications. We offer conclusions in Section 8.

2 A Brief Literature Review

This paper is closely related to a number of branches of the literature. Downs (1987) developed the canonical theoretical model of a single election in which candidates

can commit to policies prior to an election. Alesina (1988) extends the basic static framework and considers a repeated election model with two candidates.

An alternative approach to the Downsian approach is based on the citizen-candidate literature, which goes back to Osborne and Slivinski (1996) and Besley and Coate (1997). These models are based on the notion that candidates cannot commit to policies prior to an election. Most of the citizen-candidate literature focuses on one-shot elections. Duggan (2000) introduced repeated elections into a citizen-candidate model with asymmetric information. This model was extended to account for term limits by Bernhardt, Dubey, and Hughson (2004) and Bernhardt, Campuzano, Squintani, and Câmara (2009). These models provide the basic framework that we estimate in this paper. The key modeling difference is that we allow for asymmetries in the underlying distributions of ideology of candidates from the two competing parties. As a consequence, equilibria are not symmetric.

Bernhardt, Camara, and Squintani (2011) consider a model without term limits and allow for unobserved differences in ability among candidates. Duggan and Fey (2006) consider repeated elections within a Downsian model and office motivated candidates. Benefits of holding office play a role in our model as well. Banks and Duggan (2008) consider repeated elections when the policy space is multi-dimensional. They characterize the set of equilibria in simple voting and policy strategies. Aragones, Palfrey, and Postelwaite (2007) also consider a repeated election model with two candidates, but allow for reputation effects which lead to policy moderation in equilibrium.

As we noted above, the seminal empirical paper on term limits is Besley and Case (1995). They consider two different agency models with term limits. The empirical analysis is based on a difference-in-difference estimator using U.S. data from gubernatorial election from 1950-1986. We extend their data set and replicate

their results. They show that term limits affect policy choices as predicted by the model we estimate. We provide a completely different identification and estimation strategy that is based on the type of repeated election models discussed above. Our model implies that term limits only affect the policy choices of moderates. Another prominent empirical paper on term limits is Daniel and Lott (1997) who provide evidence that term limits increase the probability that incumbents lose elections. This finding is broadly consistent with our model as we discuss in Section 7 of this paper.

Finally, our paper is related to a small, but growing literature that estimates games in political economy. The seminal paper here is Merlo (1997) who estimated a dynamic bargaining model of government formation. Diermeier, Eraslan, and Merlo (2003) extend that framework and provide additional evidence in support of the bargaining approach using Italian data. Coate and Conlin (2004) and Coate, Conlin, and Moro (2008) estimate models of voter turn-out using data from Texas liquor referenda. Degan and Merlo (2011) also estimate a model of turn-out in multiple elections. Iaryczower and Shum (2012) estimate a game with asymmetric information to model the voting behavior of judges in appeal courts. Myatt (2007) and Kawai and Watanabe (2013) consider models of strategic voting. Sieg and Wang (2013) empirical estimates the impact of municipal unions on elections and economic policies in large U.S. cities.

3 Repeated Elections and Term Limits

We consider a game that captures the repeated elections of a governor in a state that has adopted a two-period term limit for the office holder.[4] There is a continuum of infinitely lived voters that differ by their ideological location, $\theta \in R$. Voters derive utility solely from the policy, $x \in R$, that a governor implements when in office. The period utility that voter θ receives from a governor who implements a policy $x \in R$ is given by a symmetric single-peaked loss function, $u(x, \theta)$. For simplicity we assume that:

$$u(\theta, x) = -|\theta - x| \tag{1}$$

The distribution function of voters' preferences in the society is given by $F_\theta(\cdot)$. The median voter is located at $\theta = 0$. Voters maximize expected life-time utility. Period utilities are discounted using a common factor, β.

Politicians receive a payoff both from being in office and from the position that they personally take while in office. A governor with ideology ρ who belongs to party j and locates at x derives period utility

$$v_j(\rho, x) = -|\rho - x| + y_j \tag{2}$$

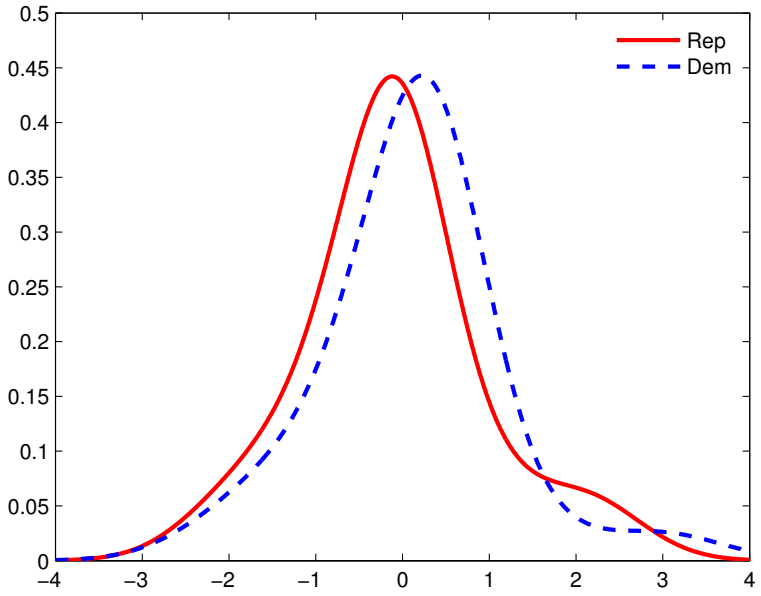
where $y_j > 0$ captures the payoff from holding office. Politicians share a common discount factor, γ and maximize life-time utility.

We focus on the empirically relevant case where challenging candidates are chosen by opposing parties, denoted by D and R. In contrast to previous papers we do not assume that party R (D) consists of all candidates with ideology $\rho < 0$ ($\rho > 0$). Our

[4] Our model follows the recent literature on repeated election and combines elements of Bernhardt, Dubey, and Hughson (2004), Bernhardt, Campuzano, Squintani, and Câmara (2009), and Bernhardt, Camara, and Squintani (2011)

empirical results indicate that this assumption is empirically not valid. Instead we assume that heterogeneity among politicians of party j is given by a distribution, denoted by $F_j^{\rho}(\cdot)$. The two distributions share a common support.

Figure 1: The Distribution of Ideological Positions by Party



To illustrate this modeling assumption Figure 1 plots the estimated densities of candidates preferred policies for each party. (We explain in detail below how we identify and estimate these densities.) There are clearly significant differences in the ideological positions of Republican and Democratic candidates for governor. As expected, the mean of the Democratic distribution is significantly larger than the mean of the Republican distribution, implying that, on average, Democrats prefer higher taxes and expenditures than Republications. However, there is also much overlap in the relevant support of both distributions. Candidates with negative values can be viewed as "fiscal conservatives," while candidates with positive values are "

fiscal liberals." We, therefore, conclude that our model needs to account for the fact that there are both "liberal" and "conservative" Democrats and Republican candidates.

The ideological positions of politicians are private information, not observed by other candidates or voters. Voter hold beliefs about ideologies, observe policies taken in office and update beliefs about incumbents.

If there is no incumbent (such as the first period of the game), there is an election between two untried challengers, one from each party. Whenever two untried politician compete against each other in an election, the outcome is determined by a coin toss that elects a politician of party D with probability p_D. The politician that wins the election then becomes the incumbent.[5]

Consider the case in which a Republican has been elected to office for a first term in period t. The elected governor implements a policy during his first term, denoted by x_t, which is observed by all voters. Voters update their beliefs about the type of the incumbent. At the beginning of period $t+1$, the Republican incumbent faces a challenger from party D in an election. If the incumbent is reelected, he serves a second term in period $t+1$. Since he faces a binding term limit, a second term incumbent implements his preferred policy, $x_{t+1} = \rho$. In period $t+2$ there is an open election, since the incumbent cannot run for reelection. The game at the beginning of period $t+2$ is exactly like the game at the beginning of period t. We focus on a stage-undominated Perfect Bayesian Equilibrium (PBE).

First term politicians have strategies, $\delta_j(\rho)$, that map types into first term policies. These strategies are party specific. The history of past positions for an incumbent that has served one period is given by $H_t = x_{t-1}$. An incumbent's strategy is a

[5]It is not difficult to endogenize this winning probability by making this probability a function of the value functions associated with both candidates.

function $\delta_j(\rho, x_{t-1})$ that assigns a policy for each history, politician's type and party, $j \in \{D, R\}$.

A voting strategy for an election with an established incumbent from party j is given by a function $\alpha_j(\theta, x_{t-1})$ that maps the voters type and the observed history into the probability of voting for an incumbent that belongs to party j.[6] We focus on anonymous sincere voting strategies, i.e. voting strategies that only depend on the incumbent's personal history and party membership. Voting is sincere if

- $\alpha_R(\theta, x_{t-1}) = 1$ if voters prefer the Republican incumbent.
- $\alpha_R(\theta, x_{t-1}) = 0$ if voters strictly prefer the Democratic challenger.

Similarly, we can define voting strategies if the incumbent is a Democrat. Voters do not use weakly dominated strategies that hinge on the fact that a voter is not pivotal.

Voter beliefs about a Republican incumbent's ideology for all possible histories are given by the common belief function $P_R(\rho|x_{t-1})$ which is the cumulative probability that a Republican incumbent has ideology less than ρ given the observed history x_{t-1}.

Consider a time period t, which is the second period for an incumbent, i.e. the incumbent is term-limited. He, therefore, solves the following optimization problem:

$$\max_{x_t} \ [-|\rho - x| + y_j] \tag{3}$$

As a consequence, a term-limited governor will implement his preferred policy in the second period, $x_t = \rho$.

Let $V^o(\theta)$ denote the expected discounted utility of electing a new governor in an open election. Notice that this value function is time independent since it does not depend on the history of the game.

[6]The voting strategy for open elections is a mixed strategy, i.e. a coin toss.

Let $V^D(\theta)$ denote the expected discounted utility of electing a new governor from party D. The expected discounted utility if a Republican incumbent is reelected to serve a second term is given by:

$$V^{R,I}(\theta, x_{t-1}) = -E\{|x_t - \theta|\} + \beta E[V^o(\theta)] \tag{4}$$

If the incumbent is a Republican, sincere voting then implies that

1. $\alpha_R(\theta, x_{t-1}) = 1$ if $V^{R,I}(\theta, x_{t-1},) \geq V^D(\theta)$
2. $\alpha_R(\theta, x_{t-1}) = 0$ if $V^{R,I}(\theta, x_{t-1}) < V^D(\theta)$

A similar condition holds for a Democratic incumbent.

Definition 1 *An equilibrium then consists of two strategy functions for voters (one for each party), two common belief functions, two strategies for untested politicians, and two strategies for incumbents, such that:*

- *the candidates maximize expected utility given their own ideology and voters' strategies,*
- *the voters vote sincerely given the candidates' and incumbents' strategies,*
- *beliefs are consistent with candidates' and incumbents' strategies and updated according to Bayes' Rule.*

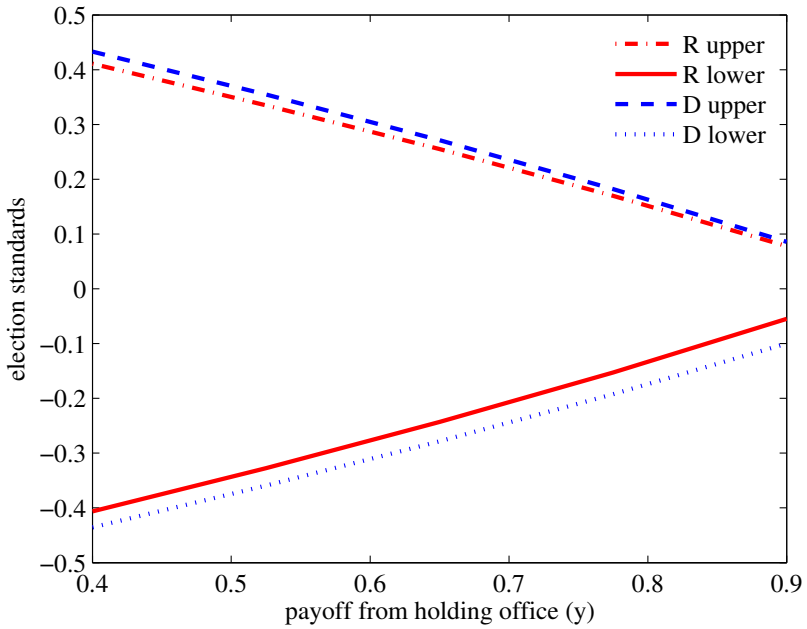
We are now in a position to characterize the key properties of equilibrium. We have the following result:

Proposition 1 *Voters adopt time invariant election standards for incumbents of each party that are given by* $[\underline{s}_j, \bar{s}_j]$, $j \in \{D, R\}$. *An incumbent belonging to party* j *is reelected if and only if the observed policy in the first period in office is within the interval given by* $[\underline{s}_j, \bar{s}_j]$.

In the rest of this section, we provide some intuition for the result in Proposition 1 and outline a proof.

Note that the resulting equilibrium is not necessarily symmetric, i.e. politicians from different parties face different election standards. Figure 2 illustrates the election standards that arise for each party using our estimated model. We plot the upper and lower election standard as a function of the benefits of holding office. Note that there are significant differences in election standards across parties. Moreover, both parties have a lower and upper threshold reflecting the fact that there liberals and conservatives in each party as we have seen in Figure 1. Finally, election standards get tighter as the benefits from holding office increase.

Figure 2: Election Standards



The election standards then imply ideological thresholds for politicians which

implicitly characterize politicians' strategies. Let us define:

$$\bar{\rho}_R(\bar{s}_R) = \gamma y_R - |\bar{\rho}_R - \bar{s}_R| = 0 \tag{5}$$

Notice that a Republican politician with ideology $\bar{\rho}_R(\bar{s}_R)$ is indifferent between implementing policy $\bar{s}_R$ and being reelected and implementing policy $\bar{\rho}_R(\bar{s}_R)$ and not being reelected. Similarly define

$$\underline{\rho}_R(\underline{s}_R) = \gamma y_R - |\underline{\rho}_R - \underline{s}_R| = 0 \tag{6}$$

Notice that a Republican politician with ideology $\underline{\rho}_R(\underline{s}_R)$ is indifferent between implementing policy $\underline{s}_R$ and being reelected and implementing policy $\underline{\rho}_R(\underline{s}_R)$ and not being reelected.

Then consider a Republican politician that has just been elected in period t to serve his first term. The candidate's optimization problem implies the following decision rules:

- $\rho < \underline{\rho}_R(\underline{s}_R)$ then $x_t = \rho$, expecting to lose reelection in $t+1$.
- $\rho \in (\underline{\rho}_R(\underline{s}_R), \underline{s}_R)$ then $x_t = \underline{s}_R$, expecting to win reelection in $t+1$.
- $\rho \in (\underline{s}_R, \bar{s}_R)$ then $x_t = \rho$, expecting to win reelection in $t+1$.
- $\rho \in (\bar{s}_R, \bar{\rho}_R(\bar{s}_R))$ then $x_t = \bar{s}_R$, expecting to win reelection in $t+1$.
- $\rho > \bar{\rho}_R(\bar{s}_R)$ then $x_t = \rho$, expecting to lose reelection in $t+1$.

This equilibrium can be supported by the following voting beliefs.

- If $x_t < \underline{\rho}_R(\underline{s})$, then $P_R(\rho|x_t) = 0$ for all $\rho < x_t$ and $P_R(\rho|x_t) = 1$ for all $\rho \geq x_t$. (Left Extremists)

- If $x_t = \underline{s}_R$ then $P_R(\rho|x_t) = F_R^{\rho}(\rho|\rho \in [\underline{\rho}_R(\underline{s}_R), \underline{s}_R)$. (Left-leaning Moderates)
- If $x_t \in (\underline{s}_R, \bar{s}_R)$, then $P_R(\rho|x_t) = 0$ for all $\rho < x_t$ and $P_R(\rho|x_t) = 1$ for all $\rho \geq x_t$. (Centrists)
- If $x_t = \bar{s}_R$ then $P_R(\rho|x_t) = F_R^{\rho}(\rho|\rho \in [\bar{s}_R, \bar{\rho}_R(\bar{s}_R)])$. (Right-leaning Moderates)
- If $x_t > \bar{\rho}_R(\bar{s})$, then $P_R(\rho|x_t) = 0$ for all $\rho < x_t$ and $P_R(\rho|x_t) = 1$ for all $\rho \geq x_t$. (Right Extremists)
- If $x_t \in (\underline{\rho}_R(\underline{s}_R), \underline{s}_R)$, then $P_R(\rho|x_t) = 0$ for all $\rho < \underline{\rho}_R(\underline{s}_R)$ and $P_R(\rho|x_t) = 1$ for all $\rho \geq \underline{\rho}_R(\underline{s}_R)$. (Beliefs when off-equilibrium deviations occur left center.)
- If $x_t \in (\bar{s}_R, \bar{\rho}_R(\bar{s}_R))$, then $P_R(\rho|x_t) = 0$ for all $\rho < \bar{\rho}_R(\bar{s}_R)$ and $P_R(\rho|x_t) = 1$ for all $\rho \geq \bar{\rho}_R(\bar{s}_R)$. (Beliefs when off-equilibrium deviations occur right center.)

Suppose that the median voter is decisive.[7] A Republican incumbent will be reelected if he is preferred to an untested challenger from the Democratic party. The median voter prefers the Republican incumbent at $x_t = \underline{s}_R$ to the challenger from party D if and only if

$$-E(\rho|\rho \in [\underline{\rho}_R(\underline{s}_R), \underline{s}_R]) + \beta V^o(0) \geq V^D(0) \tag{7}$$

Similarly, the median voter prefers the Republican incumbent at $x_t = \bar{s}_R$ to the challenger from party D if and only if

$$-E[\rho|\rho \in [\bar{\rho}_R(\bar{s}_R), \bar{s}_R)] + \beta V^o(0) \geq V^D(0) \tag{8}$$

Equilibrium also requires that the median voter does not prefer a politician that locates at $x_t = \underline{\rho}_R(\underline{s}_R)$ to the challenger:

$$-\underline{\rho}_R(\underline{s}_R) + \beta V^o(0) \leq V^D(0) \tag{9}$$

[7] We will discuss below how to verify this assumption.

Similarly, the median voter does not prefer a politician that locates at $x_t = \bar{\rho}_R(\bar{s}_R)$ to the challenger:

$$-\bar{\rho}_R(\bar{s}_R) + \beta V^o(0) \leq V^D(0) \tag{10}$$

Here we will focus on equilibria which maximal sincere beliefs which satisfy:

$$-E(\rho|\rho \in [\underline{\rho}_R(\underline{s}_R), \underline{s}_R]) + \beta V^o(0) = V^D(0) \tag{11}$$

$$-E[\rho|\rho \in [\bar{\rho}_R(\bar{s}_R), \bar{s}_R)] + \beta V^o(0) = V^D(0) \tag{12}$$

Equations (5), (6), (11) and (12) then define election standards and cut-off points.

Similarly, we can derive election standards for Democratic incumbents denoted by $\underline{s}_D$ and $\bar{s}_D$, as well as cut-off points $\underline{\rho}_D(\underline{s}_D)$ and $\bar{\rho}_D(\bar{s}_D)$.

Finally, we need to verify that the median voter is in fact decisive. The value function of voter θ for electing an untried Democratic challenger is given by the following expression:

$$\begin{aligned} V^D(\theta) &= \int_{\underline{z}}^{\underline{\rho}_D(\underline{s}_D)} -|\rho - \theta| + \beta\, V^R(\theta)\, dF_D^\rho(\rho) \\ &+ \int_{\underline{\rho}_D(s)}^{\underline{s}_D} -|\underline{s}_D - \theta| - \beta|\rho - \theta| + \beta^2\, V^o(\theta)\, dF_D^\rho(\rho) \\ &+ \int_{\underline{s}_D}^{\bar{s}_D} (1+\beta)(-|\rho - \theta|) + \beta^2\, V^o(\theta)\, dF_D^\rho(\rho) \\ &+ \int_{\bar{s}_D}^{\bar{\rho}_D(\bar{s}_D)} -|\bar{s}_D - \theta| - \beta|\rho - \theta| + \beta^2\, V^o(\theta)\, dF_D^\rho(\rho) \\ &+ \int_{\bar{\rho}_D(\bar{s}_D)}^{\bar{z}} -|\rho - \theta| + \beta\, V^R(\theta)\, dF_D^\rho(\rho) \end{aligned} \tag{13}$$

A similar equation holds for $V^R(\theta)$. Finally, we have:

$$V^o(\theta) = p_D V^D(\theta) + (1 - p_D) V^R(\theta) \tag{14}$$

where p_D is the probability that an untried Democrat wins an open election.[8]

To finish the proof, we need to verify that the value functions are single-peaked in θ. While we do not have a general proof for this result, we can numerically verify these conditions for each specification that we consider in estimation. To illustrate these issues, we plot the key value functions based on our parameter estimates.

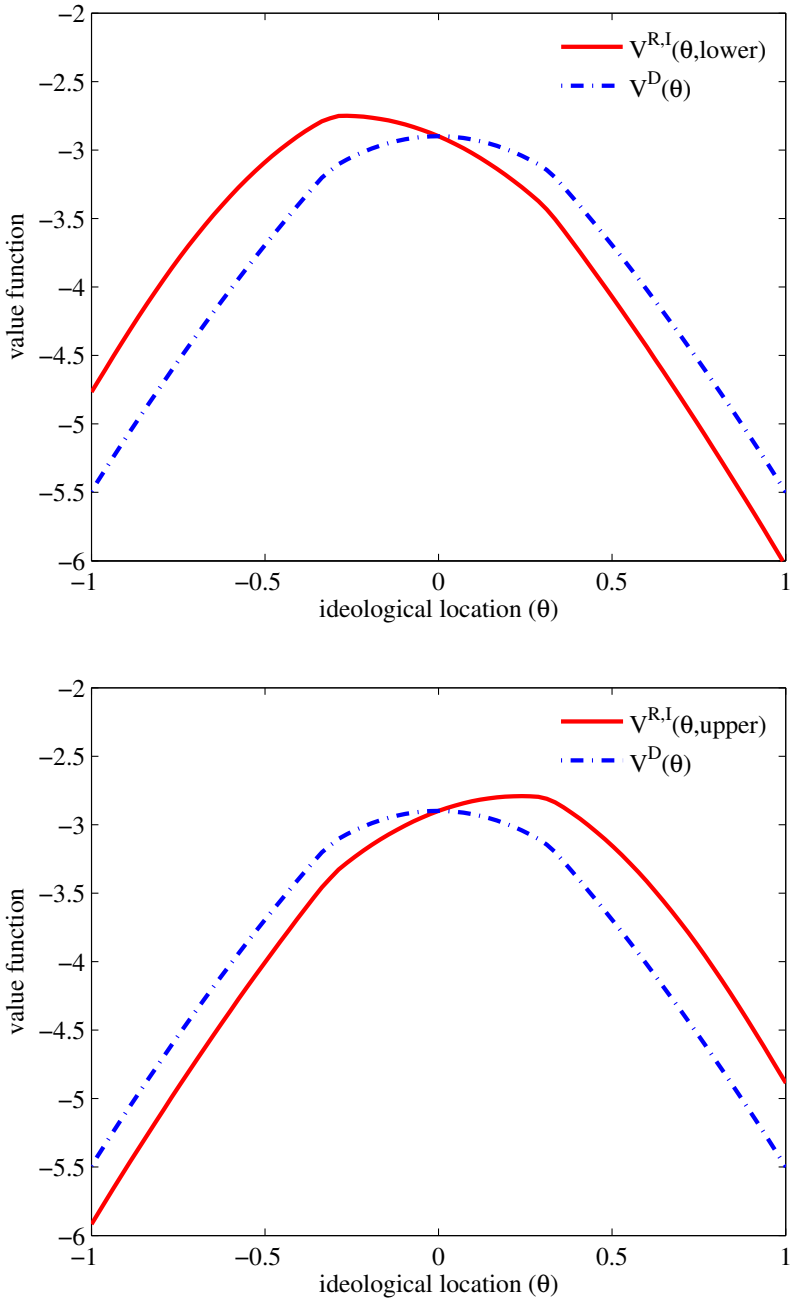
First consider the case in which an incumbent is pitted against an untested challenger. Figure 3 plots the value functions associated with a Republican incumbent and an untested challenger from the Democratic party. We consider two interesting cases. The upper panel of Figure 3 plots $V^{R,I}(\theta, lower)$ which refers to the case when the last period policies was given by $x_{t-1} = \underline{s}_R$. This is the case of a moderate conservative Republican. The lower panel of Figure 3 plots $V^{R,I}(\theta, upper)$, which refers to the case when the last period policies was given by $x_{t-1} = \bar{s}_R$. The incumbent is thus a moderate liberal Republican. By construction the two value functions intersect in both panels of Figure 3 at zero which is the location of the median voter. The median voter is, therefore, indifferent between reelecting the incumbent or electing the challenger. The two plotted value functions only intersect once and, thus, satisfy a single-crossing property. The set of voters who prefers the Republican incumbent is a connected set. As a consequence, the median voter at zero is decisive.

4 Identification and Estimation

In this section we show that our model is non-parametrically identified and discuss how to estimate it using semi-parametric methods.

[8]Note that we implicitly assume that an extremist runs for a the second term, but loses the election and is replaced by candidates from the opposing party. Alternatively, we could assume that extremists do not run in the second period and the election is an open election.

Figure 3: Value Functions: $V^{R,I}$ and V^{D}



4.1 Observed Policies and Measurement Error

While we assume that voters observe the policy implemented by the governor denoted by x_t, this policy is not easily observed by the econometrician. Instead we observe a variety of policy outcomes which are imperfect measures of x_t. In the empirical analysis, we will consider the four such outcomes: expenditures per capita, taxes per capita, workers compensations and minimum wages. We follow the recent literature on factor models and interpret the observed policies are noisy measures of the ideological policies that are implemented by governors. Differences between observed policies and policies favored by governors may arise due to the complexities of the legislative process or shocks during the implementation process.

We specify and estimate a separate system of measurement equations for each party, $j \in \{D, R\}$. Let us consider the case in which we observe, at least, three policies denoted by z^i_{jt}. i=1,2,3, .., I. Following the econometric literature on latent factor models, we assume:

$$z^i_{jt} = \alpha_{ji}\, x_{jt} \;+\; \epsilon^i_{jt} \tag{15}$$

where measurement errors, ϵ^i_{jt}, and x_{jt} are mutually independent. Moreover, $\epsilon^i_{jt} \sim F^{\epsilon}_{ij}$ are i.i.d. across time. Measurement errors also have zero expected values. Furthermore, we normalize $\alpha_{j1} = 1$.[9]

4.2 Identifying the Distributions of Ideological Positions

We can non-parametrically identify F^{ρ}_{j} and F^{ϵ}_{ij} based on the observed policy outcomes for each party. Notice that governors always reveal their true preferences in their last

[9]For a more careful discussions of these techniques see, for example, Carneiro, Hansen, and Heckman (2003) Hu and Schennach (2008), Cunha, Heckman, and Schennach (2010) and Krasnokutskaya (2011).

term in office. Thus, we exclude the first period policy choices of governors who won their re-election. Using the subpopulation that consists of policies enacted by one term governors and second term policies of reelected governors, we first identify α_{ji} using the ratios of observed covariances:

$$\alpha_{j2} = \frac{Cov(z_j^2, z_j^3)}{Cov(z_j^1, z_j^3)} \tag{16}$$

$$\alpha_{j3} = \frac{Cov(z_j^2, z_j^3)}{Cov(z_j^1, z_j^2)} \tag{17}$$

Following Cunha, Heckman, and Schennach (2010), we rewrite the measurement equations using the following renormalization:

$$\bar{z}_{jt}^i = x_{jt} + \bar{\epsilon}_{jt}^i \tag{18}$$

where $\bar{z}_{jt}^i = \frac{z_{jt}^i}{\alpha_{ji}}$ and $\bar{\epsilon}_{jt}^i = \frac{\epsilon_{jt}^i}{\alpha_{ji}}$. Then, we implement the Kotlarski's Theorem on equation (18) to find the characteristic functions of $x_j = \rho_j$ and ϵ_j^i as follows:

$$\varphi_j^\rho(t) = \exp\left(\int^t \frac{\varphi_j^{1,n}(0,u)}{\varphi_j^n(0,u)} du\right) \tag{19}$$

$$\varphi_{1j}^{\bar{\epsilon}}(t) = \frac{\varphi_j^n(t,0)}{\varphi_j^\rho(t)} \tag{20}$$

$$\varphi_{2j}^{\bar{\epsilon}}(t) = \frac{\varphi_j^n(0,t)}{\varphi_j^\rho(t)} \tag{21}$$

where φ_j^n is the joint characteristic function of $\bar{z}_j^1$ and $\bar{z}_j^2$ for the restricted sample. The inversion formula is used to estimate the densities based on the characteristic functions:

$$f_j^\rho(x) = \frac{1}{2\pi}\int_{-T}^{T} \exp(-itx)\varphi_j^\rho(t)dt \tag{22}$$

$$f_{ij}^{\bar{\epsilon}}(x) = \frac{1}{2\pi}\int_{-T}^{T} \exp(-itx)\varphi_{ij}^{\epsilon}(t)dt \quad i = 1, 2 \tag{23}$$

where T is a smoothing parameter.

4.3 Identifying the Election Thresholds and the Benefits of Holding Office

We can also identify the election standards and the benefits of holding for governors.[10] Let ψ denote a vector containing election standards and the compensation for governors:

$$\psi = (\underline{s}_D, \bar{s}_D, y_D, \underline{s}_R, \bar{s}_R, y_R) \tag{24}$$

We normalize the discount factor of politicians to be equal to one ($\gamma = 1$) since γ and y_j are not separately identified. The incumbents' indifference conditions in (5) and (6) then imply that

$$\begin{aligned} \underline{\rho}_D &= \underline{s}_D - y_D \\ \bar{\rho}_D &= \bar{s}_D + y_D \\ \underline{\rho}_R &= \underline{s}_R - y_R \\ \bar{\rho}_R &= \bar{s}_R + y_R \end{aligned} \tag{25}$$

The fraction of extremists in each party is given by

$$Pr\{\text{Lose Reelection}|j\} = F_j^{\rho}(\underline{s}_j - y_j) + 1 - F_j^{\rho}(\bar{s}_j + y_j) \tag{26}$$

Note that this fraction can be consistently estimate in a sample. Let N_j denote the sample size and n_j the number of incumbents that are reelected. The fraction of extremist in party j in the sample is, therefore, given by $\frac{N_j - n_j}{N_j}$.

These two moment conditions in equation (26) together with the four equilibrium

[10] We can estimate p_D as the share of Democratic winners in open elections.

conditions

$$
\begin{aligned}
-E(\rho|\rho \in [\underline{s}_D - y_D, \underline{s}_D]) + \beta V^o(0) &= V^R(0) \\
-E(\rho|\rho \in [\bar{s}_D, \bar{s}_D + y_D]) + \beta V^o(0) &= V^R(0) \\
-E(\rho|\rho \in [\underline{s}_R - y_R, \underline{s}_R]) + \beta V^o(0) &= V^D(0) \\
-E(\rho|\rho \in [\bar{s}_R, \bar{s}_R + y_R]) + \beta V^o(0) &= V^D(0)
\end{aligned} \tag{27}
$$

then uniquely identify the parameters ψ.

4.4 Identifying the Distribution of Voters' Ideal Points

Consider the case in which the incumbent is a conservative Republican. Let $x_{R,t-1} \leq 0$ be the policy that the Republican incumbent adopted in his first period. Recall that

$$V^{I,R}(\theta, x_{R,t-1}) = -E[|x_{R,t} - \theta|] + \beta E[V^o(\theta)] \tag{28}$$

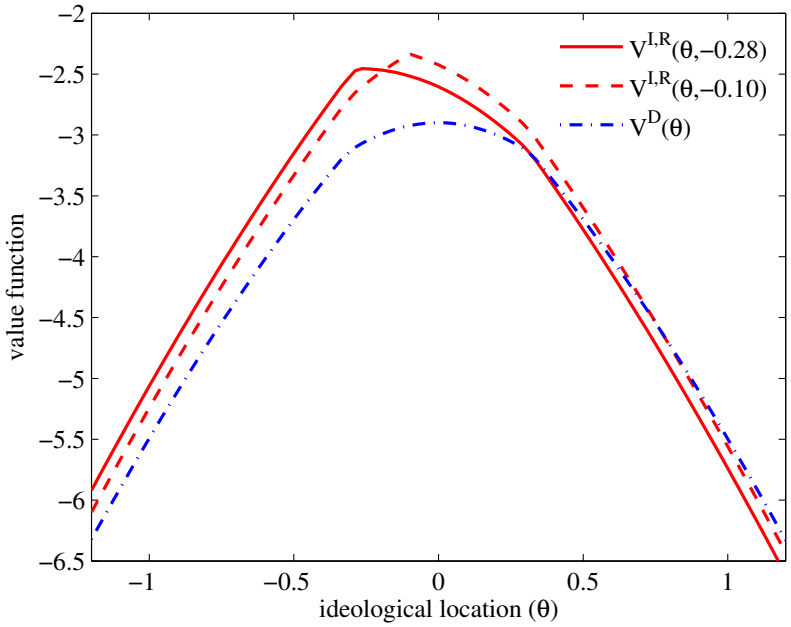
is the value function of voter θ if the incumbent is reelected. Let $V^D(\theta)$ denote the value function of electing an untested Democratic candidate. Given sincere voting, the set of individual that vote for a conservative Republican incumbent is defined as:

$$I_R(x_{R,t-1}) = \left\{ \theta \;\middle|\; V^{I,R}(\theta, x_{R,t-1}) \geq V^D(\theta) \right\} \tag{29}$$

If preferences satisfy a single-crossing property, this is a connected set. Hence, there exists a unique cut-off point, denoted by $\theta_R(x_{R,t-1})$ such that all voters with $\theta \leq \theta_R(x_{R,t-1})$ will vote for the incumbent while all votes with $\theta > \theta_R(x_{R,t-1})$ will vote for the challenger.

Figure 4 illustrates the basic mechanism. We plot the value function associated with a Democratic challenger and three different Republican incumbents. The set $I_R(x_{R,t-1})$ is implicitly characterized by the intersection of the incumbent's and challenger's value functions.

Figure 4: Vote Shares



The observed vote share, denoted by v_t, then satisfies:

$$F_\theta(\theta_R(x_{R,t-1})) = v_{Rt} \tag{30}$$

Given that we have identified the parameters of politicians' preferences and the distribution of politician types in the first two steps, $\theta_D(x_{R,t-1})$ is known up to the discount factor β.[11]

In practice, we do not observe the policy, x_{Rt}. Instead we observe noisy measures z^i_{Rt} The expected vote share of the incumbent conditional on observing z_{Rt-1} is, therefore, given by:

$$E[v_{Rt}|z_{R,t-1}] \;=\; \int F_\theta(\theta_D(x_{R,t-1}))\; g(x_{R,t-1}|z_{R,t-1})\; dx_{R,t-1} \tag{31}$$

where the conditional density $g(x_{R,t-1}|z_{R,t-1})$ can be derived from the measurement model in equation (15). We can use a flexible parametrization for $F_\theta(\cdot)$ and estimate

[11] We set the annual discount factor of voters equal to 0.95.

its parameters by minimizing the squared differences between the observed and the predicted vote shares in equation (31).

4.5 Semi-parametric Estimation

The proofs of identification are constructive and can be used to define a moments estimator that is based five different type of orthogonality conditions. First, we use co-variance restrictions to estimate the factor loading coefficients. Given the factor loadings, we can use Kotlarski's Theorem to estimate the distribution of the distribution of ideology.

To ease the burden of computing equilibria, we approximate the density of ρ obtained from Kotlarski's Theorem using semi-nonparametric methods. Following Gallant and Nychka (1987), we define SNP densities as:

$$h(x) = \left[\sum_{j=0}^{K} \alpha_j (x-\mu)^j\right]^2 \exp\left[-\frac{(x-\mu)^2}{\gamma^2}\right], \quad \int h(x)dx = 1 \tag{32}$$

The second set of orthogonality conditions are then based on the distance between $f(x)$ and $h(x)$.

The third set of moment restrictions arise form the fraction of extremists that are not reelected in the first period. As discussed in the previous section, these moment restrictions together with equilibrium conditions that define the upper and lower thresholds can be used to estimate the benefits from holding office.

Forth, we can construct additional orthogonality conditions based on the observed policies of candidates that win reelection. Term limits give rise to policy moderation in the first period relative to the second period. The degree of observed policy moderation depends on the functions and parameters of our model. We solve the model and simulate policy outcomes. We can, then, match the first and second moments of

the distribution of observed policies for each party for two-term politicians.

Finally, we can construct moment conditions based on the observed and the predicted vote shares by matching predicted vote shares with observed vote shares for elections that pit an incumbent against a challenger. By combining orthogonality conditions from these different sources, we obtain an over-identified method of simulated moments estimator. We use bootstrap methods to estimate standard errors for the parameters and functions of interest.

5 Data

Our data set is based on all gubernatorial elections between 1950 and 2012 in the U.S. In constructing our data, we closely follow Besley and Case (1995) to guarantee that our findings are comparable to their study. The Book of the States provides detail information about gubernatorial term limits. Table 1 summarizes term limits by state during our sample period. Note that different states have adopted term limits at different points of time.

Data on vote shares, party affiliation, and incumbency status of candidates in gubernatorial elections are based on a web site called www.ourcampaigns.com. Table 2 summarizes election data.

We use the same policy outcome measures as Besley and Case. Taxes can be obtained from the state government tax data collected by U.S. Census. We focus on total general sales tax, individual income tax, and corporate net income tax, which account for the vast majority of state tax receipts. Total general expenditures are also obtained from the U.S. Census. The Monthly Labor Review and the Report on the Minimum Wage Commission provide detailed data on minimum wages for each

Table 1: Term Limits by State, 1950-2012

State law	State
States with no term limits	CT, ID, IL, IA, MA, MN, NH, NY, ND, TX, UT, VT, WA, WI
States limiting governors to 1 term in office	VA
States limiting governors to 2 terms in office	DE, NJ, OR
State law changed from no limit to 2 term limit (year of change)	KS(1974), ME(1966), MD(1954), NE(1967), NV(1972), OH(1966), SD(1956), AZ(1993), AR(1993) CA(1990), CO(1991), MI(1993) MT(1992), RI(1994), WY(1993)
State law changed from 1 term limit to 2 term limit (year of change)	AL(1970), FL(1970), GA(1978), IN(1973), LA(1968), MO(1966), NC(1977), OK(1967), PA(1971) SC(1982), TN(1980), WV(1972) KY(1992), MS(1986)
State law changed twice (2 term - 1 term - 2 term)	NM(1971, 1991)

Table 2: Winners' Vote Shares, Party Affiliation, and Incumbency Status

Variable	Obs	Winner's Vote Share	Democratic Party
Total	255	0.58	0.53
Incumbent	103	0.61	0.52
Challenger against Incumbent	39	0.54	0.62
Challenger in open election	113	0.57	0.50

Note: The vote share is calculated based on votes cast for the two candidates.

state in the U.S. Finally, data on worker's compensations can be from the Analysis of Worker's Compensation Law and the Book of States. Workers compensation is measured as the maximum weekly benefits for temporary total disability. Temporary total disability benefits are paid during the period an employee is unable to work due to the effects of the work-related injury, subject to the waiting period, if applicable. Table 3 provides some descriptive statistics of our policy outcome measures. All taxes, income, and expenditure are per capita in 1982 dollars.

For the rest of the paper, we consider four policy outcome measures: total taxes per capita which combines sales taxes and personal income taxes as well as expenditures per capita, the minimum wage and weekly workers compensation benefits .

There exists a fair bit of heterogeneity in policy outcomes across states and time. To account for heterogeneity among states as well as business cycle effects, we regress all policy outcomes on a full set of state and time dummy variables as well as state income and population. We then use the time and state adjusted policies when we implement the estimator of our model.

One way to measure policy moderation is to analyze the differences in the standard deviation of policies adopted in the first and second periods restricting attention to

Table 3: State Policy and Economic Variables, 1950-2012

	Mean	Std Dev
Sales tax	367	171
Income tax	189	186
Corporate tax	44	36
State spending	1326	704
Minimum wage	2.1	1.4
Maximum weekly benefits	239	108
State income	11969	4285
Population (millions)	4.8	5.1
Governor cannot stand for reelection	0.29	0.46
Party of governor (=1 if Democrat)	0.55	0.5

a subsample of policies that were enacted by two-term governors. Broadly speaking, our model implies that the observed standard deviation of policies should be larger in the second period than the first period.

Table 4 reports the empirical results for our sample. We find that the standard deviation of first period policies is smaller than the standard deviation of second period policies for all four outcome measures that we consider in this paper. The difference is statistically different from zero in three out of four cases. We also conduct the same analysis for each party. Our qualitative findings are similar once we condition on party membership. The main difference is that we find more pronounced differences in the standard deviation for Republicans than Democrats, especially for tax and minimum wage policies.

Finally, we replicate and extend the empirical findings in Besley and Case (1995)

Table 4: Variance Test

	std deviation 1st period	std deviation 2nd period	One sided Test p-value
expenditures	99.56	122.48	0.0001
taxes	57.27	58.59	0.3025
minimum wage	0.47	0.53	0.0263
workers comp	23.68	26.92	0.0090

using their difference-in-difference estimator.[12] All regressions include year and state fixed effects and a number of time varying controls such as population and state income. The top part of Table 5 reports the results for the initial sample (1950-1986). Table 5 shows that we find that our estimates are almost identical to the ones reported in Besley and Case. Next we extend their analysis to our full sample which covers the period from 1950-2012. The results are reported in the lower half of Table 5 of the paper. Overall, the point estimates are similar than the ones for the initial sample. The estimated standard errors are slightly larger.

6 Empirical Results

We implement our semi-parametric estimator using per capita tax revenue, per capita expenditure, minimum wages and worker's compensation as policy outcomes measures. Table 6 reports the parameter estimates and estimated standard errors of

[12]Small differences arise due to the fact that we do not control for the fraction of old households in the state.

Table 5: Besley-Case Regressions

All States, 1950-1986				
	total tax	expenditure	minimum wage	weekly benefits
Democratic incumbent	15.73	22.40	0.08	13.50
term limited	(5.41)	(9.00)	(0.07)	(3.96)
Republican incumbent	-8.08	-0.46	-0.43	-1.85
term limited	(6.89)	(11.47)	(0.09)	(5.07)
Governor's party	2.15	12.30	-0.14	-4.74
is Democratic	(3.84)	(6.40)	(0.05)	(2.82)
# of observation	1776	1776	1776	1680
All States, 1950-2011				
	total tax	expenditure	minimum wage	weekly benefits
Democratic incumbent	17.15	43.00	0.08	3.25
term limited	(5.16)	(9.70)	(0.05)	(3.17)
Republican incumbent	-12.51	-7.79	-0.27	-8.12
term limited	(6.03)	(11.33)	(0.05)	(3.70)
Governor's party	-10.91	8.80	-0.06	-0.77
is Democratic	(3.85)	(7.25)	(0.03)	(2.37)
# of observation	2976	2976	2976	2880

the factor loading factors and the benefits of holding office.[13] Standard errors are computed using a bootstrap algorithm.

Table 6: Parameter Estimates

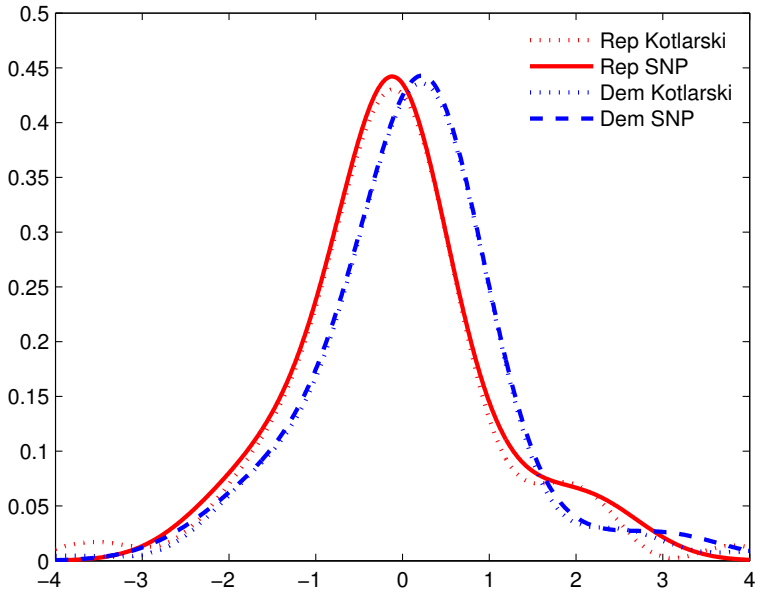
Parameter	Estimate	S.E.
y_D	0.5705	0.0162
y_R	0.5958	0.0166
α_{D2}	2.0043	0.0708
α_{R2}	2.0142	0.1244
α_{D3}	0.0031	0.0001
α_{R3}	0.0029	0.0001
α_{D4}	0.1258	0.0052
α_{R4}	0.1315	0.0027

Based on the model estimates we can then predict the fraction of moderate and centrist politicians for each party. We find that 33.6 (34.5) percent of all Republicans (Democrats) are moderates while 32.3 (32.6) percent are centrists. These estimates suggest that a large fraction of candidates engage in policy moderation.

Figure 5 plots SNP and Kotlarski estimates of the distribution of ideological positions by party. Our estimates imply that the densities of ideal points overlap. There are fiscally conservative Democrats and Republicans who serve as U.S. governors. Similarly, there are liberal Democrats and Republicans that prefer, on average, higher spending and taxation levels. Our model suggests that the effect of policy moderation depends on which side of the median voter a politician finds himself. Both types of moderates need to move towards the center to win reelection. A fiscally conservative

[13]Our estimates for the probability that a Democrat will win an open election, denoted by p_D, is 0.5044 which indicates that open election are very competitive.

Figure 5: The Distribution of Ideological Positions by Party



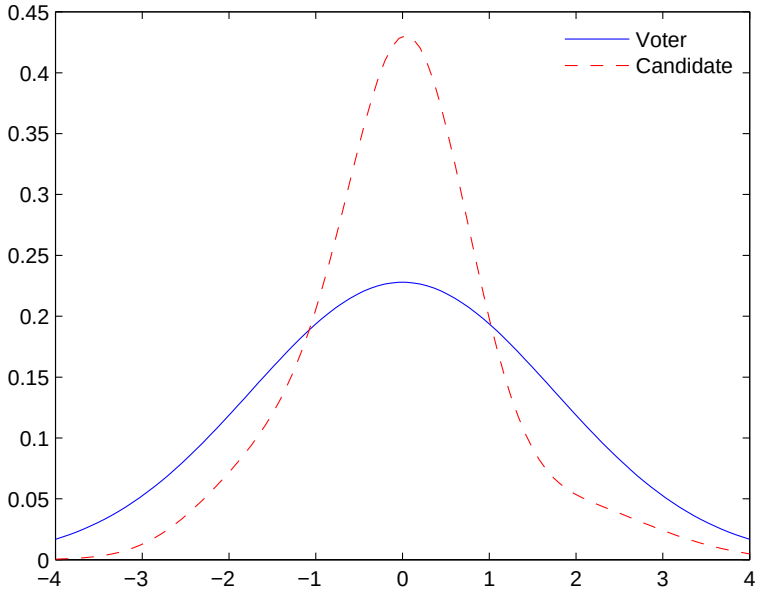
politician will adopt higher taxes and expenditures in the first period than in the second period. A fiscally liberal politician will adopt lower taxes and expenditures in the first period than in the second period. Note that this is true for both parties. The degree of policy moderation is, however, party specific.

This insight then suggests that a modified version of the Besley & Case regression. First, we restrict the sample to politicians that win reelection. Second, we split the sample not only based on party affiliation, but also based on a classification of whether a politician is a fiscally conservative or liberal. Our classification used the second period policies to classify governors as liberal or conservative. We implement the modified Besley & Case type regression using the observed data as well as simulated data based on our model. Note that our observed policy measures contain measurement error. As a consequence our measures of liberal and conservative con-

tain some error. However, both regression will be equally affected or equally biased by this classification error.

Tables 7 and 8 report the results of these regression exercises. We find that the modified Besley & Case regressions are supportive of our modeling strategy. Conservatives adopt higher tax and spending policies in the first period while liberals do exactly the opposite. Moreover, the magnitude of the policy moderation effects are similar in the observed data and the simulated data. Note that we do not impose these restrictions when we estimate our model. The analysis above can, therefore, also be interpreted as a model validation exercise.

Figure 6: Ideological Positions of Voters and Candidates



Finally, we implement the third stage of our estimation strategy by matching the predicted voted shares with the observed vote shares of incumbents using a NLLS estimator. Figure 6 plots the estimated densities of ideological positions of voters

Table 7: Modified Besley-Case Regressions

Actual Data				
Variables	expenditure		tax	
2nd term	liberal	conservative	liberal	conservative
Democratic incumbent	-32.27	21.13	-4.41	4.17
1st term	(12.34)	(15.22)	(5.97)	(6.91)
Republican incumbent	-25.75	50.36	-11.03	30.10
1st term	(16.30)	(12.95)	(6.34)	(7.30)
Governor's party	-4.27	-4.39	-12.98	8.36
is Democratic	(14.38)	(14.09)	(6.14)	(7.12)
Constant	79.08	-79.05	49.20	-48.78
	(11.34)	(9.18)	(4.45)	(5.13)
Simulation				
Variables	expenditure		tax	
2nd term	liberal	conservative	liberal	conservative
Democratic incumbent	-41.29	30.23	-21.10	23.50
1st term	(2.40)	(2.36)	(1.33)	(1.43)
Republican incumbent	-38.98	30.81	-21.48	22.65
1st term	(2.42)	(2.39)	(1.45)	(1.33)
Governor's party	-3.71	-2.38	2.15	2.33
is Democratic	(2.41)	(2.37)	(1.39)	(1.38)
Constant	57.65	-67.97	35.55	-32.08
	(1.71)	(1.69)	(1.03)	(0.94)

Table 8: Modified Besley-Case Regressions

Actual Data				
Variables	minimum wage		workers comp	
2nd term	liberal	conservative	liberal	conservative
Democratic incumbent	-0.14	0.16	-13.54	6.60
1st term	(0.06)	(0.06)	(3.35)	(2.85)
Republican incumbent	0.07	0.31	-1.28	8.82
1st term	(0.06)	(0.06)	(3.45)	(3.10)
Governor's party	0.15	-0.22	8.77	2.79
is Democratic	(0.06)	(0.06)	(3.39)	(2.98)
Constant	0.23	-0.52	15.47	-17.06
	(0.04)	(0.05)	(2.46)	(2.15)
Simulation				
Variables	minimum wage		workers comp	
2nd term	liberal	conservative	liberal	conservative
Democratic incumbent	-0.17	0.18	-13.01	11.12
1st term	(0.01)	(0.01)	(0.63)	(0.55)
Republican incumbent	-0.33	0.10	-8.01	12.12
1st term	(0.02)	(0.01)	(0.55)	(0.68)
Governor's party	0.07	0.15	-0.25	-4.55
is Democratic	(0.01)	(0.01)	(0.59)	(0.62)
Constant	0.13	-0.34	11.81	-8.54
	(0.01)	(0.01)	(0.39)	(0.47)

and candidates.

Figure 6 shows that both distributions are similar. Citizen-candidate models assume that these two distributions are identical. Our results provide some support for this assumption. If anything, political candidates tend to be less radical than voters. This finding is plausible since the distribution of politicians is restricted to potential candidates. These candidates must be viable and are thus screened carefully by parties. Moreover, they typically have to survive an internal primary process to win the party nomination. This process primarily eliminates candidates that are extreme in their positions. However, this process is not perfect and a fair amount of heterogeneity in political candidates remains even at the gubernatorial election stage.

7 Policy Implications

We are now in a position to study the impact of of term limits on the electoral outcomes and economic policies. The natural benchmark is a model without term limits. We, therefore, solve out model with and without term limits and compare the predictions. Table 9 summarizes the impact of eliminating term limits on electoral outcomes.

We find that election standards are significantly tighter in a model with a two-period term limit. This is not surprising. Moderates adopt more radical positions in the second term when they are lame duck politicians according to our model. Voters know these strategies and respond by using tight election standards. Eliminating term limits implies that incumbents still have incentives to moderate their policies in all periods since they want to be re-elected. Voters anticipate these incentives, know the strategies of incumbents and respond by adopting wider election standards. As a consequence, the fraction of politicians that are reelected and the fraction of successful

Table 9: Eliminating Term Limits

	Normal Model		SNP Model	
Parameter Parameter	Two Term Limit	No Term Limit	Two Term Limit	No Term Limit
$\bar{s}_D$	0.3361	0.4073	0.3975	0.4477
$\bar{s}_R$	0.3216	0.4005	0.3973	0.4472
$\underline{s}_D$	-0.3412	-0.4073	-0.4026	-0.4477
$\underline{s}_R$	-0.3140	-0.4005	-0.3821	-0.4472
Fraction Dem. Centrists	0.2838	0.3382	0.3264	0.3623
Fraction Rep. Centrists	0.2559	0.3194	0.3230	0.3657
Fraction Dem. Moderates	0.3735	0.3555	0.3458	0.3307
Fraction Rep. Moderates	0.3538	0.3357	0.3363	0.3158

incumbents increases by approximately 2 percentage points for both parties.

Eliminating term limits also has an impact on economic policies. Table 10 summarizes the key findings of our policy simulations using our model. Not surprisingly, we find that the average differences in mean policies is small. In general, eliminating term limits implies policies that are closer to the median voter on average. But the overall mean effects are small in magnitude. Term limits have, however, a significant impact on the variance of policies. Comparing the standard deviations of all four economic policies, we find large differences between both models. The standard deviation is almost 20 percent smaller in a model without term limits.

Table 10: Policy Implications

	2 Term Limit	No Term Limit (T=2)	No Term Limit (T=3)
Mean			
Tax	4.1726	3.0613	2.5223
Expenditure	-28.2748	-17.4766	-12.2955
Minimum Wage	-0.0885	-0.0578	-0.0389
Compensation	1.0442	0.5195	0.4916
Standard Deviation			
Tax	75.9798	66.1114	56.1710
Expenditure	143.0375	125.7841	108.0949
Minimum Wage	0.5126	0.4246	0.3595
Compensation	28.9157	23.4277	19.8624

8 Conclusions

Building on recent theoretical advances in modeling repeated elections, we developed a model in which candidates from two parties compete in statewide elections. Candidates are drawn from different distributions of ideological positions, which share a large common support. Equilibria can be characterized by asymmetric election standards, which depend on the party of the candidate. We show that our model is non-parametrically identified and propose a semi-parametric estimator.

The empirical analysis draws on data from U.S. gubernatorial elections between 1950 and 2012. Our analysis provides a new empirical evaluation of the impact of term limits on political competition and policy outcomes in the U.S. We find that term limits provide strong incentives for moderate governors to move towards the center of the ideological spectrum during the first term in office. We also find evidence that the

distribution of voter ideal points is similar to the distribution of political candidates providing support for citizen-candidate type models. Term limits lead to tighter election standards. As a consequence, incumbents are more likely to get reelected in an electoral system without term limits. Moreover, term limits imply larger variation in observed economic policies such taxes, expenditures, minimum wages and workers compensation. We view the methods developed in this paper for estimating dynamic games of electoral competition as promising for future research.

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