Political agency model of persistent electoral success with endogenous rents

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Abstract: The paper presents a political agency model that observes how budgetary decisions on public good production affect the prospects of holding office for an incumbent political party. A simple budgetary function is broadened to include other expenditures such as public sector wages and social transfers so as to present a constraint to rent-extraction. Upon this a ratio of public goods to other expenditures is determined, which the party must keep within certain boundaries set by the voters. Rents are extracted from public good expenditures instead of being exogenously given as a part of a budget, as the party must be able to conceal rent-extraction due to constitutional boundaries. The incumbent's decision on rents and public good production directly affects the state of the economy upon which the voters decide whether to re-elect the incumbent or not. Incumbents make their decisions based on observing the economic growth shock. For high levels of growth they decide to respect the voter re-election rule, while for low levels they will defect and extract maximum rents. In a repeated game setting an incumbent will always chose the optimal strategy with respect to the observed growth shock. This way, for high enough levels of economic growth an incumbent party may stay in office for an infinite amount of periods and keep maximizing rents with respect to the given constraints, without having to trade-off rents for holding office. The paper presents empirical evidence on United States gubernatorial and state legislature elections from 1992 to 2008 to evaluate the underlining theory.

Keywords: Political agency, rent-extraction, public good production, political parties, endogenous rents

JEL Classifications: D72, H72, C71, C33

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1. INTRODUCTION

Models of political agency are based on the principal-agent relationship between the voters who act as principals and the politicians who act as agents. The main focus of the models is the inability of principals to completely control what agents do. Political agency literature tries to understand how politicians misuse their political power in order to obtain an excess amount of budgetary funds defined as political rents gained from pursuing office. A rational agent's maximization problem is to acquire political rents outside the market in the political arena where he controls budgetary expenditures. Here arises the conflict of interests implied by the principal-agent framework. The principals are unable to observe everything an agent does creating the problem of electoral accountability of politicians. Uncertainty and asymmetric information give further incentives to politicians to misrepresent themselves and pursue their own interests. Due to such behaviour of agents there will exist a trade-off between voter utility (policies appealing to voters) and rent-extraction.

Political agents have an incentive to limit rent-extraction since they are accountable to voters through the electoral process. The voters vote retrospectively where they punish bad behaviour of incumbents. Too much rent-extraction may reduce economic performance and send signals of an incompetent incumbent. According to the findings in Murphy et al. (1993) rents can also hurt innovation and therefore reduce economic growth resulting in bad equilibria and lower future outputs. Limiting rent-extraction is rewarded by voters through re-election. Voters assign a cut-off threshold value above which they re-elect the politician. Since the political agent is a rational utility maximizer he chooses to respect the voter threshold in order to stay in office and maximize future payoffs from rents. Re-election incentives will therefore improve the selection and discipline of politicians.

The models are often characterized by a two period setting in which a politician's term ends in the second period. In order to stay in office to reach the second period the incumbent

politician should limit his rent-extraction. This creates the moral hazard problem since the bad politician is free to divert the entire budget towards his private means in the second and final period. There is also an adverse selection problem concerning how good politicians should distinguish themselves from bad ones, since the first period behaviour of bad politicians implies mimicking the behaviour of good politicians in order to remain in office and maximize next period rents.

The paper aims to show how in Western type democracies political parties can maximize their time in office and still obtain enough rents to satisfy the private utilities of its party members. It will present a model that alters certain typical assumptions of other political agency models in order to test its effect in a more realistic scenario of politics. This includes setting an infinitely repeated game with political parties instead of individual candidates in order to remove the last period (term limit) effect. This will shift the focus to the dynamics of party decision making and emphasise its aims of maintaining a positive reputation and still achieving its rent-seeking goals. Every political party has the desire to indefinitely continue with its rent extraction, even if this 'only' implies maintaining a certain level of power within a society, to which each party member may reap personal gains. If the incumbent party is a rational rent maximizer it plays a cooperative strategy with the voters in order to remain in office for a long period of time. The incumbent will take the economic environment into account when making budgetary allocation decisions and will play strategically according to the observed economic situation. After presenting the political agency literature the paper defines the political environment and the model's main assumptions. It solves the model by specifying voter and politician strategies and the voter re-election rule upon which the equilibrium levels of public good production, rents and the state of the economy are determined. It uses the data on United States gubernatorial and state elections from 1992 to 2008 to test the main predictions of the model.

2. RELATED LITERATURE

The most comprehensive review of political agency models and their implications is done by Besley (2006). He recognizes three main types of political agency models. Early models developed by Barro (1973) and Ferejohn (1986) observed the moral hazard problem of the agents. They brought to focus the problems of uncertainty, retrospective voting and electoral control and introduced the threshold level of the voters' decision rule that should restrain bad behaviour of an incumbent. Other models introduced the problem of adverse selection (Besley and Prat, 2006) where the main issue was to differ between the good or bad type of a politician. The focus is on how the voters can form beliefs on different types based on signals of politician's behaviour. The strongest emphasis of the literature has been on the models combining both moral hazard and adverse selection such as in Austen-Smith and Banks (1989), Banks and Sundaram (1993), Besley and Case (1995a), Coate and Morris (1995), Rogoff (1990), Persson and Tabellini (2000) and Besley and Smart (2007). These models use policies chosen by incumbents as a signalling message to the voters, upon which they will base their conclusion on the incumbent's type. They are solved through a perfect Bayesian equilibrium where both pooling and a separating equilibrium exist and bad politicians are able to mimic the good ones in their policy choices in order to send signals of a good type to voters to get re-elected.

After the initial focus of the political agency literature on theoretical models, lately there has been a growing influence of empirical papers in the field. They were mostly concerned with observing gubernatorial elections and the effects of term limits on governor rent-extracting behaviour (Besley and Case 1995a, 1995b; Alt, De Mesquita and Rose 2011), corruptive activities (Ferraz and Finan, 2011) or on environmental policy (List and Sturm, 2006). Besley and Case (2003) test the political agency framework on the effect of political institutions on policy choices in the U.S.

Finally, Persson and Tabelini (2000), Rogoff (1990) and Rogoff and Sibert (1988) observe the career concern model and electoral cycles where economic performance becomes the signal voters receive. Incumbents need to show competence in maintaining economic stability and growth, which is compromised by extensive rent-seeking (as found by Murphy et al 1993), so a limit of rent-seeking will show competence and ensure re-election. A good empirical testing of this kind of setting can be found in Brender and Drazen (2008). The career concern model creates a link to the models of the political business cycle pioneered by Nordhaus (1975), developed further by many others, but most comprehensively presented in Alesina, Roubini and Cohen (1997).

3. POLITICAL ENVIRONMENT

This paper aims to challenge the assumptions of most political agency models in several ways. The first standpoint is that all politicians are rent-seekers meaning that the voters don't face the problems of adverse selection but only the moral hazard problem where politicians need to be constrained in their abuse of power. Politicians seek to maximize their private interest from holding office by implementing their preferred policies. These are sometimes *white elephant* projects or *pork-barrel* spending, but the pursuit for satisfying their own private interests might even generate favourable public outcomes. The idea that all politicians are rent-seekers follows the models presented in Besley (2004) and Casselli and Morrelli (2004) where selection of politicians is adverse and always produces bad politicians. The assumption is that opportunity costs of working in a market sector are too high for high-ability individuals so there will always be negative selection of candidates into politics. Even if high-ability citizens were allowed to enter office in order capitalize on their political experience such as predicted by Matozzi and Merlo (2008) or in Gagliarducci et al. (2010) there are still incentives for these individuals to enter the political market in order to obtain

personal benefits for themselves, meaning they will still engage into a trade-off with the voters over the optimal policies.

The second standpoint is that the paper observes political parties rather than individual politicians. This assumption goes in line with the work of Levy (2004) where political parties rather than individuals are better in setting policies and appealing to voters in a multidimensional policy space. In a single dimension policy space the findings of the citizen-candidate framework (Osborne and Slivinsky, 1996; Besley and Coate, 1997) fit the policy setting much better as whichever individual running is closest to the median voter will win the elections. In situations with more than one policy issue Levy (2004) finds that parties are the best way of aggregating preferences of politicians and sending their signals to voters. This setting is more realistic since all budgetary decisions are made on a local level where state and local authorities assign public projects and distribute federal spending. The governor isn't the only one making the allocation decisions; they are made within-party lines since the benefits from being in-office are shared with other members of the executive branch and party legislators. After the governor's term limit expires the party looks to remain in-office with a new candidate.

When using political parties instead of candidates the paper moves beyond the two period setting, modelling an infinitely repeated game such as in Ferejohn (1986) and Banks and Sundaram (1993) in order to avoid the last period effect. An infinitely repeated game implies introduction of reputation and constant interaction between politicians and voters, as applied by Alesina (1988). The paper's assumption is that the incumbent wishes to maximize his time in office since a political party isn't constrained by any constitutional boundary of how long it can stay in office.[1] It can hold office persistently while only changing its

[1] There indeed exist parties which are able to remain in office for up to 20 or even 30 years. This would mean that they consecutively win 5 to 7 elections, instead of only 2 after which the model ends.

politicians. The paper has an intention to show that a party can use persistent power to acquire rents in every period while at the same time maximizing its chances of re-election. The assumption of a rent discount factor is rejected since the model introduces a stochastic growth shock to evaluate whether budgetary revenues and budgetary expenditures will be increasing or decreasing in future periods. This implies that, during times of economic growth (which occurs most of the time), public good production, a way through which rents can be extracted, as well as the total amount of public expenditures tends to increase over time implying more rents in every subsequent period instead of fewer rents.[2]

Existence of parties eliminates the emphasis on term limits, an important factor of political agency literature (Besley and Case, 1995b, 2003; Smart and Sturm, 2006; Alt, de Mesquita and Rose, 2011; Ferraz and Finan, 2011). With term limits reputation is less important in the final term where expropriation of rents can commence. By introducing continuous agents on the political arena – parties – this widely accepted idea loses support. In modern democracies incumbent politicians do care about the reputation of their party, but also of their own. If politicians engage in other activities when they exit or retire from office or if they seek to run for higher office (such as assumed and modelled in Diermeier, Keane and Merlo, 2005) then the reputational capital they create for themselves is an important decision parameter.

Political rents obtained from holding office are defined as any form of private benefits acquired from the political arena, as interpreted by Tullock (1967) and Krueger (1974). The benefits generally include any monetary or non-monetary concessions acquired by politicians through restricting competition by unnecessary regulation, protecting or creating monopolies or any other form of satisfying various interest groups through prone legislation. This paper

[2] Intuition is that in each period as the economy grows, cities expand and the population rises there is an increasing need for government services, new roads, new demands for public transportation, new schools, hospitals, etc.

recognizes rents in a similar but somewhat different form. Rents take the form of excess payments extracted through public good expenditure and obtained exclusively by an incumbent, never by an opposition politician.[3] The rent-extraction process is linked with corruption and misappropriation of budget funds for private benefits, similar to what is shown by Ferraz and Finan (2011). They recognize corruptive activities as a form of frauds in procurement, diversion of public funds (expenditures without proof of purchase) and over-invoicing (buying goods above the market price).

An assumption most political agency models hold is that rents are determined simultaneously with other budgetary expenditures and extracted directly out of the budget. Rent-extraction can be maximized by spending all budget revenues on rents instead of public goods (the *Leviathan* scenario set by Brennan and Buchanan, 1980). This creates a trade-off between re-election and rent-extraction, as more budget funds allocated towards rents distorts the budget directly leaving less funds for other budgetary expenditures. Such an assumption is questionable due to the existence of certain constitutional and legal boundaries that ensure budget transparency and forbid budgetary misuse for personal benefit under the punishment of imprisonment. Therefore incumbent politicians need to think of a way to "hide" their rent-extraction. The assumption of this paper is that rents can't directly be extracted from tax revenues; rather they are dependent on public good provision, as more public goods increase rent extracting opportunities. Incumbent politicians maximize their public good expenditures but with respect to the budgetary redistribution obligation of satisfying the needs of voters besides public goods, namely social transfers and public sector wages. By adding transfers and wages only a fraction of expenditures gets diverted towards public good production (and

[3] The classical rent-seeking definition may give space for an opposition politician to obtain rents through the legislative process. If any opposition politician is a member of an important Parliament committee he or she may use this power to legislate laws that favour various interest groups that may finance their campaigns. In this paper, only an incumbent has the legitimate power to produce public goods (at a national or local level), since only a politician in office may distribute budget funds and through this process is eligible to acquire rents.

hence towards rent-extraction). The incumbent maximization function would concern maximizing public good expenditures (to increase internal rents) while holding them in the same constant ratio to transfers and other wage expenditures (to increase re-election chances).

4. MODEL

The model is defined as an infinitely repeated game between the voters and incumbent political parties. In each period an incumbent political party has to make budgetary decisions on the allocation of social transfers (f), public sector wages (w) and public good expenditures (g). After making the decision on public good expenditures an incumbent will get a certain amount of rents $r \in [0, \hat{r}]$ diverted from each public good it creates. Rents are determined endogenously and can only be extracted from the public good expenditures function. They represent a payoff to all politicians in power, along with ego rents from holding office, R. Rents are drawn from a cumulative distribution function $F(r|g)$ and between the minimum required amount of public goods (denoted as $\underline{g}$) which imply extracting zero rents ($\underline{r} = 0$) and the maximum possible amount of public goods ($\hat{g}$) for which the rents are $r = \hat{r}$:

$$r = \int_{\underline{g}}^{\hat{g}} r_i dF(r|g) \qquad (1)$$

The incumbent party will base its budgetary allocation decisions as well as its rent extraction on observing a stochastic economic growth shock $\beta \sim u[-\varepsilon, \varepsilon]$. The β parameter will determine the future level of tax revenues and consequently a higher next period budget that signals higher expected rent-extraction in future periods. If β grows continuously over time an incumbent party will choose a strategy to maximize their probability of winning and remaining in office since it will be able to get higher rents every subsequent period. If the β decreases the party will chose a rent maximization strategy in the current period since it expects less rents in the future. Due to the introduction of the β parameter there is no discount

factor in the model, as future rents will depend solely on the growth rate of the economy. The politicians observe β with certainty each period before they make their decision, while the voters observe β with a probability $q \in [0,1]$.

An incumbent party faces a budget constraint in each period which is defined as:

$$t\bar{y} = g(\theta', r) + T + V \tag{2}$$

Where $T = \sum_{i=1}^{n} f^i$ are aggregate transfers to the public (social benefits, unemployment benefits, pensions etc.) while $V = \sum_{i=1}^{n} w^i$ are aggregate public sector wage expenditures of the government.[4] The term on the left is total revenue (tax rate times aggregate income). Taxation is proportional to the level of income. The first term on the right ($g = \sum_{i=1}^{n} g_i$) are total public good expenditures which are equal to the actual costs of all goods (θ') which are stochastic and distributed on $\theta' \sim u[0, c]$ and known only to the politicians, times the total quantity of all goods (G). The single public good (g_i) expenditure function ($G_i = 1$) is defined as:

$$g_i(\theta_i', r_i) = \theta_i G_i = (\theta_i' + r_i) G_i \tag{3}$$

$$\text{where } r_i = \theta_i - \theta_i' = \lambda g_i \tag{4}$$

The term θ_i represents the unit cost of a public good as presented to the public (through official sources and the media), while θ_i' represents the actual cost of goods which are never observed by the public and known only to the politician. Since actual costs are a stochastic shock the politicians can't anticipate the total rents they might get in future periods, but only whether these rents will be higher or lower (based on β). r_i are rents extracted from providing a single public good and present a difference between total costs and actual costs (unobserved to the voters). They can't be set directly in the budget function (2) due to the

[4] The level of expenditures is always increasing if constant GDP growth is assumed and a constant wage growth is linked with real GDP growth (adjusted by inflationary expectations of the unions by collective bargaining). This doesn't imply a constant increase of the expenditure to GDP ratio but a simple observation that public expenditures do indeed increase over time, unless disturbed by a negative growth shock.

assumption of budget transparency; rather, they must be concealed and extracted indirectly within the public good expenditure function. The way rents are defined in (4) implies that an incumbent party assigns a fixed weight (λ) from any public good it produces to rent-extraction[5]. The relative size of rents will according to (3) and (4) depend on total quantity of public goods produced, and from (4) it can also be inferred that total rents depend on how much the public good actually costs; $r_i = \frac{\lambda}{1-\lambda}\theta_i'$, for $0 \leq \lambda < \frac{1}{2}$. Since λ is always kept fixed, an increase in rents can only be obtained by an increase in total funds diverted towards public good expenditures (g). The levels of total costs and the quantities of public goods will add uncertainty in total rent-extraction. For higher total costs an incumbent gets more rents but less public goods, if a politician were to keep g in the same level as before. Hence the total quantity of public goods will depend on the realization of the cost shock. However, maximization of rents is observed from the perspective of total public good expenditures as defined in (1).

The constraint of the incumbent's rent maximization is the ratio of public goods to other government expenditures which constitutes the voter re-election rule. From the budget constraint (2) the politicians and voters can determine the term ψ which denotes a ratio of budget expenditures diverted towards public goods against expenditures on social transfers and public sector wages:

$$\psi = \frac{g(\theta', r)}{T + V} \tag{5}$$

In order to get re-elected the incumbent needs to balance the ratio of public goods to other expenditures at a constant level depicting its promise of ensuring constant wage growth in the public sector as well as transfers to various social groups. The ratio will act as a

[5] Imagine a political party demanding a commission for any procurement it allows. This commission (a percentage of costs of a good that goes directly into the politicians' pockets) stays the same in relative terms for any project, but increases in absolute terms as more government revenue is allocated to public good expenditure each period.

constraint to incumbents' rent maximization since any decrease of public sector wages or transfers risks losing voter support. If the ratio was too high, this would imply, for example, less money for agricultural subsidies. This would yield strikes of the farmers creating a signal of a bad state of the economy for the incumbent leading to loss of voter support. If public sector wages would, for example, cease to grow at their predetermined level, this would result in discontent from public sector workers, again creating a distorted picture of the government to the median undecided voters leading to a lack of political support for the incumbent. This distorted signal of government performance defines the state of the economy. The state of the economy doesn't necessary imply economic performance, but rather signals sent by dissatisfied voters, observed by ideologically unbiased voters. Therefore the satisfaction of the ratio will directly impact the state of the economy and incumbent chances of re-election.

Timing

Timing starts by a observing a political party in power in their first term in office ($t = 0$) which has to make a decision on allocating budgetary spending. All politicians are rational rent maximizers, meaning their goal is to maximize time in office.

(1) Incumbent party observes β_{t-1} (previous period growth) and receives a signal of whether to expect high or low levels of rents in the current period. It will also observe the stochastic cost shock θ, and the desired level of the voter re-election rule.

(2) Upon observing the shocks with certainty, during its term in office the incumbent continuously chooses total levels of public good expenditures, g (within the set $\mathcal{P} \in \{g_0, \dots, \hat{g}_n\}$) and consequently the ratio ψ taking into consideration the voter re-election rule. Voters do not observe the policies set by the government directly. They cannot observe the final level of rents, nor the actual costs of public goods, but can observe the shock β with probability q.

(3) After the first half of the term spent in office[6] the incumbent party can observe the growth shock of the current period, β_t upon which it will anticipate expected future rents (from $t = 1$ onwards) and upon which it will base its final decision on public good expenditures and rent-extraction in $t = 0$. At this point the party forms expectations over the total amount of rents which it gathers throughout $t = 0$.

(4) The final chosen level of g conditions a certain state of the economy, denoted by σ, where $\sigma \in \{\sigma_0(g_0), \dots, \sigma_n(\hat{g}_n)\}$. The budget policy generates effects on certain voter groups (unemployed, pensioners, public sector workers). Any distortion of the ratio will result in dissatisfaction of particular groups who might find themselves as victims of a rent-extracting government policy disregarding their welfare.

(5) Pre-election time. Voters observe the state of the economy (σ) and make their decision on whether or not to support the incumbent. The incumbent party at the end of the period gathers all the rents they have extracted during their time in office which makes their rent-extraction complete for the current period.

(6) Elections. A poor state of the economy infers an incumbent who extracted too much rents (and didn't respect the re-election rule) and is thus elected out of office, while a good state of the economy infers an incumbent who pleased the voters just enough to remain in office.

The entire process is repeated for all $t \in \{1, \dots, \infty\}$. Each period the incumbent faces the same decisions and pre-observes the same parameters before making these decisions. The voters also play strategies based on the levels of the re-election rule, which is updated every period according to their preferences.

[6] One can easily imagine a term of two or four years of length, where one strategy is applied in the first half of the term, while a different strategy is applied in the other part of the term. The theories of political business cycles described in Alesina, Roubini and Cohen (1997) are based on similar assumptions. β_t is the growth shock one year before the elections (for a two year length of a term).

4.1. VOTER UTILITY AND THE RE-ELECTION RULE

Voters make decisions based on signals of political behaviour and actions of politicians. They evaluate whether a politician deserves to remain in office depending on how he distributes public spending and how this can shape the state of the economy and economic performance. Although they are free to observe policies the model implies that the voters act under the Downsian (1957) rational ignorance assumption and choose not to engage in direct observation of politician activities as this may prove to be too costly.

There are three voter groups (or districts) in the economy; two partisan on each side supporting its respective ideologically differing parties, and the middle one being ideologically unbiased. Interest groups do exist but unlike the findings in Coate and Morris (1995) their influence on electoral results is marginalized since I assume they become biased towards either parties and thus join the partisan votes on either side. The intuition is that interest groups often bias themselves towards parties that are ready to offer them concessions and announce their support towards a certain option before the elections.

All groups are assumed to be roughly equal by size and magnitude. In order to win the election the incumbent party doesn't need to maximize total voter support but only the necessary amount to win the election. They need to obtain the support of 2 voter groups (or equivalently win in 2 districts). Assume that victory is certain in 1 out of 3 groups/districts both on the opposite corners of a one-dimensional ideological spectrum. The focus of the politicians is on the middle, undecided group, with the highest density and most swing voters (as in Persson and Tabellini, 2000). However, the group of undecided voters is hard to observe since members of the group come from different incomes and backgrounds. Satisfaction of the middle groups' interests would be to keep a stable state of the economy. The median, undecided group is by assumption homogenous in its preferences over the re-election threshold. This simplification is due to putting more emphasis on politician strategies

of maximizing time in-office. By simply stating the re-election threshold as the group's median voter decision rule would yield the same intuitive result.

The utility of median group j consists of voters' wages (determining their private sector income and disposable income or consumption), social transfers they receive (unemployment benefits, pensions, agricultural subsidies etc.), public sector wages (determined by social contracts made by the unions representing the public sector workers and the government; their annual increase is tied to GDP growth adjusted by inflation) and preferences of voters towards total public good provision. The utility function of group j is:

$$W^j = C^j + H(G) \tag{6}$$

where C is consumption, $C = (1-t)y + T$. Insert this into (6) to get:

$$W^j = (1-t)y^j + T^j + H(G) \tag{7}$$

where the level of income y^j determines aggregate income from labour (in both private and public sector) and T^j denotes social transfers to group j. The final term denotes a smooth concave increasing function describing voters' preferences over public good provision.

Voters also draw utility from the state of the economy, σ and the exogenous growth shock β which they observe with a certain probability $q \in [0,1]$. By observing β they form expectations on incumbent behaviour in the current period. The values of these two parameters will determine the re-election decision for group j. The final expected voter utility function for the decisive median group j is:

$$EW^j = (1-t)y^j + T^j + H(G) + \sigma(\psi_t) + q\beta_t \tag{8}$$

The members of the median group are consistent of two types of voters: (i) those directly affected by government budgetary decisions (transfer recipients and public sector workers) and willing to show their dissatisfaction directly; and (ii) those indirectly affected

(private sector workers who determine public good preferences) who will punish the incumbent for either a deteriorating state of the economy or a decrease of public good production. The group homogeneity assumption still stands since it only concerns the levels of the re-election ratio threshold.

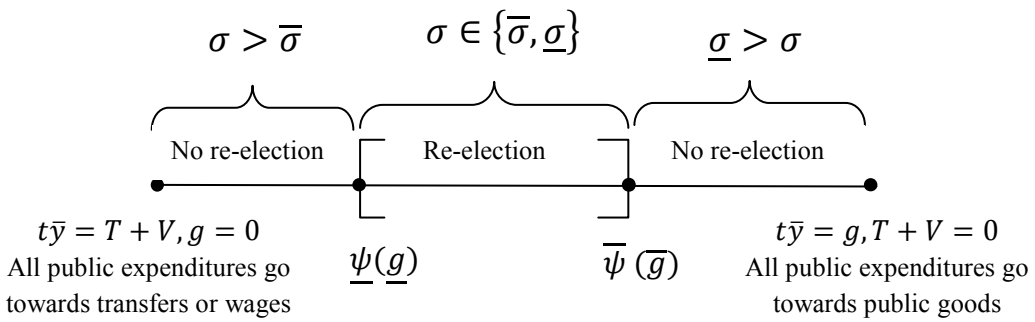
Re-election rule

The voter re-election rule acts as the constraint to politician rent maximization and a method of ensuring political accountability. The voters' threats are credible as if they observe negative signals from the incumbent party they elect it out of office. From equation (5) the voter re-election rule is defined as the ratio of public goods to other expenditures $\psi = \frac{g}{T+V}$, $\psi \in [0,1]$. Assuming that the denominator is fixed the incumbent party can't change the levels of wages and social transfers; it can only choose a level of public goods[7]. Therefore the decision on public good expenditures will determine the value of the ratio.

Voters assign the ratio ψ to be between certain levels. Not too low as this means not enough goods are being produced and not too high as they would like more public resources to be diverted towards redistribution programs and public sector wages. So the level of ψ is determined within a set $\Omega \in \left[\underline{\psi}, \overline{\psi}\right]$[8]. A high ratio implies high levels of public goods: $\overline{\psi} = \frac{\overline{g}}{T+V}$, and similarly a low ratio implies low levels of public goods: $\underline{\psi} = \frac{\underline{g}}{T+V}$. Any level of public good expenditures within these boundaries would satisfy the voters' desire for a good state of the economy, $\sigma \in \{\overline{\sigma}, \underline{\sigma}\}$. The decision of the incumbent based on the voter re-election rule lies on the line between the two levels of the ratio the public is indifferent of and is graphically represented in Figure 1:

[7] Wages and social transfers can be observed as constantly increasing in line with the real GDP increase and before each budgetary decision their desired level is known. This is why they are considered to be fixed.
[8] The level of ψ is determined by the total amount of transfers and public sector wages the public needs. Then by knowing this level of desired total transfers and wages, a politician can easily calculate what is left from the total budget revenue to spend on public goods.

Figure 1: Voter re-election rule



For any ψ between $\left[\underline{\psi}, \overline{\psi}\right]$ the state of the economy will be within $\sigma \in \{\overline{\sigma}, \underline{\sigma}\}$ meaning that the decision of the voters is to re-elect the incumbent. For $\overline{\psi}$ the state of the economy ($\underline{\sigma}$) although lower than optimal, is still high enough for the voters to vote for the incumbent. For any $\psi > \overline{\psi}$ too much public goods are produced and not enough money is left for transfers and wages so the state of the economy will be $\sigma < \underline{\sigma}$ which is lower than the lowest level still appreciated by the voters. For any $\psi < \underline{\psi}$, the state of the economy will be $\sigma > \overline{\sigma}$ but still not good enough to satisfy the majority of voter preferences since not enough public goods are built which may trigger dissatisfaction with those voters within group j with stronger public good preferences. The ratio, similar to public good preferences, can be described by an increasing concave function as for higher values of the ratio, voter utility increases at a decreasing rate, up to a certain point after which it falls for further increases of the ratio. This goes in line with the model's assumptions since too much public goods imply less transfers and public sector wages.

According to the assumptions of the re-election rule the probability of winning of the incumbent can be determined as:

$$p_I = \begin{cases} 1, & if\ \ \underline{\psi} \leq \psi \leq \overline{\psi} \\ 0, & if\ \ \psi < \underline{\psi} \text{ or } \psi > \overline{\psi} \end{cases} \qquad (9)$$

The incumbent party wins with certainty for setting the ratio within the re-election set $\Omega \in \left[\underline{\psi}, \overline{\psi}\right]$, and loses with certainty for any value outside of the set Ω.

4.2. INCUMBENT UTILITY AND STRATEGY

The incumbent party is a rational utility maximizer seeking to win elections in every period to have an option of extracting rents. The incumbent party's utility is a combination of ego rents from holding office and rents that can be extracted once in office. Since the position of holding office is primary attractive because of the possible rent-extracting opportunities, the optimal strategy of the incumbent party is to keep this position as long as they are able to maximize the flow of rents in the current period and expected rents in future periods. In $t = 0$ this utility is achieved with certainty (since it is already in office), while in every subsequent period it depends on the probability of winning office. The total level of expected rents in every period is dependent on the growth shock β:

$$U_I^0 = R_0 + \beta_{t-1} \int_{\underline{g}}^{\hat{g}} r_0 dF(r|g) \ \ldots \ t = 0 \qquad (10)$$

$$EU_I^1 = \left(R_1 + \beta_{t-1} \int_{\underline{g}}^{\hat{g}} r_1 dF(r|g) \right) p_I(\psi_{t-1}) \ \ldots \ t = 1 \qquad (11)$$

$$\ldots$$

$$EU_I^n = \left(R_n + \beta_{t-1} \int_{\underline{g}}^{\hat{g}} r_n dF(r|g) \right) p_I(\psi_{t-1}) \ \ldots \ t = n \qquad (12)$$

In every period $t = 1, \ldots, \infty$ the incumbent decides on a new level of public good production (and hence rent-extraction).

An incumbent's ex ante utility (expected utility at the start of term $t = 0$) is:

$$EU_I = E[U_I^0(r|g)] + p_I(\psi_t)\beta_t \sum_{t=1}^{n} E[U_I^t(r|g)] + \big(1 - p_I(\psi_t)\big)E[U_I^c] \qquad (13)$$

The first term denotes expected utility in the actual period $t = 0$ as defined in (10); the utility it will receive at the end of the first term in office, when total rents are realized. The second term is the sum of all future expected utilities when in office[9], from period $t = 1$ onwards, if it wins the election with probability $p_I(\psi_t)$ depended on satisfying the ratio in period $t = 0$. The incumbent's future rents will depend on β_t in the current period $t = 0$ as it will signal how big expected rents might be in period $t = 1$. The final term denotes the probability of losing the election if the party doesn't respect the re-election ratio and the utility it will get if the challenger, the opposition party, is now in office. This utility for the incumbent might even be negative once the opposition party is in office, as too much rent-extraction may be subject for punishment (such as a corruption trial).

The incumbent plays the same Prisoner's Dilemma game each period in an infinitely repeated game setting. When one party loses an election, a new party is in power facing the same decision and basing its rent-extracting decision on the same strategy. The incumbent's equilibrium strategy is to adapt the expectations of the voters to play the cooperative strategy every period, where a cooperative strategy implies respecting the voter re-election rule every single period in order to remain in office. Any defection from this optimal strategy will result in loss of elections (immediate punishment) and the inability to extract further rents. The game can be thought of as a tit-for-tat Prisoner's Dilemma game where any deviation from a cooperative strategy is met with immediate punishment from the voters. Even though the agent does change after the voters imply a punishment strategy, from the voters' perspective they always play a tit-for-tat game where they punish defection and reward cooperation.

[9] For simplicity ego rents are normalized to zero in all future periods.

A repeated game setting compares the defection and cooperation strategies of the incumbent party starting from its first term in office, $t = 0$. The incumbent plays a cooperative strategy if and only if the expected utility from the cooperative strategy is higher than the expected utility from the defection strategy:

$$E[U_I^0(\overline{r}|\overline{g})] + \beta_t \sum_{t=1}^{n} p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g})] \geq E[U_I^0(\hat{r}|\hat{g})] + E[U_I^C] \qquad (14)$$

The term on the right of the equation presents expected utility from taking maximum rents and the utility the party gets from a challenger in power, achieved with certainty for a defective strategy. When it defects it does so to maximize rent-extraction but is faced with no further future payoffs in terms of rents. Utility in $t = 0$ will either be cooperative (with $(\overline{r}|\overline{g})$) or defective (with $(\hat{r}|\hat{g})$), and will depend on the level of β_{t-1} observed in the previous period, before holding office (as in equation (10)). However, the incumbent's decision is based on anticipating what future rents will be. It observes β_0 in the current period (one year before the elections in a two year term), and bases its decision on current period rent-extraction on anticipated future rents. Under the assumption of constant growth where future allocation of rents is always higher, there is no period in which an incumbent is a 'lame duck'. It chooses to defect only when the β parameter is sufficiently small so that it might find itself in a better position now with maximum rents then with future lower rents.

Proposition 1: *Incumbent party will base its strategy on rent-extraction and consequently on its chances of re-election based on the value of the current period growth shock β_t. For any*

$$\beta_t \geq \frac{E[U_I^0(\hat{r}|\hat{g})] + E[U_I^C] - E[U_I^0(\overline{r}|\overline{g})]}{\sum_{t=1}^{n} p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g})]} = \beta^* \qquad (15)$$

the incumbent party always plays a cooperative strategy and chooses its level of rent-extraction and public good creation with respect to the voter re-election rule, while for any

$$\beta_t < \frac{E[U_I^0(\hat{r}|\hat{g})] + E[U_I^C] - E[U_I^0(\overline{r}|\overline{g})]}{\sum_{t=1}^{n} p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g})]} = \beta^* \qquad (16)$$

the incumbent party will always defect and by extracting too much rents be voted out of office. These set of strategies solved for β_t are a unique sub-game perfect Nash equilibrium strategy of the incumbent party's repeated game.

Proof: See Appendix A.

The intuition is as follows. In bad times during a negative shock β $\left(\beta < \beta^*, \sigma < \underline{\sigma}\right)$ if the incumbent party wants to stay in office it needs to limit its rent-extraction even further to make sure that the state of the economy remains good ($\sigma > \underline{\sigma}$) in order to get re-elected. If it fails to adjust its 'greed' towards this shock it will lose the elections. Most of the politicians get voted out of office in recession periods. The model implies this is because the politicians are reluctant to reduce their own rents. The incumbent party in this case decides it will be too costly for them (in the sense of less rent-extraction) to maintain the current level of the ratio. They will extract maximum rents now as they anticipate lesser future rents. This can be thought of as reaching a term limit in the standard political agency framework when the incumbents extract maximum rents in this period knowing they will be released from office in the next one. When the incumbent observes $\beta \geq \beta^*$ they will behave and perform in a cooperative fashion and opt to stay in power, knowing they will be able to extract more rents.

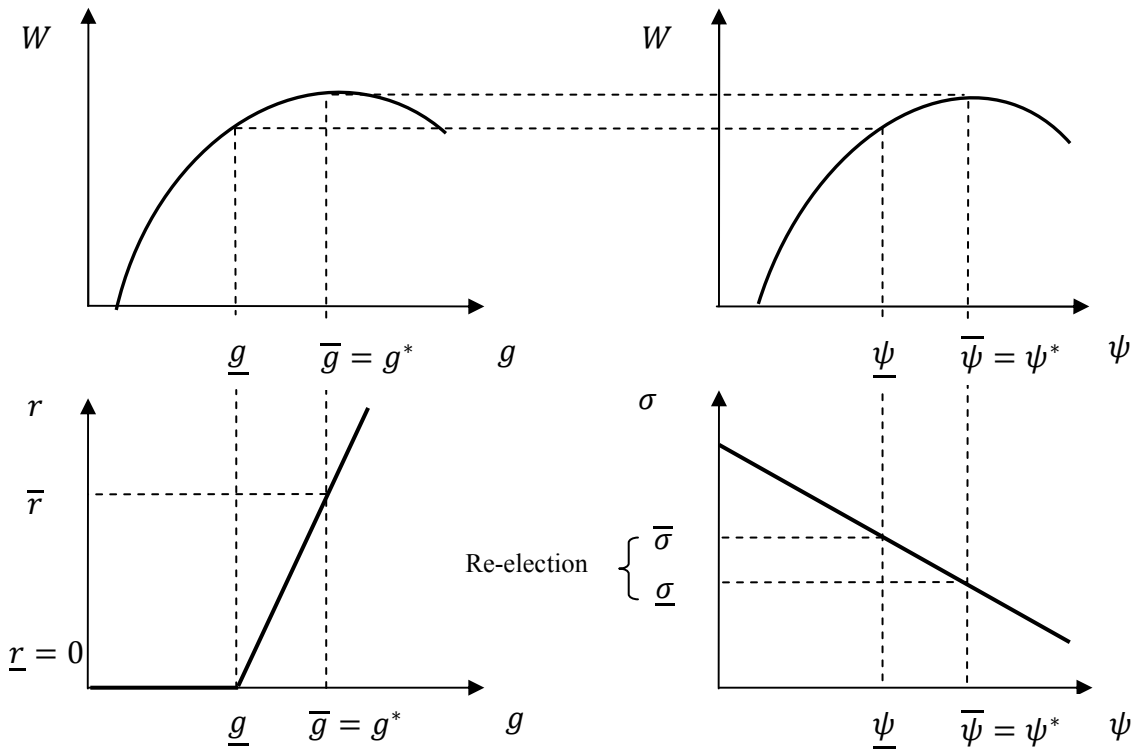
The growth shock β acts as a decisive factor for an incumbent on whether or not to play a cooperative strategy. It observes β_{t-1} from before holding office and receives a signal of what costs (θ') to expect in period $t = 0$. After observing both of these stochastic components (β_{t-1} and θ') the party can anticipate the level of rents in the current period but cannot anticipate their level in future periods. Upon observing β_t in the middle of the current

period[10] it will make its final decision on whether or not to respect the re-election rule. The paper finds empirical evidence on this assumption by linking economic growth from one year before the elections to the levels of the ratio in the election year. The beliefs on the shock β are updated every period upon which the party forms expectations of rents in future periods. They will calculate all future rents based on the value of β_t observed in the actual period. As the β_t changes in each subsequent period they update beliefs on their expected utility and decide whether to cooperate or not.

4.3. EQUILIBRIUM

The incumbent party's budgetary decision and the probability of winning office for the next term depend directly on the voter re-election rule, which it will respect only for a high enough β. The incumbent's allocation choices in each period can be summarized in Figure 2:

Figure 2: Relationship between public good production, rent-extraction and re-election



[10] Keep in mind that t here denotes election period, which is two calendar years.

The first graph on the lower left depicts the quasi-linear relationship between rents and public good production. Rents increase with public good expenditures only after a certain initial allocation. The intuition is that each state needs a crucial initial level of public goods to be produced and it isn't plausible to extract rents below that point. After that certain point (at the lower desired level of public goods, $\underline{g}$) rent-extraction begins. For a level of public good expenditures less than or equal to $\underline{g}$ rents are zero. Any increase of public good expenditures above $\underline{g}$ substantially increases rents relative to their previous levels. Voter welfare will be increasing at a decreasing rate due to the concavity of their utility function. The intuition is that sometimes politicians produce certain public goods that aren't of crucial importance for the voters (such as organization of sporting events and building stadiums) but it nonetheless increases their welfare. As soon as the voters observe a negative utility triggered by higher politician rent-extraction they will feel that the politicians aren't doing a good job which increases their dissatisfaction. This can be observed for any point of rents higher than $\overline{r}$ (and public goods higher than $\overline{g}$) as the voter utility starts decreasing. The decrease of utility sends a signal of a poor state of the economy after any $\sigma < \underline{\sigma}$, signalling a politician who cares more of his own rents then on voter welfare.

In the final graph on the lower right, depicting the relationship between the ratio and the state of the economy, it is obvious that an increase of the ratio above $\overline{\psi}$ triggers a negative effect on the state of the economy.[11] But the ambiguous part is the effect on the state of the economy for any level of the ratio $\psi < \underline{\psi}$. For any ratio $\psi < \underline{\psi}$ public good production decreases and other expenditures (transfers and wages) increase. This means the state of the economy wouldn't decrease for those voters who depend on transfers and public sector

[11] This doesn't imply that more public goods generate negative economic performance. It simply means that from the voters' point of view more public goods ('white elephants') imply less spending on public sector wages and transfers, generating outcomes less favourable for voters who are directly dependent on government spending.

wages. No one would commence strikes and protests as they are receiving more money than before. However, this level decreases the voter utility for all those voters with stronger public good preferences and lowers the public good expenditures below the initial desired level by all voters ($g < \underline{g}$). Also, for any level $\psi < \underline{\psi}$ the result wouldn't be Pareto optimal as it would trigger a decrease in voter utility. This is why $\underline{\psi}(\underline{g})$ would be the lowest voter indifference level in the re-election rule. Finally, it wouldn't be profitable for the incumbent to do so as less public goods imply lower rents, or precisely for any $\psi < \underline{\psi}$, meaning that $g < \underline{g}$ implies rents to be $\underline{r} = 0$. This is stated in Proposition 2:

Proposition 2: *The incumbent party has no desire to choose any level of public goods lower than or equal to* $\underline{g}$ *(and no ratio lower than or equal to* $\underline{\psi}$*) as it has an intention to maximize rents through public good expenditures. The chosen level of public good expenditures will always be:*

$$g > \underline{g}(\underline{r}) \;\; and \;\; \psi > \underline{\psi} \tag{17}$$

Proof: See Appendix A.

Taking into account the findings from Propositions 1 and 2, the optimal level of public good provision and consequently the re-election ratio and rent-extraction can be found.

Proposition 3: *Assume the incumbent party observes* $\beta \geq \beta^*$*. Since the party's only way to maximize rents is through public good expenditures and since the re-election probability depends on staying within the desired set* $\Omega \in \left[\underline{\psi}, \overline{\psi}\right]$*, it will always choose the public's higher level of desired goods,* $\overline{\psi}$*, for the observed high level of* β*. The equilibrium levels of public good expenditures and the ratio* ψ *are then:*

$$g^* = \overline{g} \;\; and \;\; \psi^* = \overline{\psi} \tag{18}$$

Both the level of the ratio and public good production increase voter welfare at a decreasing rate: $\frac{\partial W}{\partial g} > 0,\ \frac{\partial^2 W}{\partial g^2} < 0,\ and\ \frac{\partial W}{\partial \psi} > 0, \frac{\partial^2 W}{\partial \psi^2} < 0$. *The incumbent will converge towards the optimal equilibrium level of* g^* *from which it can extract the optimal amount of rents;* $r^* = \int_{\underline{g}}^{\hat{g}} \overline{r} dF(r|g^*)$.

Proof: See Appendix A.

The incumbent sets an equilibrium level of public good production g^* and hence the ratio ψ^* every period as this enables maximum rents from that period and maximizes the probability he is re-elected for the next period (since the ratio is within the indifference levels set by the voters, $\underline{\psi} \leq \psi \leq \overline{\psi}$). According to the findings of Proposition 3 and the model description in Figure 2, the equilibrium state of the economy can be calculated.

Proposition 4: *If the equilibrium public good policy is* $g^* = \overline{g}$*, and from this the equilibrium ratio is* $\psi^* = \overline{\psi}$ *according to Proposition 3, and under the assumption of the incumbent observing* $\beta \geq \beta^*$*, the equilibrium level of the state of the economy is then always:*

$$\sigma^* = \underline{\sigma}(\psi^*(g^*)) \tag{19}$$

where $\frac{\partial \sigma}{\partial \psi}\frac{\partial \psi}{\partial g} = \frac{\partial \sigma}{\partial g} < 0$ *verifying the assumption made by the model that voters who send negative signals depend on direct government expenditures.*

Proof: See Appendix A.

For every equilibrium condition in which the incumbent chooses a high enough level of public good expenditures the state of the economy is good enough for the voters in order for the incumbent to get re-elected. This verifies the assumption that the level of public goods chosen indirectly influences the state of the economy by altering the ratio ψ upon which the voters create their beliefs. The economy will never produce at optimal full employment

efficiency, since there will always be an incentive for politicians to extract rents and misappropriate resources and thus lower the potential output.

Propositions 2 to 4 were all made under the assumption of the incumbent observing $\beta \geq \beta^*$. Under high enough levels of β the incumbent chooses to continue to play the game in infinite periods. This is why any $\beta \geq \beta^*$ moves the politician on the equilibrium path, where both the principles and the agent play a cooperative strategy making everyone better off. If, however, $\beta < \beta^*$ then the decision of the incumbent is to defect and maximize his current rent extraction. On Figure 2 this will be any level of public goods chosen that is $\hat{g} > \overline{g}$, for which the state of the economy will be lower than $\underline{\sigma}$. Therefore, a decision made by an incumbent observing $\beta < \beta^*$ is an out of equilibrium path where he ends his game with the voters by choosing a defection strategy.

According to these propositions I find a testable argument. Since an incumbent never chooses any g lower than $\underline{g}$, and since its upper re-election boundary is $\overline{g}$, upon observing a high β it decides to keep the ratio lower than or equal to $\overline{\psi}$, or higher than $\overline{\psi}$ upon observing a lower level of β. The higher level of the ratio is the threshold level as according to Proposition 2 a politician will never set the ratio below $\underline{\psi}$, so any ratio lower than $\overline{\psi}$ will automatically respect the re-election rule. The empirical implication is that upon observing a negative (or diminishing) growth rate, the upper boundary of the re-election ratio will be disturbed and the ratio will be too high (since more public goods will be produced by the politician). This will lead to electoral defeat of the incumbent.

5. EMPIRICAL EVIDENCE

In order to test the main predictions of the model I present empirical evidence on the effects of ratio ψ on the probability of re-election. I test the following findings proposed in the paper: (i) an increase of ψ (and consequently an increase of public good expenditures, g)

decreases the probability of re-election after a certain point; and (ii) a decrease of real growth (β) one year before the elections will lead to an increase of the ratio ψ.

5.1. DATA AND EMPIRICAL STRATEGY

A panel data is collected for gubernatorial and state legislature elections (both upper and lower house) for 48 continental U.S. states over the period of 1992 to 2008. The database contains state elections for every two years[12] and 9 elections for both governors and the state legislature. The reason for using data on United States is its availability and the same methodology of data collection and measurements for each state. The analysis becomes even more robust due to the fact that all 48 states are accountable to the same constitutional and legal boundaries and the same democratic order. In order to estimate the effects on electoral results the data is collected for state and local spending of each state observed, along with the variables of economic performance proven to have an effect on re-election of incumbents according to Brendner and Drazen (2008) and Besley and Case (2003). The summary statistics of all variables used in the model are presented in Tables 1 and 2 in Appendix B. The sources and explanations of the data on elections, spending and all other used variables are given in Appendix B under the summary tables.

The empirical strategy estimates the following linear probability model of the effect of changes in ratio ψ on the electoral success of the incumbent:

$$I_{it} = \alpha_i + \gamma_1 \Delta\psi_{it} + \gamma_2 \Delta\psi_{it}^2 + \boldsymbol{\delta X_{it}} + \boldsymbol{\vartheta D_{it}} + \varepsilon_{it} \qquad (20)$$

The dependent variable I_{it} for state i and time t is the dummy indicator that takes the value 1 if the incumbent governor is (re-)elected or if the party stays in majority in the state legislature and the value 0 if the incumbent governor loses the election or the party loses its

[12] Five U.S. states (AL, LA, MA, MI, NB) are only holding legislature elections for the lower house every 4 years, while Nebraska has a unicameral and a non-partisan state legislature. All other states hold lower house legislature elections every two years.

majority. For a Republican governor in power if on the next legislature elections the Republicans lose the senate and/or assembly elections, the value given is 0. If the Republicans win this implies that they retain office, and the value assigned is 1. This assumption is based on the intuition that citizens punish bad behaviour of the in-office party when receiving signals of violating the ratio. Any policies made by the current governor that violate the ratio will result into punishment of the governor's party in election time (every two years). This will signal to the governor that he needs to improve the ratio and cut down rent-extraction in order to remain in office or he will be punished as well as his party.

The explanatory variable is the change in the public spending ratio, $\Delta\psi_{it}$. The change of the ratio is observed from the previous election year to the current election year in order to show if the incumbent is increasing or decreasing rent-extraction since the last voter signal observed. The values γ_1 and γ_2 measure the effects of the ratio on incumbent re-election. The squared value ($\Delta\psi_{it}^2$) indicates the concavity of the voters' preferences over the ratio as presented in Figure 2. The model offers a unique prediction that the ratio should increase up until a certain point, labelled $\overline{\psi}$ above which it wouldn't be optimal for the incumbent to continue with rent-extraction.

The control variables are in line with those used in some empirical political agency models[13]. These can be divided into a vector of economic ($\boldsymbol{X_{it}}$) and demographic ($\boldsymbol{D_{it}}$) differences between states that may affect the likelihood of incumbent re-election. The economic controls include measures of economic performance such as GDP growth in the election year and in one year before the elections, unemployment rate, income taxes, changes in personal income and deficit to GDP ratio. The demographic controls include total state population, share of population under 15 (young) and share of population over 65 (old),

[13] For example in Besley and Case (1995b, 2003), Listz and Sturm (2006), etc.

implying that states with too much old or young people will have higher levels of targeted social spending.

When using gubernatorial and state elections panel data the paper uses state fixed effects (denoted by α_i) to control for unobserved heterogeneity. This way the focus of the estimates is shifted from across state differences to within state differences. The drivers of the potential bias are unobserved characteristics (such as individual and party preferences and politician ability) that tend to differ between states but are assumed to be constant over the short period of time observed. The ratio in each state is driven by different kinds of unobservable bias so by including state fixed effects the cut-off values of the ratio is allowed to differ across states.

The problem arising when using a linear probability model is the inability to get good estimates for extreme values of the explanatory variable. In the dataset used, the explanatory variable (change in public spending ratio) doesn't tend to take extreme values for any state observed. The extreme values reported in Table 1 are for the entire sample, but when observing each state individually the extreme values tend to be within a 10% range. The problem of heteroskedasticity that also tends to be a characteristic of linear probability models is controlled for by using robust standard errors, clustered by state.

5.2. RESULTS

Before the estimation of the ratio effects on re-election it is necessary to estimate whether there is a link between economic growth and ratio ψ, which corresponds to the findings in Proposition 1 and is important for the conclusions in Propositions 3 and 4. If an incumbent party observes deteriorating growth one year before the elections it will base its rent-extraction in the election period on that observation. I estimate the following regression:

$$\Delta\psi_{it} = \alpha_i + \eta_{it}\Delta\beta_{it} + \boldsymbol{\delta X_{it}} + \boldsymbol{\vartheta D_{it}} + \mu_{it} \qquad (21)$$

where $\Delta\psi_{it}$ denotes the ratio change as the dependent variable, while $\Delta\beta_{it}$ is the main explanatory variable denoting change of economic growth of the state i one year before the election and the election year. The emphasis is on the change of the growth parameter since it explains the reaction of incumbents when observing deteriorating growth. This presents the growth shock of the current election period (β_t), upon which politicians anticipate future rents. If economic growth is worse in the election year than one year before the election, the incumbent anticipates lower rents in the next period and increases rent-extraction in this period thus driving up the ratio. The change of the ratio is observed in order to capture the reaction of the politicians on the growth change and anticipated rent-extraction. Parameter η_{it} measures the total effect of economic growth on the ratio. Control variables are the same used in (20), while α_i is the state fixed effect.

The paper tests the growth effect from two angles: the change of the growth rate from one year before the election to the election year, and the growth change as an indicator variable. The reason for the indicator variable is to show the growth effect directly, without taking into consideration its size, just its direction. The growth indicator variable (denoted 'growth change dummy' in Table 3) is assigned to the growth change variable where a positive change (bigger growth in election year than the previous year) is given a value of 1, while a negative change (smaller growth in election year) is given a value of 0. This is consistent with propositions of the model, where both the growth rate in the current year and the growth rate in the previous year are variables that can explain the behaviour of the incumbent party.

The results are presented in Table 3 in Appendix B. Columns (1) to (3) test the relationship between the ratio change and the change of growth. The unobserved heterogeneity is controlled for by including state fixed effects. The relationship between them is negative, as predicted by the model, but it only shows significance (at a 10% level) when

there are no controls included. By including controls, the explanatory variable loses its significance and by that its explanatory power. This could be explained by the size of the growth change which increases the standard error of the explanatory variable. In order to avoid the size effect of growth change, a set of OLS regressions (columns 4 – 6) are done testing the dummy growth change against the ratio change. These show a much better explanatory power and are significant at a 1% level for the first regression (4) and at a 5% level for the final two regressions. The last regression (6), including all control variables (economic and demographic) shows a negative effect of the change in economic growth to the change of the ratio; a decrease of economic growth since the previous year results in an increase of the ratio by 3.75% on average. Other variables that prove to have an effect on the ratio change are the unemployment rate, public expenditure growth, change in income tax and the term limit effect. An increase in unemployment and taxes result in a negative effect on the ratio which is expected. With more people unemployed and with lower incomes, the state has to divert more spending towards social services, driving up the denominator of the ratio and decreasing its value. The positive expenditure effect is also expected, meaning that more spending will drive up the ratio, by increasing public good expenditures. Finally, the term limit effect signals that as the end of the final term for the governor approaches, even though he has an increasing likelihood to extract more rents[14], the party as a whole will try to decrease the ratio in order to remain in power. The conclusion differs for parties than it does for individual politicians, which is what the model implied in its assumptions of modelling an infinitely repeated game. Overall the results in Table 3 support the predictions of the model that economic growth in the previous year influences the party's decision over spending and public good expenditures.

[14] As empirically proven by Alt, de Mesquita and Rose (2011), Besley and Case (1995b), Ferraz and Finan (2011) and Smart and Sturm (2006).

The results of the main prediction of the model – the effect of the ratio on re-election – are presented in Table 4 in Appendix B. Column (1) observes the direct effect of the ratio on re-election using state fixed effects to control for unobserved heterogeneity, while columns (2) to (5) include the term limit effect and other economic and demographic variables. According to the results shown in columns (1) to (5) it can be inferred that over time the increasing levels of the ratio increase the probability of re-election[15] for the incumbent and imply higher public good spending each period. As the population increases, the tax base is larger, revenues are higher and so are the expenditures. The finding goes in line with the prediction in Proposition 2, where the ratio chosen would always be the higher level ratio. However, the negative value of the square parameter, highly significant at a 1% level[16], implies the concavity of voter preferences where too high levels of the ratio lead to a decrease of voter utility that can cause the incumbents to lose office. The inclusion of the term limit variable from column (2) onwards signals a significant negative relationship implying that if the party's governor is reaching a term limit, the likelihood of the party remaining in office will decrease. This is why the party will try to improve its winning probability by decreasing the ratio when observing poor growth, as predicted by the term limit effect in Table 3. Columns (3) to (5) control for all other economic performance variables. In column (3) previous year growth shows a significant effect (5% level), but current period growth doesn't. However, by controlling for other variables, lag growth loses significance in explaining re-election. This goes in line with the findings of Brender and Drazen (2008) where they prove that economic growth in developed countries doesn't have any effect on re-election. Besides growth, the share of population over 65 surprisingly has a negative effect on re-election on average. In the final column (6) the impact of the ratio is removed to show the effects of other economic performance variables on re-election. The final regression is a check of how good

[15] At a 5% significance level for all regressions.
[16] For regressions (2), (4) and (5), while significant at a 5% level in regressions (1) and (3).

the data can explain re-election without the ratio or term limits. It seems that none of the control variables (apart from expenditure growth) have any significant effect on re-election as defined with parties instead of individual candidates. This further shows that the public spending ratio is an important determinant of party competition, decision making and rent-extraction.

Overall the empirical evidence presented tends to give support for the ideas proposed by the model. For decreasing economic growth the incumbents tend to increase the levels of the ratio. For increasing growth the ratio decreases, since the politicians allocate slightly more funds towards public sector wages and social transfers in order to remain in office to extract more expected next period rents. A higher level of the ratio tends to increase re-election probability but at a decreasing rate since a too high ratio implies that the incumbent is not allocating enough funds to satisfy the basic voter preferences. Contrary to the political business cycle theory, politicians won't manipulate economic growth in order to get elected, they will try to manipulate budgetary expenditures and their rent-extraction based on the signals sent from the economic environment. The economic environment acts more as a signal to politicians on rent-extraction than to voters on re-election.

6. CONCLUSION

The main attempt of the paper is to develop a political agency model that observes how political parties can stay in office for long periods, without having to trade-off rent-extraction for staying in power. Political rents are determined endogenously within the public good expenditure function where they increase for higher expenditures on public goods. The paper focused on explaining the moral hazard problem of incumbent politicians, where their rent-extraction is constrained by introducing a voter threshold denoted by the ratio of public goods to other expenditures. Altering the values of the ratio by choosing a level of public good expenditures will influence the state of the economy upon which the voters base their re-

election decisions. The model stresses the importance of a repeated game setting and a stochastic economic growth shock that will determine the incumbent rent-extracting decisions. When observing a positive shock the incumbent will play a unique equilibrium cooperative strategy every time, since it expects more future rents, and will never be voted out of office. For a negative, or a diminishing, economic growth the incumbent will play a defection strategy where it extracts the maximum available amount of rents. For a cooperative strategy the state of the economy ends up within the voter's threshold and they will reward the incumbent with re-election. For a defection strategy the state of the economy is disturbed and the voters apply an immediate punishment for the incumbent.

The empirical evidence presented tends to support the claims stated in the paper using U.S.A. states data. It finds a negative causal relationship between previous year economic growth and the public spending ratio. Higher levels of the ratio increase the probability of re-election up until a certain point when further public good production and higher ratios will yield the incumbent party out of office.

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APPENDIX A

Proof of Proposition 1: Define the cooperative strategy of the voters as (a_r), and the cooperative strategy of an incumbent i as $s_i = (s_{i1}, \dots, s_{in})$, for every $s_i \in \Omega_i$. Any s_i outside the re-election set presents a defective strategy of the incumbent denoted as s_{-i}. The incumbent plays first and if it plays a cooperative strategy (s_i) the best response of the voters is to play cooperate as well (a_r) in every stage. If the voters would deviate for a cooperative strategy of an incumbent (play a_{-r}) they would send a signal to the incumbent to play a deviation strategy in the next period and extract maximum rents. Therefore, this strategy profile isn't optimal for the voters. They will only use a deviating strategy upon observing a deviation from the incumbent. If an incumbent decides to deviate and play s_{-i}, his expected payoff will be $E[U_I^0(\hat{r}|\hat{g})] + E[U_I^C]$. However, there will be no future payoffs for the incumbent, since his action will trigger a defection strategy from the voters. Even though in the first period it is obvious that any defection strategy will yield a higher immediate payoff, $E[U_I^0(\hat{r}|\hat{g})] > E[U_I^0(\overline{r}|\overline{g})]$ which is true since $\hat{r} > \overline{r}$ and $\hat{g} > \overline{g}\ \ \forall\, r, g$, the incumbent will not chose a defection strategy every period as it also values future rent opportunities. Ex ante rents are calculated based on the sum of all future utilities $\beta_t \sum_{t=1}^{n} p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g})]$. By comparing payoffs from cooperative and defective strategies the incumbent will compare utilities of both actions adjusted for future expected utilities.

A strategy profile s^* for a repeated game is a Nash equilibriuim if the strategy s_i is the best response given what the voters will play when observing a defection strategy:

$$s_i^* \in \underset{s_i \in \Omega_i}{\operatorname{argmax}}\ u_i(s_i, s_{-i}^*)$$

For any incumbent i, it must be shown that $u_i(s_i) \geq u_i(s_{-i}^*)$. The incumbent plays a cooperative strategy if and only if the payoff from a cooperative strategy is higher than the payoff from a defection strategy, as stated in equation (14) from the model:

$$E[U_I^0(\overline{r}|\overline{g})] + \beta_t \sum_{t=1}^{n} p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g})] \geq E[U_I^0(\hat{r}|\hat{g})] + E[U_I^C]$$

where ψ_{t-1} concerns the level of the ratio in the previous period with respect to future utilities from $t = 1$ onwards. Solving the upper equation for β_t yields the optimal strategy for the incumbent:

$$\beta_t \sum_{t=1}^{n} p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g})] \geq E[U_I^0(\hat{r}|\hat{g})] + E[U_I^C] - E[U_I^0(\overline{r}|\overline{g})]$$

Playing a cooperative strategy (s_i) is optimal if and only if:

$$\beta_t \geq \frac{E[U_I^0(\hat{r}|\hat{g})] + E[U_I^C] - E[U_I^0(\overline{r}|\overline{g})]}{\sum_{t=1}^{n} p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g})]} = \beta^*$$

An incumbent cannot get a better payoff by deviating for any $\beta_t \geq \beta^*$, meaning that the cooperative strategy solved for β_t is a Nash equilibrium of the tit-for-tat game for the incumbent. The game is a repeated stage game, repeated in every single period. A sub-game perfect equilibrium of a repeated game includes a stage game Nash equilibrium in every sub-game. Since the stage game Nash equilibrium is played every period, or in every sub-game, it is by definition a sub-game perfect Nash equilibrium.■

Proof of Proposition 2 (By contradiction): Any level of public goods $g < \underline{g}$ implies two effects; a non-optimal amount of rents ($\underline{r} = 0$) and no re-election (as the voter re-election rule $\Omega \in \left[\underline{\psi}, \overline{\psi}\right]$ isn't satisfied). Any level of public goods $g = \underline{g}$ implies re-election since the voter re-election rule is under its boundaries but the level of rents is still $\underline{r} = 0$. Incumbent party utility maximization function is according to equation (10) depended on rent-extraction (any $r > \underline{r}$). Rent maximization disables the incumbent from choosing any $g = \underline{g}$ and therefore obtaining no rents. Since it isn't plausible for the incumbent to choose any $g \leq \underline{g}$, the chosen level of public goods always has to be $g > \underline{g}$ which is implied by proposition 2.■

Proof of Proposition 3: From the assumption implied by the model that the level of rents increases with public good expenditures in equations (3) and (4) it is obvious that the higher level of g chosen from the set $\mathcal{P} \in [g_0, \dots g_i \dots, g_n], \forall i \in N$ increases the utility the incumbent gets. The set $\mathcal{P}$ contains increasing levels of g for every level of expenditures chosen, meaning that $g_0 < g_1 < g_2 < \dots < g_n$. According to the definition of the ratio ψ from equation (5) the level of public good chosen determines the level of the ratio, implying that the choice of ψ is also determined within a set containing increasing members; $S \in [\psi_0, \dots, \psi_n]$ where $\psi_0 < \psi_1 < \psi_2 < \dots < \psi_n$, and where n denotes the decision on the size of the ratio, ψ_0 is the lowest level chosen implying no public goods and maximum transfers and wages, while ψ_n is the highest level chosen implying maximum public goods and no transfers or wages.

The incumbent party when playing a cooperative strategy as implied in Proposition 3 ($\beta \geq \beta^*$) chooses any level within the set $\Omega \in \left[\underline{\psi}, \overline{\psi}\right]$, where $\Omega \subseteq S$ (a subset of S). By assumption $\psi_0 < \underline{\psi}$ and $\overline{\psi} < \psi_n$, meaning that the highest level of the ratio in set S is higher than $\overline{\psi}$ and that the lowest level of the ratio in S is lower than $\underline{\psi}$. If $\Omega \subseteq S$ where both sets contain increasing members and if $\psi_0 < \underline{\psi}$ and $\overline{\psi} < \psi_n$, then by choosing the highest ψ within the re-election rule set Ω in order to maximize its utility, the incumbent will always chose the level $\psi^* = \overline{\psi}$. The decision of optimal $g^* = \overline{g}$ follows the same conclusion.■

Proof of Proposition 4: From the proof of Proposition 3 and according to the assumptions of the model presented in Figure 2, it follows that for any $\psi^* = \overline{\psi}$ and $g^* = \overline{g}$ and according to the assumption of a negative relationship between g and σ, it must be that the state of the economy is $\underline{\sigma}$. The state of the economy $\underline{\sigma}$ is optimal $\sigma^* = \underline{\sigma}(\psi^*(g^*))$, for any ψ^* and g^* chosen that satisfies Proposition 3. ■

APPENDIX B

Table 1. Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Re-election	432	0.6041667	0.4895959	0	1
Ratio	432	0.1630327	0.0399779	0.0744813	0.3138859
Change of ratio	384	0.0006781	0.1353455	-0.3617157	0.3969931
Change^2	384	0.0182712	0.0253624	1.67E-08	0.1576035
Term limit	432	0.2175926	0.4130872	0	1
GDP	816	204000000	248000000	12500000	1910000000
GDP growth	432	0.0566279	0.0292396	-0.0389991	0.1708972
Lag GDP growth	432	0.0554604	0.0241432	-0.0536531	0.1399923
Change in growth	389	0.0012966	0.0306592	-0.1160793	0.1104976
Dummy growth change	389	0.4987147	0.5006423	0	1
Budget deficit	720	2178828	6851939	-61400000	83500000
Deficit to GDP	432	0.0101926	0.0199418	-0.0412	0.1928
Change in deficit/GDP	384	-0.034349	9.585826	-95.607	115.729
Revenue growth	389	0.0667248	0.1385824	-0.3817504	0.5898104
Expenditures growth	384	0.0748308	0.0482547	-0.0206968	0.3016281
Income tax rate	816	0.0941341	0.0117671	0.0602	0.1277
Income tax change	384	-0.0026604	0.03121	-0.0934	0.0921
Personal income	816	30609.88	8492.098	14749.27	63889.87
Personal income change	384	0.0957109	0.0434129	-0.033	0.2809
Unemployment rate	816	0.0497623	0.0132065	0.0227	0.1122
Unemployment change	384	-0.0039784	0.2420115	-0.4384	1.027
Population change	389	0.0133309	0.0139159	-0.007776	0.1044776
Share of under 17	384	0.2519826	0.0196887	0.2077	0.3522
Share over 65	384	0.131436	0.068148	0.085	1.42534

Sources and description of data: Data on public good spending, budget revenues and expenditures decomposed into the data on capital outlays and current expenditures was taken from the US Census Bureau (2011) for the entire period observed.

The public spending ratio was calculated by dividing capital outlay expenditures for each state (denoting public good expenditures) by all other current expenditures (which accounted total social transfers, public sector wages and all other expenditures). The capital outlay is defined as: "Direct expenditure for contract or force account construction of buildings, grounds, and other improvements, and purchase of equipment, land, and existing structures. Includes amounts for additions, replacements, and major alterations to fixed works and structures. However, expenditure for repairs to such works and structures is classified as current operation expenditure." (US Census Bureau, 2011). Current expenditure "include direct expenditure for compensation of own officers and employees and for supplies, materials, and contractual services except amounts for capital outlay, assistance and subsidies, interest on debt, and insurance benefits and payments". (US Census Bureau, 2011).

Data on GDP and unemployment is taken from the US Bureau of Economic analysis (2011). Data on income taxes and personal income was taken from the Tax Foundation (2011). Data on population was taken from the Statistical Abstract of the United States published by the Census Bureau (2011).

The dummy variables on re-election were assigned as specified under equation (20), and according to the data from Table 2.

Table 2: Election summary data

		Legislature elections	
Elections/ Parties	Governor	State Senate (Upper)	State House (Lower)
Total Democrats	96	218	242
Total Republicans	115	205	181
Total Independent	3	-	-
Total elections	214	423	423

All 48 states included, over the period from 1992 until 2008. Total Democrats and total Republicans includes every time when a Democrat or Republican governor or party would either win office or hold office.
Source and description of data: Election data on both gubernatorial and state legislature election (upper and lower house) was taken from the Statistical Abstract of the United States from the years 1992 - 2008 published by the Census Bureau (2011).
Notes on electoral results: Nebraska state legislature is unicameral and non-partisan, so only gubernatorial changes are observed in this state. In California in 2003 gubernatorial recall elections are accounted as the 2002 elections where the democrat in power at the time, Gary Davis, instead of ensuring his second term was recalled a year later. On the new elections the Republican candidate Arnold Schwarzenegger won. The dummy value given for 2002 is 0, since it is accounted as an incumbent defeat. Gubernatorial and state legislature elections are all being held in even years except for Kentucky, Louisiana, Mississippi, New Jersey and Virginia which are held in odd years. The previous period growth effects are all taken into account for these 5 states.

Table 3. Public spending ratio and economic growth

	OLS Regressions					
Dependent variable: Ratio change ($\Delta\psi$)	(1)	(2)	(3)	(4)	(5)	(6)
GDP growth change	- 0.4433*	- 0.3098	- 0.2944			
	(*0.2401*)	(*0.2573*)	(*0.2614*)			
Growth change dummy				- 0.0409 ***	- 0.0363 **	- 0.0375 **
				(*0.0149*)	(*0.0158*)	(*0.0159*)
Term limit		- 0.0279	- 0.0278		- 0.0291	- 0.0295 *
		(*0.0179*)	(*0.0173*)		(*0.0178*)	(*0.0172*)
Revenue growth		- 0.0948 *	- 0.1558 *		- 0.0774	- 0.1325
		(*0.0501*)	(*0.0824*)		(*0.049*)	(*0.0759*)
Expenditure growth		0.1314	0.3235 *		0.1525	0.3479 *
		(*0.1398*)	(*0.1824*)		(*0.1429*)	(*0.1864*)
Deficit to GDP			0.3903			0.3561
			(*0.6841*)			(*0.6872*)
Unemployment rate			- 3.499 ***			- 3.442 ***
			(*0.904*)			(*0.8979*)
Income tax change			- 0.4571*			- 0.4875 *
			(*0.2655*)			(*0.2628*)
Share under 17			0.4091			0.5202
			(*0.7554*)			(*0.7464*)
Share over 65			0.0142			0.0302
			(*0.0313*)			(*0.0324*)
Fixed Effects:	yes	yes	yes	yes	Yes	yes
F-test:	3.41	2.76	4.84	7.48	3.73	5.33
Observations	384	384	384	384	384	384
R^2	0.0316	0.0462	0.1246	0.0436	0.057	0.1363

Notes: See notes to Table 1 for information on sample variables. For years 2001 and 2003 there was no data available for state revenues and expenditures, making the panel unbalanced. All regressions are OLS fixed effects regressions that include a constant, the change in public spending ratio and the controls as specified in equation (21). The change in public spending ratio is the dependent variable, while the main explanatory variable is the change in economic growth from one year before the elections and the election year. Standard errors are shown in parentheses and are robust to heteroskedasiticy and clustered by state. *** denotes significance at 1%, ** at 5% and * at 10%.

Table 4. Re-election and the public spending ratio

	OLS Regressions					
Dependent variable: Re-election	(1)	(2)	(3)	(4)	(5)	(6)
Ratio change	0.4433 **	0.3916 **	0.3552 **	0.4152**	0.4395 **	
	(*0.1865*)	(*0.1839*)	(*0.1851*)	(*0.2415*)	(*0.1858*)	
Ratio change squared	- 2.9287 **	- 2.9723 ***	- 2.843 **	- 3.170 ***	- 3.127 ***	
	(*1.1423*)	(*1.0902*)	(*1.108*)	(*1.097*)	(*1.1009*)	
Term limit		- 0.2679 ***	- 0.2674 ***	- 0.2453 ***	- 0.2449 ***	
		(*0.0593*)	(*0.0601*)	(*0.0614*)	(*0.062*)	
GDP growth (election year)			- 0.4536	- 0.7983	- 0.6462	- 0.8096
			(*0.8936*)	(*1.0281*)	(*1.0607*)	(*1.1105*)
Lag growth (previous year)			2.268 **	1.3807	1.599	1.5328
			(*1.1691*)	(*1.3857*)	(*1.378*)	(*1.4269*)
Expenditure growth				-1.013	-1.031	- 1.1208 *
				(*0.6520*)	(*0.6562*)	(*0. 6661*)
Deficit to GDP change				0.0009	0.0007	0.0010
				(*0.0027*)	(*0.0029*)	(0.*0027*)
Unemployment change				- 0.0451	- 0.0931	0.00249
				(*0.1555*)	(*0.1631*)	(0.*1749*)
Income tax change				0.9455	0.4564	0.1586
				(*0.7626*)	(*0.8206*)	(*0.8462*)
Personal income change				0.4329	0.3535	1.020
				(*0.8861*)	(*0.9015*)	(0.*9576*)
Population change					- 4.1083	- 3.3905
					(*2.741*)	(*2.7828*)
Share under 17					- 1.5607	- 3.0688
					(*2.511*)	(*2.6467*)
Share over 65					- 0.6614 ***	- 0. 62044 ***
					(*0.0976*)	(*0.1302*)
Fixed Effects:	yes	yes	yes	yes	yes	yes
F-test:	6.10	12.76	8.65	5.11	7.25	3.81
Observations	384	384	384	384	384	384
R^2	0.1868	0.2361	0.2441	0.2597	0.2731	0.2022

Notes: See notes to Table 1 for information on sample variables. All regressions are OLS regressions that include a constant, the re-election dummy variable and the controls as specified in equation (20). All regressions include state fixed effects. Re-election dummy variable is the dependent variable, while the main explanatory variable is the change in public spending ratio and its squared value. Standard errors are shown in parentheses and are robust to heteroskedasiticy and clustered by state. *** denotes significance at 1%, ** at 5% and * at 10%.