Persistent electoral success with endogenous rents

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Persistent Electoral Success with Endogenous Rents: Eliminating the trade-off between rent-extraction and re-election

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Abstract

The paper examines how is it possible for an incumbent political party to stay in power for long periods of time without having to trade-off rents for holding office. It presents a new way of explaining and measuring the real effects of rent-extraction on political re-election in local government. It models local government due to the different and exact way rent-extraction can be measured there; through pork-barrel spending on public goods upon which a political party is able to extract rents. Setting rents as an endogenous variable permits the model to evaluate their effect on political re-election and preservation of power. The paper alters certain typical assumptions of other political agency models in order to test its effects in a more realistic scenario of politics.

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. 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, re-election, public good expenditures, local government, political parties, endogenous rents*

JEL Classifications: D72, H72, C71, C33

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1 Introduction

The principal-agent relationship in politics is concerned with an inability of voters (principals) to fully control what the politicians (agents) do. Without full power of accountability and transparency, politicians who hold an informational advantage can misuse their political power in order to obtain an excess amount of budgetary funds, defined as political rents gained from pursuing office.

According to Tullock (1967) and Krueger (1974), rents are defined as any form of private benefits acquired from the political arena. This includes 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 recognizes rents in a similar but somewhat different fashion. Rents take the form of excess payments extracted through public good expenditures on various pork-barrel projects and are obtained by an incumbent politician. The rent-extraction process is most easily explained through corruption and misappropriation of budget funds for private benefits. For example while building a road or a bridge a politician can conceal his rent-extraction by presenting one price to the public while charging a different (lower) price to the contractor, thus taking the difference for himself. Ferraz and Finan (2011) recognize such corruptive activities as frauds in public procurement, diversion of public funds (expenditures without proof of purchase) and over-invoicing (buying goods above the market price). These types of actions are more easily and frequently done on a local level than on a national level which is why the paper focuses on local politics.

The crucial effort of engaging into corruptive activities is to 'hide' the rent-extracting process within the public good creation function, thus making rents fully endogenous. The paper follows insights from Mauro (1998) that different types of government expenditures provide different opportunities for corruption, where high-technology goods provided by specialized oligopolies (defence spending) or large infrastructure projects could be more likely for collecting bribes and rents than, for example, education spending. In general it is much harder to extract rents from individualized social transfers than from public investments. This is why the paper uses public good expenditures as a proxy for rents.

In addition, a variety of constitutional boundaries (budgetary transparency) and media exposure prevent the politicians from openly determining rents within the bud-

get constraint, as is the general assumption of political agency models (Brennan and Buchanan, 1980; Besley, 2006; Besley and Smart, 2007; Persson and Tabellini, 2000). The problem with the oversimplified assumptions of such models are quasi-linear preferences which make the public good function independent of rents, implying that the preferred level of public goods is an increasing function of its cost shock.

The models of political agency as summarized in Besley (2006) describe a general setting in which a rational agent's maximization problem is to capture political rents outside the market in the political arena where he controls budgetary expenditures. The principals are unable to observe the budgetary allocation process directly, creating the problem of electoral accountability of politicians (the monitoring problem). Uncertainty and asymmetric information give further incentives to politicians to misrepresent themselves and pursue their own interests. Due to such behaviour of agents there exists a trade-off between voter utility (policies appealing to voters) and rent-extraction (policies appealing to politicians in power) (as shown in Brennan and Buchanan, 1980; Besley, 2006; Persson and Tabellini, 2000). The central issue is whether or not electoral competition and the discipline effect of the voters will induce the politicians to announce voter optimal policies or rent-maximizing policies.

The models are often characterized by a two period setting in which a politician's term ends in the second period (the term limit assumption in Besley and Case 1995a, 1995b; Alt, de Mesquita and Rose 2011; Ferraz and Finan, 2011). In order to stay in office and reach the second period the incumbent politician should limit his rent-extraction in $t = 1$, since retrospective voters will reward congruent behaviour. The re-election incentive should improve the discipline of politicians. However, in the second and final period ($t = 2$), a moral hazard problem arises since bad politicians are free to divert the entire budget towards their private means. In classical moral hazard models (Barro, 1973; Ferejohn 1986) the homogenous voter observes the action of the politician but with a noise. The politician observes this noise before making his action (or level of effort), which depends on the re-election rule chosen by the voters to limit the incumbent's incentives for rent-extraction. The focus of these models is on the discipline effect. In expanding the moral hazard problem, newer models introduced adverse selection (Austen-Smith and Banks, 1989; Banks and Sundaram, 1993; Besley and Case, 1995a; Rogoff, 1990; Persson and Tabellini, 2000; Besley and Smart, 2007) concerning how good politicians should distinguish themselves from bad ones, where the first period behaviour

of bad politicians implies "mimicking" the behaviour of good politicians and sacrificing first period rents in order to remain in office and expropriate the entire budget for rents in $t = 2$. The probability of a politician doing so depends on his time preference for money, i.e. the discount factor. So apart from the discipline effect the selection effect is added where candidate types determine the competency of politicians in providing public goods, or in determining whether or not they are likely to extract more rents. The candidate's choice of policy will determine his type and send a signal to the voters on re-election.

This paper, modelled in a public choice tradition, is concerned only with the discipline effect and the moral hazard problem as it makes three assumptions that alter the political environment of general political agency models. The first one is a single candidate type, which removes the selection problem, the second is modelling party politics in local elections (to eliminate the term limit effect and introduce reputation), and the third one are endogenous rents, determined within the public good creation function, presenting the proportion of budgetary funds allocated towards pork-barrel spending and white elephant projects.

It builds on the findings of Ferejohn (1986) and Persson, Roland and Tabelini (1997), where a rent-maximizing agent will apply a certain effort to satisfy the voters and derive an endogenous utility (rent) from holding office. The dynamic setting emphasizes more clearly the source of power of the politician as his ability to choose a preferred policy, while the voters need to adjust their voting rule so as to leave the politician enough rents. In many of these assumptions if the level of the shock isn't big enough, neither will the politician's effort and he will defect towards diverting the entire budget towards rents. Due to a number of constitutional boundaries this isn't plausible, since he can only divert a small part of the budget for personal gain.

Political agency models tend to get caught up in modelling the term limit assumption and disregard the relative persistency of certain politicians in office, which is indeed a factual phenomenon (where certain parties tend to stay in office for 20 to 30 years, particularly on a local level). The paper attempts to fill this gap in the literature, on the line of the theoretical assumptions made in de Mesquita et al (2005), or Helland and Sorensen (2012). The Helland and Sorensen (2012) paper is particularly useful in that perspective as it offers genuine insights on persistent rent extraction, although it fails to fully endogenize rents.

The model predicts that during times of negative growth shocks the incumbent will increase the amount of pork-barrel projects knowing he is facing less rents in future periods, while during times of positive shocks he will reduce current rent-extraction as he anticipates better future rent-extracting opportunities. A positive shock changes a politician's time preferences and makes him more patient, and therefore rewards him with re-election. After defining the political environment and the model's main assumptions, the paper specifies voter and political strategies and decision rules, upon which the equilibrium levels of public good production and the state of the economy are determined.

2 Political environment

The paper challenges some general assumptions of most political agency models. The first assumption is that all politicians are rent-seekers implying that the voters don't face adverse selection but only the moral hazard, discipline problem. In the public choice tradition, politicians seek to maximize their private interest from holding office by implementing their preferred policies. While providing the general public goods for the satisfaction of voter preferences and thus generate favourable public outcomes, they have a strong incentive to divert some of the budgetary allocation towards pork-barrel spending from which they aim to extract rents. Even though some of these policies yield a negative welfare effect, they are rational for an individualist self-interested point of view. This finding goes back all the way to Buchanan and Tullock's (1962) or Brennan and Buchanan's (1980) definition of politicians as self-interested utility maximizers or the more recent de Mesquita et al (2005) who assume that

> "...all political leaders, regardless of their institutional setting, have a common utility function that emphasizes first holding onto (or gaining) office and second maximizing their personal income while in office."(de Mesquita et al, 2005, pp.21).

Political selection models such as Besley (2004) or Casselli and Morrelli (2004) imply a similar finding where the selection of politicians is adverse and always produces bad politicians. The assumption is that opportunity costs of working in the 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 pre-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 assumption is that the paper observes political parties rather than individual politicians. This assumption goes in line with the work of Snyder and Ting (2002) or Levy (2004) where political parties are shown to be better in aggregating within-party preferences over optimal policies and appealing to voters in a multidimensional policy space. The multidimensional 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 power with a new candidate. Parties care of their future re-election probabilities and have mechanisms to discipline "lame duck" individual office-holders who have an incentive to ignore the party's long run credibility.

When using political parties instead of candidates the paper moves beyond the two period setting and avoids the last period effect, modelling an infinitely repeated game such as in Ferejohn (1986) or Banks and Sundaram (1993). 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. It can hold office persistently while only changing its politicians.

Existence of parties eliminates the emphasis on term limits. 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 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. The paper overlooks the aspects of political competition between the in-office and the opposition party in order to only focus on the dynamics of electoral control.

The third assumption is the aforementioned approximation of rents within the public good expenditures function. As opposed to the Leviathan scenario in Brennan and Buchanan (1980) where all budget revenues can end up in rents, this paper takes into consideration other constitutional budgetary obligations, namely social transfers and public sector wages, in addition to budget transparency which significantly diminishes scope for the misuse of public funds. In addition endogenous rents mean that they cannot be extracted directly from tax revenues; instead they must be hidden within budgetary expenditures that provide the easiest rent-extracting opportunities (such as public investments on infrastructure projects or defence spending, as assumed by Mauro, 1998).

3 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). The paper broadens the classical budget constraint often given in political agency models such as in Besley and Smart (2007), Persson and Tabellini (2000) or Brennan and Buchanan (1980), by including social transfers, public sector wages, and by removing rents directly from the budget constraint and inserting them within the public good creation function.

An incumbent party faces the following budget constraint in each period:

$$\tau \overline{y} = g\left(\theta', r\right) + T + V \tag{1}$$

Where $T = \sum_{i=1}^{n} f^i$ are aggregate transfers to the public (social and unemployment benefits, pensions etc.) while $V = \sum_{i=1}^{n} w^i$ are aggregate public sector wage expenditures of the government. The term on the left is total revenue (tax rate τ, times aggregate income). Taxation is proportional to the level of income. There is a balanced budget every time, i.e. there are no budget deficits or public debts. The first term on the right $g = \sum_{i=1}^{n} g_i$ are total public good expenditures which depend on the realization of rents (r) and actual costs of all public goods (θ'), which are stochastic, distributed on $\theta' \sim u\left[0, c\right]$, and known only to incumbent politicians. A single public good g_i expenditure function is defined as:

$$g_i\left(\theta_i', r_i\right) = \theta_i G_i = \left(\theta_i' + r_i\right) G_i \tag{2}$$

$$\text{where } r_i = \theta_i - \theta_i' = \lambda g_i \tag{3}$$

Expenditure for a single public good equals total costs of the public good as presented to the public (θ_i) times the total quantity of the good ($G_i = 1$). 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. r_i are rents extracted from providing a single public good and present the difference between total costs and actual costs. They can't be set directly in the budget function (1) due to the assumption of budget transparency; rather, they must be concealed and extracted indirectly within the public good expenditure function. The way rents are defined in (3) implies that an incumbent party assigns a fixed weight (λ) from every single public good it produces to rent-extraction[1]. The factor $\lambda \in [0, 1]$ can be interpreted as political preferences towards budget misappropriation and pork-barrel spending[2]. It is an endogenous, random, cultural shock, drawn by nature specifically for every politician. The political and institutional environment in which the incumbent operates along with its intrinsic preferences towards rents, will determine the total amount of pork-barrel projects (similar to de Mesquita et al, 2005).

The relative size of rents will according to (2) and (3) depend on total quantity of public goods produced, and it can also be inferred from (3) that rents depend on how much a single public good actually costs; $r_i = \frac{\lambda}{1-\lambda}\theta_i'$, for $0 \leq \lambda < 1/2$. Since λ is always kept fixed for a single agent, 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, while total rent-extraction will depend on

[1]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. So if $\lambda = 0,2$ then 20% of spending on a single public good is allocated towards rents.

[2]In stable democracies λ is likely to be a small number, as political preferences towards corruption and budget misappropriation are rather small, but not nonexistent.

total public good expenditures and the preferences towards corruption.

3.1 Rents

After making the decision on public good expenditures an incumbent will get a certain payoff, defined as rents $r \in [0, \widehat{r}]$, which can only be diverted from the pork-barrel projects it creates. This implies that rents and public goods are characterised by a quasi-linear preference relation, where rent-extraction begins after a certain point, once the initially desired level of public goods and services are provided. Accordingly, equation (2) can be rewritten into an aggregate public good expenditures function:

$$g = \sum_{i=1}^{n} g_i = (1-\lambda) \sum_{j=1}^{m} G_j + \lambda \; H\left(\theta', r\right) \tag{4}$$
$$\text{for all } i \in N, \text{and for all } j \in M, \text{where } i \neq j$$

With:

$$\frac{\partial g}{\partial \theta'} < 0, \quad \frac{\partial g}{\partial r} > 0, \quad \frac{\partial g}{\partial \lambda} > 0 \tag{5}$$

Where G_j is some initially desired and provided amount of public goods (for which the total amount of expenditures is $\underline{g}$), while $H(\cdot)$ is a quasi-convex function depicting the total amount of pork-barrel spending (upon which rents are defined). Public good expenditures are an increasing function of total rent-extraction and the propensity to extract rents (which differs from one party to the other), and a decreasing function of actual costs. It's easy to see from (4) that higher spending allocated towards public good expenditures (as a budget item) is the only way to increase rent-extraction via more pork-barrel spending, with λ kept fixed. The size of pork-barrel spending within the public good expenditures function depends on the given value of λ[3].

Rents are drawn independently from a cumulative distribution function $F(r\,|g)$. They are defined between the minimum required amount of public good spending (denoted as $\underline{g}$) which imply zero pork-barrel spending and hence zero rents ($\underline{r} = 0$) and the maximum possible amount of public good spending, where the entire budget is diverted towards public goods ($\widehat{g} = \tau \overline{y}$) and a certain fixed number of pork barrel projects, for which rents are $r = \widehat{r}$:

[3]Similar to the single public good expenditures function (2), a value of $\lambda = 0,2$ would imply 20% of public good spending going towards pork-barrel projects and 80% towards voter preferred public goods.

$$W(r) = \int_{\underline{g}}^{\widehat{g}} r dF(r|\, g, \lambda) \tag{6}$$

3.2 Decision parameter

The incumbent party will base its budgetary allocation decisions as well as its rent-extraction upon observing a random stochastic shock β, uniformly distributed on $\beta \sim u[-\epsilon, \epsilon]$. Some political agency papers use a random noise variable that depicts either a productivity parameter transferring resources into public goods (Persson et al, 1997), a public good cost shock (Persson and Tabelini, 2000, and Besley and Smart, 2007) or any exogenous occurrence that will determine the effort of a politician (Ferejohn, 1986). This paper uses a similar random shock parameter that will determine the next period level of taxes and public goods. It can most simply be described as an economic growth shock that affects the next period budget of the incumbent. For example, a high shock will signal a higher future level of tax revenues ($\tau\bar{y}$) and consequently higher expected rent-extraction. The politicians observe β with certainty each period before they make their decision, while the voters observe β with a probability $q \in [0, 1]$.

3.3 Re-election threshold and the state of the economy

In each period the incumbent party chooses an initial policy through which it collects a certain amount of taxes and subsequently allocates a certain amount of budgetary funds towards public goods, wages and transfers. Even though it seeks to maximize its rents by setting higher taxes and diverting more spending to pork-barrel projects, it also has a desire to remain in office and thus needs to keep its constitutional commitment to public sector wages and social transfers[4]. Holding office is only attractive because of rent-extraction opportunities.

Voters expect the incumbent party to determine some intrinsically optimal level of spending and taxes, $\psi^v(g^v, \tau^v)$, which is different from the optimal level desired by politicians[5]. An incumbent party will always have an incentive to determine a combination of

[4]We can think of the commitment towards public sector wages and social transfers as one possible constraint to rent-extraction and diversion of funds towards pork-barrel spending.

[5]Some groups value certain amount of spending more than others (social transfers recipients and public sector workers), and some groups will favor more public goods, but all to a certain extent above which further spending and further taxes would damage the electoral chances of the incumbent party. Persson et al (1997) paper recognizes the conflicting interests over the composition of government spending between voters and the politicians. Their choice variable encapsulates this assumption.

taxes and spending higher than the public optimum (in order to satisfy various partial interests necessary for its re-election[6]):

$$\widehat{\psi}(\widehat{g},\widehat{\tau}) > \psi^{v}(g^{v},\tau^{v}) \tag{7}$$

Apart from satisfying partial interests, the utility functions of the politicians include rents, which is why their desired optimal levels of spending and taxes must be higher than the voters'. The intuition of the paper is that because of hidden rents politicians will aim to secure higher public good spending (via more pork-barrel projects), and hence levy higher taxes, thus increasing the overall size of government. The empirical evidence on the increasing size of governments in the past 50 years (see Maddison, 2001, or Tanzi and Schuknecht, 2000) verifies this intuition, although the paper disregards the possible effect of intrinsic voter preferences towards more redistribution, a larger safety net, or other factors recognized by Higgs (1987), and focuses solely on rent-extraction as a partial explanation for growth in size of government. A new line of research would be needed to establish this relationship with certainty. By trying to find a proxy for rents and tie them with re-election probabilities, this paper attempts to show that rents in form of political income from holding office are the source of political self-interest and motivation for increased public spending (as implied by Buchanan, 1975; but also in Acemoglu and Verdier, 2000, or Goel and Nelson, 1998, even though they focus primarily on corruption).

Due to the existence of uncertainty and the consequential problem of political accountability, the voters cannot prevent the incumbents from determining higher than optimal taxes and spending, but can punish them ex-post. The voters will punish any behaviour of incumbents that set the level of taxes and spending above some control level $\overline{\psi}(\overline{g},\overline{\tau})$, which is higher (and thus worse off) than the voter optimal level, but still lower than the maximum level desired by the incumbent party:

$$\widehat{\psi}(\widehat{g},\widehat{\tau}) > \overline{\psi}(\overline{g},\overline{\tau}) > \psi^{v}(g^{v},\tau^{v}) \tag{8}$$

The control level of $\overline{\psi}$, represents the voter re-election threshold that measures political effort and the consequential satisfaction of voter utilities, and above which the

[6]The paper doesn't model transfers to special interests, but works on the findings of other political agency papers which offer intuitive results where, because of special interests, the level of spending by politicians will always be higher than the optimum desired by the voters (see Coate and Morris, 1995).

incumbent party will be voted out of office. According to Ferejohn (1986) this threshold is a level of the politician's effort determined by voters, which shouldn't be set too high to encourage rent-extraction, nor too low to encourage shirking. In Persson et al (1997) they use abstaining from effort as a category of measuring utility, upon which the politician can divert resources to private use. Instead of observing size of effort, this paper focuses on the deviation from a set of randomly determined boundaries of public policy which can trigger voter dissatisfaction. It uses the stochastic growth shock as a decision threshold for politicians and the public policy parameter as a decision threshold for the voters. The role of voting is to achieve a higher level of discipline and hence lower rent-extraction.

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

$$p_I = \begin{cases} 1, & \text{if } \psi^v \leq \psi \leq \overline{\psi}, \\ 0, & \text{if } \psi > \overline{\psi}. \end{cases} \tag{9}$$

Office oriented parties will avoid losing the election, and will aim to respect the voter re-election threshold for a sufficiently favourable shock β, even though this will generate for them a lower than maximum amount of rents. The intuition is that in order to get re-elected politicians need to sacrifice some of their own utility from higher rents, by committing to a credible (constitutionally bound) promise of ensuring wages for public sector workers as well as transfers to various social groups. Any level of spending and taxes that will break up the delicate balance of budgetary expenditures will result in loosing voter support from those affected. For example if public sector wages would cease to grow at their predetermined level, this would result in discontent from public sector workers, 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 the government's in-office performance defines the state of the economy (σ). The state of the economy doesn't necessary imply economic performance, but rather signals sent in-between voters. The voters decide on the re-election of the politician based on the realization of the state of the economy shock, where $\sigma \in \left\{\sigma_0(\psi_0), \ldots, \sigma_n(\widehat{\psi}_n)\right\}$.

3.4 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.

1. Incumbent party observes β_{t-1} (previous period shock) 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'. Party preferences towards rents, λ are know to the incumbents.

2. Upon observing the shocks with certainty, during its term in office the incumbent continuously chooses total levels of public good expenditures g and taxes τ, and consequently ψ. 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, and update their threshold accordingly.

3. After the first half of the term spent in office[7] the incumbent party can observe current period shock, β_t upon which it anticipates expected future rents (from $t = 1$ onwards) and upon which it bases the final decision on public good expenditures and rent-extraction in $t = 0$.

4. The final chosen level of ψ conditions a certain state of the economy, σ. Voters observe the state of the economy (σ) and decide whether or not to support the incumbent. The voters are unable to prevent rent-extraction, but can punish the incumbent ex-post, implying that the re-election threshold is ex-post optimal. The incumbent party at the end of the period gathers all the rents they have extracted during which makes their rent-extraction complete for the current period.

5. Elections. A poor state of the economy infers an incumbent who extracted too much rents 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 $t \in \{1, \ldots, \infty\}$. Each period the incumbent faces the same decisions and pre-observes the same parameters before making these decisions.

[7] 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 second part of the term, similar to the political business cycle theory. β_t is the growth shock one year before the elections (for a two year length of a term).

The voters also play strategies based on the levels of the re-election threshold, which is updated every period according to their preferences and the shock β.

4 Voter and political utilities

4.1 Voter utility

Voters make decisions based on signals of political behaviour and actions of politicians. They evaluate whether a party deserves to remain in office depending on how it sets taxes and distributes public spending, and how this can shape the state of the economy and its in-office 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 is one median, undecided voter group[8] consistent of voters homogenous in their preferences over the re-election threshold. These voters receive the signal of political performance through the state of the economy parameter.

Due to their rational ignorance, voters monitor in-office performance of incumbents rather than a direct policy (as in Ferejohn, 1986, or Persson et al, 1997). Performance is based on the voter decision rule and the manifestation of the rule on their decision utility. The voter expected utility function is dependent on the realization of the state of the economy shock (σ) and the political decisions on taxes and spending[9]:

$$E \sum_{t=0}^{\infty} \delta^t u\left(\sigma_t | \psi_t\right) \tag{10}$$

where $0 < \delta < 1$ is the discount factor, while $u\left(\sigma_t | \psi_t\right)$ is a concave utility function monotonically increasing in σ_t. The utility function is twice continuously differentiable with partial derivatives denoted as u_σ and u_ψ, strictly increasing in σ, strictly decreasing in ψ, and jointly concave in both σ and ψ. The voters' perception on the state of the economy, and the signal of political performance they receive is defined as:

$$\sigma_t = \mu[1 - f\left(\psi_t\right)]^2 + q\beta_t \tag{11}$$

[8] We can easily assume a large number of groups, however in each case the median, undecided group will be crucial for political re-election. The median group is the one with the highest density and most swing voters (as in Persson and Tabellini, 2000).

[9] Voter utility is observed only from the effect of political performance on the voters.

Where β_t is the election year shock while μ is a nonnegative constant random variable depicting the institutional environment which cannot be affected by the politician in the short run, but only in the long run. It will determine the slope of the state of the economy curve. It is obvious from (11) that the incumbent choice variable ψ_t will determine the voter perception of the state of the economy, and hence his re-election choice. If β is observable with a positive probability ($q = 1$), then voters will update their preferences over the re-election threshold. If $\sigma = f(\psi(\beta))$, where $\frac{\partial \sigma}{\partial \beta} > 0$ and $\frac{\partial \psi}{\partial \beta} < 0$, then positive shocks will imply the voters desiring lower taxes and spending, while negative shocks will imply the opposite[10]. If $q = 0$, then the preferences on the threshold don't get updated.

An easier way to look at the threshold is to determine the desired optimal values of ψ that satisfy an aggregate voter utility function within a set of plausible outcomes in which the upper boundary of the set would be the control level $\overline{\psi}$. The re-election threshold would be defined within a positive, increasing set of different choices on budgetary redistribution $\Omega \in \left[\underline{\psi}, \overline{\psi}\right]$. The voter optimal provision of taxes and spending, $\psi^v(g^v, \tau^v)$ is necessarily equal to $\underline{\psi}$[11]. Any level of public good provision within these boundaries would send a signal of positive in-office performance and consequentially a good state of the economy, $\sigma \in \left\{\overline{\sigma}\left(\underline{\psi}\right), \underline{\sigma}\left(\overline{\psi}\right)\right\}$.

From the point of view of homogenous voters, they will gain in utility for all $\psi \in \Omega$. Hence their expected utility can be re-written as:

$$E(U) = \int_{\underline{\psi}}^{\overline{\psi}} u dF(\psi) + \int_{\overline{\psi}}^{\widehat{\psi}} 0 \cdot dF(\psi). \tag{12}$$

4.2 Incumbent utility and strategy

The incumbent party is a rational utility maximizer seeking to win elections in every period in order to have an option of extracting rents. Holding office is only attractive because of rent-extracting opportunities. In order to stay in power it needs to choose a combination of $\psi \in \Omega$, according to the re-election constraints in (7) and (8). It comprises its utility by adding up expected utilities from future expected rents.

[10] The intuition is that in times of crises (which would be an example of a negative shock) the majority of the voters expect more intervention from the government, as shown by Higgs (1987) on the US case.

[11] According to (8) $\widehat{\psi}(\widehat{g}, \widehat{\tau}) > \overline{\psi}(\overline{g}, \overline{\tau}) > \psi^v(g^v, \tau^v)$, the politicians always have an incentive to set taxes and spending higher than the voter optimal distribution. Even if they behave completely congruent, they would aim to satisfy the ψ^v threshold but never go below it, as this would jeopardize both theirs and the voters' utilities.

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 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 previous period β will determine higher or lower expected future rents:

$$U_I^0 = R_0 + \beta_{t-1} \int_{\underline{g}}^{\widehat{g}} r_0 \; dF\left(r|g,\lambda\right) \ldots \; t = 0 \tag{13}$$

$$EU_I^1 = \left(R_1 + \beta_{t-1} \int_{\underline{g}}^{\widehat{g}} r_1 \; dF\left(r|g,\lambda\right) \right) p_I\left(\psi_{t-1}\right) \ldots \; t = 1 \tag{14}$$

$$\ldots$$

$$EU_I^n = \left(R_n + \beta_{t-1} \int_{\underline{g}}^{\widehat{g}} r_n \; dF\left(r|g,\lambda\right) \right) p_I\left(\psi_{t-1}\right) \ldots \; t = n \tag{15}$$

In every period $t = 1, \ldots, \infty$ the incumbent decides on a new combination of taxes and spending, and hence rent-extraction from an affordable set of pork-barrel projects.

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

$$EU_I = E[U_I^0\left(r|g,\lambda\right)] + p_I\left(\psi_0\right)\beta_0 \sum_{t=1}^{n} \delta^t E[U_I^t\left(r|g,\lambda\right)] + \left(1 - p_I\left(\psi_t\right)\right) E[U_C^t] \tag{16}$$

The first term denotes expected utility in the actual period $t = 0$ as defined in (13); 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 discounted expected utilities when in office[12], from period $t = 1$ onwards, if it wins the election with probability $p_I\left(\psi_0\right)$ depended on satisfying the re-election threshold in period $t = 0$. The incumbent's future rents will depend on β_0 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 threshold (9) and the utility it will get if the

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

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 infinitely repeated Prisoner's Dilemma game each period. A cooperative strategy implies adapting voter expectations and respecting the re-election threshold every period in order to remain in office. Any defection from this strategy will result in loss of elections (immediate punishment) and an 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.

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:

$$E[U_I^0(\overline{r}|\overline{g},\lambda)] + \beta_0 \sum_{t=1}^{n} \delta^t p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g},\lambda)] \geq E[U_I^0(\widehat{r}|\widehat{g},\lambda)] + E[U_C^t] \tag{17}$$

The term on the right of the equation presents expected utility from taking maximum rents ($\widehat{r}, \forall r \in \widehat{g} = \tau\overline{y}$) 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 immediate future payoffs in terms of rents. Utility in $t = 0$ will either be cooperative (with $(\overline{r},\overline{g})$) or defective (with $(\widehat{r},\widehat{g})$), and will depend on the level of β_{t-1} observed in the previous period, before holding office (as in equation 13). 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 of current period rent-extraction on anticipated future rents. It chooses to defect only when the β parameter is sufficiently small (or negative) so that it might find itself in a better position now with maximum rents then with future lower rents.

Proposition 1. *Incumbent party will form its strategy on rent-extraction and conse-*

quently its chances of re-election based on the realization of the current period shock β_0. *For any*

$$\beta_0 \geq \frac{E[U_I^0(\widehat{r}|\widehat{g},\lambda)] + E[U_C^t] - E[U_I^0(\overline{r}|\overline{g},\lambda)]}{\sum_{t=1}^{n} \delta^t p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g},\lambda)]} = \beta^* \tag{18}$$

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 threshold, while for any

$$\beta_0 < \frac{E[U_I^0(\widehat{r}|\widehat{g},\lambda)] + E[U_C^t] - E[U_I^0(\overline{r}|\overline{g},\lambda)]}{\sum_{t=1}^{n} \delta^t p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g},\lambda)]} = \beta^* \tag{19}$$

the incumbent party will always defect and by extracting too much rents be voted out of office. These set of strategies solved for β_0 *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 ($\beta < \beta^*, \sigma < \underline{\sigma}$), if the incumbent party wants to stay in office it needs to limit its rent-extraction even further in order to get re-elected (more spending towards redistribution programs, or programs that are aimed at a short-run boost to the economy, imply less scope for pork-barrel projects[13], according to equations 1 and 4). 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 threshold.

However, because of the negative shock, observed partially by the voters (with a positive probability q), the voters update their beliefs and update their threshold of taxes and spending (expectations of higher spending will result in higher values of ψ). Whatever the threshold level of spending and taxes, there will always be some $\beta < \beta^*$ for which the incumbents will find it profitable to deviate[14]. It would take a stronger negative shock for the politicians to choose this strategy[15]. When it does occur, the

[13] Even though 'bridges to nowhere' tend to be a good short-run stimulus mechanism.

[14] Keep in mind that holding office is only attractive due to the possibility of rent-extraction.

[15] As the denominator in (17) increases (the probability of satisfying the threshold is higher) it takes a lower level of β^* than before to trigger a defection strategy from the politicians.

situation is similar to reaching a term limit in the standard political agency framework when the incumbents extract maximum rents in this period knowing they will be removed 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 higher rents in future periods.

The 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 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 it will make its final decision on whether or not to respect the re-election threshold. The paper finds empirical evidence on this assumption by linking economic growth (a proxy for shock β) from one year before the elections to the approximation of the ψ parameter 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 and decides whether to cooperate or not.

4.3 Equilibrium

The incumbent's allocation strategies in each period can be summarized in Figure 1.

The first graph on the lower left depicts the quasi-linear relationship between rents and public good production (as described in (4)). 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. 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, as here is where the pork-barrel spending kicks in (λ is realized - it determines the slope of the curve). 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 but it nonetheless increases their aggregate welfare (such as organization of public concerts, parades, or building stadiums). As more public goods start satisfying partial interests (pork-barrels that benefit certain interest groups), fewer voters will experience an increase in their marginal utility. At the point in which public goods produced inflict more harm than

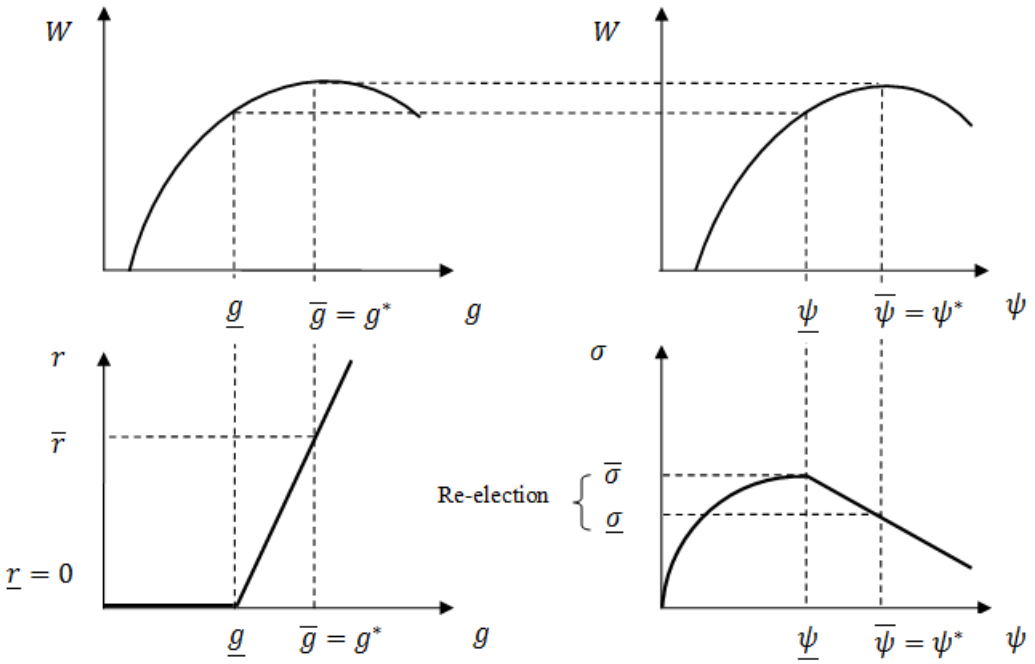

Figure 1: Relationship between public good production, rent-extraction and re-election

good to the majority of voters, their aggregate utility will start to decrease. It can also be interpreted that after a certain point the incumbents will extract more rents for themselves (or for special interest groups as predicted by Coate and Morris, 1995) than the public goods it creates, which will trigger a decrease in aggregate voter utility. The model predicts this to be observed for any point of rents higher than $\overline{r}$ (and public goods higher than $\overline{g}$).

Proposition 2. *If the incumbent party is a rational rent-maximizer, it has no desire to choose any level of public good spending lower than or equal to* $\underline{g}$ *(and no* ψ *lower than or equal to* $\underline{\psi}$*). The chosen level of public good expenditures will always be:*

$$g > \underline{g}(\underline{r}) \;\; and \;\; \psi > \underline{\psi} \tag{20}$$

Proof: See Appendix A.

The intuition is clear. Any $\psi \leq \underline{\psi}$, meaning that $g \leq \underline{g}$, implies rents to be $\underline{r} = 0$. It wouldn't be profitable for a rent-maximizing incumbent not to produce any pork-barrel

projects, as this would imply zero rents. Also, any $\psi < \underline{\psi}$ wouldn't be Pareto optimal as it would trigger a decrease in voter utility. The finding in Proposition 2 enables us to focus only on the effect after $\underline{\psi}\left(\underline{g}\right)$.

The final graph is a quasi-concave curve depicting the relationship between ψ and σ. For rising initial levels of public good expenditures and overall spending and taxation, the state of the economy parameter increases at a decreasing rate, as voter preferences for public goods and other forms of spending are being satisfied. However, after the point of interest $\underline{\psi}\left(\underline{g}\right)$ further spending on pork-barrels and white elephants yields a decreasing state of the economy, as voter perception tends to react negatively on signals of political satisfaction of personal and partial interests. The deteriorating state of the economy caused by higher rent-extraction will leave more and more voters dissatisfied, who will after a certain point $\psi > \overline{\psi}$, for which the state of the economy would be $\sigma < \underline{\sigma}$, elect an incumbent party out of office. The threshold level $\overline{\psi}$ will present the point above which further rent-extraction gains disproportionally more to the incumbent than to the voters.

Proposition 3. *Assume the incumbent party observes $\beta \geq \beta^*$. If the party maximizes rents via the public good expenditures function, and if the re-election probability depends on staying within the desired set $\Omega \in \left[\underline{\psi}, \overline{\psi}\right]$, it will always choose the voters' higher threshold level $\overline{\psi}$, for the observed high level of β. The equilibrium levels of public good expenditures and the public policy parameter ψ are then:*

$$g^* = \overline{g} \text{ and } \psi^* = \overline{\psi} \tag{21}$$

Both the public policy parameter 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, $r^* = \overline{r}$.

Proof: See Appendix A.

If $\overline{g}$ would be the total final amount of public good spending, then the area from $\underline{g}$ to $\overline{g}$ depicts total pork-barrel spending, while $\underline{r}$ to $\overline{r}$ depicts the total amount of rents. By converging to the equilibrium g^* and ψ^*, for a high enough shock β, an incumbent party is able to maximize both its rent-extraction ($r^* = \overline{r}$) and its chances of re-election,

since the voter threshold for the current period is respected, $\psi \leq \overline{\psi}$.

Proposition 4. *If the equilibrium public good expenditure is $g^* = \overline{g}$, and the equilibrium public policy parameter 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:*

$$\sigma^* = \underline{\sigma}\left(\psi^*\left(g^*\right)\right) \tag{22}$$

Proof: See Appendix A.

A possible normative implication would be that rent-extraction leads to a misappropriation of resources which implies worse off in-office performance. Instead of achieving a higher state of the economy $\overline{\sigma}$, the equilibrium revolves around a lower $\underline{\sigma}$. In addition, Proposition 3 would imply higher than optimal taxation and government spending (since $\psi^* = \overline{\psi} > \psi^v$) thereby possibly explaining some rapid growth of government size in the past century. Further empirical verification is needed to evaluate such an implication.

5 Empirical evidence

The empirical implication of the paper is that upon observing a sufficiently negative growth shock, the re-election threshold will be disturbed via more pork-barrel spending, leading to the electoral defeat of the incumbent. Crucial in this is the effect of threshold ψ on the probability of re-election. The paper tests the following findings: (i) an increase of ψ (which is approximated by public good spending) decreases the probability of re-election after a certain level; and (ii) a decrease of real growth (β, approximating a negative shock) one year before the elections will lead to an increase of ψ, i.e. higher spending on public goods.

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 from 1992 to 2008. The database contains state elections for every two years 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 electoral data, budget spending and all other variables used are given in Appendix B under the summary tables.

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

$$I_{it} = \alpha_i + \gamma_1 \psi_{it} + \gamma_2 \psi_{it}^2 + \mu \mathbf{X_{it}} + \vartheta \mathbf{D_{it}} + \epsilon_{it} \tag{23}$$

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 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 majority (or have won the majority in a previously Democratic held assembly), the value assigned is 1.

The explanatory variable is the threshold, ψ_{it}, which is approximated by public good spending. It is a difficult task to decompose public good spending into pork-barrel projects and spending on voter desired public goods. Political actions towards concealing rent-extraction within the budget allocation process make this task even more difficult (similar problems arise with attempts to measure political corruption). This is why the paper assigns a proxy to try to evaluate the effect of rents on re-election probabilities in form of higher public good spending, in particular higher pork-barrel spending. To capture this the paper observes public good spending defined as capital outlays (definition given in Appendix B under Table 2), with respect to all other budgetary current expenditures (such as social transfers or employee wages), and capital outlays per capita.

Of the two parameters, capital outlays per capita seem to be a more precise mea-

sure since they allow to observe for the direct effect of only an increase in public good spending, without implicating other types of pro-cyclical policies (which are included in the ratio of capital outlays to other budgetary expenditures, and can potentially bias it downwards in times of negative shocks). In addition capital outlays represent the type of spending from which it is most likely to extract rents (an assumption similar to Mauro, 1998).

Parameters γ_1 and γ_2 measure the effects of the threshold on incumbent re-election. The squared value ψ_{it}^2 should be able to indicate the concavity of the voters' preferences over the threshold as presented in Figure 1 (provided that γ_2 turns out negative). The model offers a unique prediction that the threshold should increase up until a certain level, labelled $\overline{\psi}$ above which it wouldn't be optimal for the incumbent party to continue with rent-extraction, if it wants to stay in office.

The control variables are in line with those used in some empirical political agency models[16]. These can be divided into a vector of economic ($\mathbf{X_{it}}$) and demographic ($\mathbf{D_{it}}$) 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, revenues and expenditures growth, unemployment rate, growth 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), implying that states with too much old or young people will have higher levels of targeted social spending.

When using gubernatorial and state election 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 ideology, 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 variables (public good spending p/c and public spending ratio) don't tend

[16]For example in Besley and Case (1995b, 2003) or Smart, Sturm (2006).

to take extreme values for any state observed. The extreme values reported in Table 2 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 is controlled for by using robust standard errors, clustered by state.

5.2 Results

Before testing the effect of the threshold on re-election, it is necessary to estimate whether there is a link between a negative growth shock and higher public good spending, as assumed in Proposition 1. This could appear to be a trivial finding, since politicians could simply be applying countercyclical measures to combat a negative growth shock. To try and overcome this potential bias the paper only looks at the effect of the growth shock on public good (capital outlays) spending per capita, which will serve as a proxy for potential pork-barrel spending. It also observes the effects of the shock on total expenditures and a ratio of public good spending to other expenditures to see whether or not the incumbent party is increasing overall spending (and implementing pro-cyclical policies) or is it applying a defection strategy of increasing their rent-extraction, as assumed by the model. If the former is the case then it can be said that a negative growth shock signalled higher rent-extraction (or at least the approximation of rent-extraction).

The following regression equation is estimated:

$$\psi_{it} = \alpha_i + \eta_{it}\beta_{it} + \mu\mathbf{X_{it}} + \vartheta\mathbf{D_{it}} + \zeta_{it} \tag{24}$$

where ψ_{it} denotes the capital outlay spending per capita as the dependent variable in regressions (1) and (2) in Table 3. Regression (3) observes total expenditures as the dependent variable, while regression (4) observes ratio of capital outlay spending over current expenditures as the dependent variable in order to see whether the shock is being translated only to pork-barrel spending or to total spending as well. β_{it} is the main explanatory variable denoting real GDP growth of the state i one year before the election. This describes the stochastic shock of the current period (β_t), upon which politicians anticipate future rents. If economic growth is sufficiently low in the year before the election (with respect to Proposition 1), the incumbent anticipates lower next period rents and increases rent-extraction in current period via higher capital outlay spending. Parameter η_{it} measures the total effect of GDP growth on capital outlays per

capita. Control variables are the same used in (23), while unobserved heterogeneity is controlled for by including state fixed effect, α_i.

The results are presented in Table 3 in Appendix B. Columns (1) and (2) show that a lower observed real GDP growth leads to an increase in spending on capital outlays per capita, under 1% and 5% significance levels. In terms of the model this would imply that a negative shock is interpreted to increase spending on public goods from which it is more likely to draw rents. The inclusions of control variables increased the explanatory power of the model (with a higher R-square and F-test). They show the obvious implications, such as higher total expenditures result in higher capital outlay spending (although there is no significant relationship with higher revenues). The unemployment rate and higher share of young and old show an inverted relationship where it is expected that for a decrease in all of these factors, spending on capital outlays will go up. This seems logical since they imply less expenditure for social transfers, thus freeing up funds for public good creation. 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[17], the party as a whole will try to decrease public good spending 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.

In order to achieve stronger confirmation of the relationship between a negative shock and higher public good spending, we need to examine whether the growth shock affects current expenditures and expenditures in general. Hence in columns (3) the paper tests whether public good spending with respect to other current expenditures (employee wages, social transfers) will react the same way to the negative growth shock, while column (4) tests the same proposition for total budgetary expenditures as the dependent variable. For neither of the two regressions do we get statistical significance of the explanatory variable, implying that a negative growth shock won't affect neither total spending nor a ratio of spending. It will only yield a significant effect for capital outlays. A possible explanation is that a variety of countercyclical policies (e.g. higher social transfers) prevented the observed effect on the spending ratio and total spending. This could imply that in times of negative shocks politicians either use capital outlays and pork-barrel spending to increase their electoral chances, or to maximize their rent-

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

extraction before being elected out of office, thus deliberately choosing to defect. The findings of in Table 4 could shed more light on the total effect.

The results of the main prediction of the model - the effect of the threshold on re-election - are presented in Table 4 in Appendix B. Column (1) observes the direct effect of capital outlays per capita on re-election using state fixed effects to control for unobserved heterogeneity, while columns (2) and (3) include other economic and demographic variables. According to the results shown in columns (1) to (3) it can be inferred that over time the increasing levels of capital outlays per capita increase the probability of re-election 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 threshold chosen would always be the higher level. However, the negative value of the square parameter, significant at a 1% level in column (3), implies the concavity of voter preferences where too high levels of capital outlay spending lead to a decrease of voter utility that can cause the incumbents to lose office. The inclusion of the term limit variable 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 capital outlay spending when observing poor growth, as predicted by the term limit effect in Table 3.

The growth of public good expenditures with respect to current expenditures, shown in columns (4) to (6) implies the same conclusions, only at a lower significance, although their results should be taken with caution, since it cannot be determined with certainty which parts of budgetary expenditures are driving the ratio upwards: higher capital outlays or lower current expenditures. By observing only capital outlays per capita, we can make stronger inferences on the effect of rent-extraction on re-election.

Economic performance indicators in all regressions in Table 4 seem to show weak and non-significant effects on the probability of re-election. This could be explained by the fact that economic performance of states matter far less in local elections than it does on a national level. The political business cycle theory predicts that the aforementioned set of variables could influence electoral results, but they are more applicable on a national level. In local politics budgetary redistribution and public goods play a much more important role. A good way to observe the economic performance indicators would be

to include the federal level of growth and tie it to whichever party is in power nationally, as similarly done in Diermeier et al (2005).

Overall the empirical evidence presented tends to support the main propositions of the model. For a low level of observed GDP growth, presenting the shock β, the incumbent party tends to increase spending on capital outlays, thereby potentially increasing their pork-barrel spending, and with it their rent-extraction. This corresponds to a defection strategy implied in Proposition 1. For a higher level of growth fewer funds are allocated towards capital outlays and more towards current expenditures in order to increase the probability of the incumbent to stay in office and extract more next period rents. Higher spending on capital outlays tends to increase re-election probability but at a decreasing rate since too much spending on public goods implies that the incumbent is not allocating enough funds to satisfy the basic voter preferences, and is moving beyond the voter threshold $\overline{\psi}$. Contrary to the political business cycle theory, politicians in local elections won't manipulate economic performance indicators (such as GDP 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 performance indicators act more as a signal to politicians on rent-extraction than to voters on re-election.

6 Conclusion

The main attempt of the paper was 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 pork-barrel projects. 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 voter preferred levels of taxes and spending, which get updated every period. Altering the optimal levels of taxes and spending 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 shock that will determine the incumbent rent-extracting decisions. When observing a positive shock the incumbent will play a unique equilibrium cooperative strategy, since it expects more future rents, and will never be voted out of office. For a negative shock (insufficient 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 relationship between the economic growth shock and spending on capital outlays, which serve as a proxy for pork-barrel spending and rent-extraction. Higher levels of capital outlay spending increase the probability of re-election up until a certain level when further public good production will yield the incumbent party out of office.

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A Appendix

Proof. Proposition 1:

Define the cooperative strategy of the voters as a_r, and the cooperative strategy of an incumbent i as $s_i = (s_{i1}, \ldots, s_{in})$, for every $s_i \in \Omega$. 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 $E[U_I^0(\widehat{r}|\widehat{g},\lambda)] + E[U_C^t]$. 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, $E[U_I^0(\widehat{r}|\widehat{g},\lambda)] > E[U_I^0(\overline{r}|\overline{g},\lambda)]$ which is true since $\widehat{r} > \overline{r}$ and $\widehat{g} > \overline{g} \forall r, g$, 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 $\beta_0 \sum_{t=1}^{n} \delta^t p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g},\lambda)]$. 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_i^* 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:

$$s_i^* \in \arg\max_{s_i \in \Omega} u_i\left(s_i, s_{-i}^*\right)$$

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 (17) from the model:

$$E[U_I^0(\overline{r}|\overline{g},\lambda)] + \beta_0 \sum_{t=1}^{n} \delta^t p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g},\lambda)] \geq E[U_I^0(\widehat{r}|\widehat{g},\lambda)] + E[U_C^t]$$

where ψ_{t-1} concerns the threshold level 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:

$$\beta_0 \sum_{t=1}^{n} \delta^t p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g},\lambda)] \geq E[U_I^0(\widehat{r}|\widehat{g},\lambda)] + E[U_C^t] - E[U_I^0(\overline{r}|\overline{g},\lambda)]$$

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

$$\beta_0 \geq \frac{E[U_I^0(\widehat{r}|\widehat{g},\lambda)] + E[U_C^t] - E[U_I^0(\overline{r}|\overline{g},\lambda)]}{\sum_{t=1}^{n} \delta^t p_I(\psi_{t-1}) E[U_I^t(\overline{r}|\overline{g},\lambda)]} = \beta^*$$

An incumbent cannot get a better payoff by deviating for any $beta_0 \geq \beta^*$, meaning that the cooperative strategy solved for $beta_0$ 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. 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 threshold $\Omega \in \left[\underline{\psi}, \overline{\psi}\right]$ isn't satisfied). Any level of public goods $g = \underline{g}$ implies re-election since the re-election threshold is respected but the level of rents is still $\underline{r} = 0$. Incumbent party utility maximization function is according to equation (13) depended on rent-extraction (any $r > \underline{r}$). A rent maximization strategy 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. Proposition 3: From the assumption implied by the model that the level of rents increases with public good expenditures in equation (4) it is obvious that the higher level of $g$chosen from the set $\mathcal{P} \in [g_0, \ldots, g_i, \ldots, g_n], \forall i \in N$ increases the utility the incumbent gets. The set $\mathcal{P}$ contains increasing levels of g for every level of expenditures chosen, meaning that $g_0 < g_1 < g_2 < \ldots < g_n$. According to the definition of ψ from (7) and (8), the choice of ψ is also determined within a set containing increasing members; $\mathcal{S} \in [\psi_0, \ldots, \psi_n]$ where $\psi_0 < \psi_1 < \psi_2 < \ldots < \psi_n$, and where n denotes the decision on the size of spending and taxes, ψ_0 is the lowest level chosen implying no taxes and no spending, while ψ_n is the highest level chosen implying maximum taxes and spending.

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 $\Omega \subseteq \mathcal{S}$ (a subset of $\mathcal{S}$). By assumption $\psi_0 < \underline{\psi}$ and $\overline{\psi} < \psi_n$, meaning that the highest level of the threshold in set $\mathcal{S}$ is higher than $\overline{\psi}$ and that the lowest level of the threshold in $\mathcal{S}$ is lower than $\underline{\psi}$. If $\Omega \subseteq \mathcal{S}$ are 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 threshold 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 intuitive conclusion. □

Proof. Proposition 4: From the proof of Proposition 3 and according to the assumptions of the model presented in Figure 1, it follows that for any $\psi^* = \overline{\psi}$ and $g^* = \overline{g}$ and according to the assumption of a negative relationship between ψ 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 satisfy Proposition 3. □

B Appendix

Table 1: Election summary data

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

Notes: All 48 continental 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 growth effects are all taken into account for these 5 states.

Table 2: Summary statistics

Variable	Observations	Mean	Std.Dev.	Min	Max
Re-election	432	0.6041667	0.4895959	0	1
Capital outlays p/c	432	0.7534826	0.2844157	0.2643852	2.712.895
Capital outlays p/c sq	432	0.648441	0.5775933	0.0698995	7.359.799
Public good spending over other spending	432	0.1630327	0.0399779	0.0744813	0.3138859
Growth of public good over other spending	384	0.0006781	0.1353455	-0.3617157	0.3969931
Growth of public good over other spending sq	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
Real GDP growth	432	0.0362356	0.0378452	-0.048284	0.3596869
Lag real GDP growth	389	0.0511355	0.0739128	-0.0646949	0.3858965
Budget deficit	720	2178828	6851939	-61400000	83500000
Deficit to GDP	432	0.0101926	0.0199418	-0.0412	0.1928
Deficit to GDP growth	384	-0.034349	9.585826	-95.607	115.729
Expenditures growth	384	0.0748308	0.0482547	-0.0206968	0.3016281
Revenue growth	389	0.0667248	0.1385824	-0.3817504	0.5898104
Personal income	816	30609.88	8492.098	14749.27	63889.87
Personal income growth	384	0.0957109	0.0434129	-0.033	0.2809
Unemployment rate	816	0.0497623	0.0132065	0.0227	0.1122
Unemployment growth	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

Notes: 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 over other 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 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 (23), and according to the data from Table 1.

Table 3: Public spending and economic growth

Dependent variable: Threshold (ψ)	(1) Capital outlays p/c	(2) Capital outlays p/c	(3) Spending ratio	(4) Total expenditures
Lag real GDP growth (one year before election)	- 0.7082 (-7.82)***	- 0.2533 (-2.77)**	0.0126 (0.85)	-0.0232 (-0.83)
Capital outlays per capita				0.0278 (2.06)**
Public spending ratio				0.1810 (1.41)
Expenditure growth		0.6356 (3.22)***	0.0631 (2.76)**	
Revenue growth		-0.1295 (-1.40)	-0.0031 (-0.29)	0.2123 (8.31)***
Term limit		-0.0344 (-1.94)**	-0.0018 (-0.84)	0.0108 (2.07)**
Unemployment rate		-3.3792 (-2.72)**	0.3233 (-2.25)**	-0.8699 (-2.30)**
Deficit to GDP		-1.0644 (-1.37)	-0.1249 (-1.23)	-2.157 (-5.56)***
Population growth		-0.8136 (-0.94)	0.2324 (2.12)**	0.3669 (1.43)
Share under 17		-10.916 (-13.06)***	0.0645 (0.73)	-0.1352 (-0.57)
Share over 65		-0.1112 (-2.04)**	0.0047 (0.96)	-0.0198 (-1.34)
F-test	61.09	33.02	4.03	17.67
Observations	389	384	384	384
R-squared	0.5097	0.7383	0.8319	0.4669

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 and real GDP growth as the main explanatory variable (as according to equation 24). The dependent variables are capital outlays p/c in regressions (1) and (2), ratio of public good spending over other spending in (3), and total expenditures in (4). t-statistics are shown in parentheses with standard errors robust to heteroskedasiticy and clustered by state. *** denotes significance at 1%, ** at 5% and * at 10%.

Table 4: Re-election and public good spending

Dependent variable: Re-election	(1)	(2)	(3)	(4)	(5)	(6)
Capital outlays per capita	0.4388	0.5922	1.031			
	(1.61)*	(2.03)**	(2.90)***			
Capital outlays per capita squared	-0.1349	-0.2033	-0.3635			
	(-1.07)	(-1.64)*	(-3.04)***			
Public spending ratio growth				0.3916	0.3552	0.4053
				(2.13)**	(1.92)**	(2.18)**
Public spending ratio growth squared				-2.9723	-2.843	-3.033
				(-2.73)**	(-2.56)**	(-2.78)**
Term limit	-0.2622	-0.2606	-0.2547	-0.2679	-0.2674	-0.2528
	(-4.54)***	(-4.48)***	(-4.02)***	(-4.52)***	(-4.45)***	(-4.06)***
GDP growth (election year)		0.0991	0.3561		-0.4536	-0.3676
		(0.11)	(0.31)		(-0.51)	(-0.34)
Lag growth (previous year)		2.2025	2.0324		2.268	1.355
		(1.85)*	(1.42)		(1.94)**	(0.97)
Expenditure growth			-0.9206			-0.7781
			(-1.28)			(-1.12)
Revenue growth			-0.324			-0.2295
			(-1.62)*			(-1.19)
Unemployment growth			-0.1766			-0.1608
			(-0.97)			(-0.91)
Deficit to GDP growth			0.0011			0.0012
			(0.41)			(0.36)
Personal income growth			0.2319			0.3717
			(0.25)			(0.41)
Population growth			-4.301			-4.6431
			(-1.64)*			(-1.76)*
Share under 17			1.1945			-2.0665
			(0.40)			(-0.85)
Share over 65			-0.6181			-0.6653
			(-6.31)***			(-6.67)***
F-test	8.95	6.67	7.35	12.76	8.65	7.48
Observations	432	432	384	384	384	384
R-squared	0.1778	0.1869	0.2639	0.2361	0.2441	0.2752

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 (23). All regressions include state fixed effects. Re-election dummy variable is the dependent variable, while the main explanatory variables are public good spending per capita for the first three regressions, and growth of public spending over other spending for the final three regressions. t-statistics are shown in parentheses with standard errors robust to heteroskedasiticy and clustered by state. *** denotes significance at 1%, ** at 5% and * at 10%.