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Signaling and spending cycles in a political agency framework

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Abstract

This paper challenges the traditional view on the political last- term effect. I show that elections can have an additional effect on the behavior of public spirited politicians by inducing them to send signals by manipulating fiscal variables.Term-limits imposed on previously selected politicians have the effect of avoiding such signaling. To have an intuition, consider elections as a tool for used by the voters to select good politicians. Bad politicians want to extract some rent from the government. Then it may be optimal for a good incumbent to underprovide public services to keep taxes low and to signal that he is not a rent-seeker. A term-limit will eliminate this signaling by good politicians, who will provide the optimal fiscal policies. Then last-term effects might be one of less discipline from bad incumbents or a good incumbent returning to optimal policies. This result helps to interpret some empirical results. Besley and Case (1995) find that lame ducks U.S. Gov increase spending and taxes. This seem an evidence that lame duck governors are shirking as a consequence of low accountability. Besley (2006) show that higher taxes lower the probability of a U.S. Governor's reelection: voters prefer low taxes and spending. Why voters reelect incumbents for a last term if their expected performance is lower? The last-term effect can in fact be an increase in the performance of the incumbents who are providing better but electorally risky policies.

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Signaling and spending cycle in a political agency framework *

Preliminary version, please do not quote

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March 1, 2011

Abstract

The aim of this paper is to challenge the traditional view on the political last-term effect. I show that elections can have an additional effect on the behavior of good (public spirited) politicians. Indeed, elections can induce good politicians to signal themselves by manipulating fiscal or policy variables. In this context, term-limits imposed on previously selected politicians can have the effect of avoiding the need of costly (in terms of welfare) signaling for good politicians.

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1 Introduction

In democracies, elections are the main tool that citizens can use to make their representatives accountable. For that reason one may expect that politicians at a term-limit, or incumbents who are prohibited to run for a new term, will provide less effort to work in the voters' interest and will tend to work more in their own interest. This change in the behaviour of term-limited politicians is known in the political agency litterature as a "last-term effet", explained by a lack of political accountability (see for instance Banks and Sundaram (1998), Persson and Tabellini (2000), Besley (2006) or Besley and Smart (2007))). Since such last-term effects are viewed as negative for the voters, as a result it is hard to explain the existence of term-limit in the constitution of many countries and jurisdictions, since it generates accountability problems and prevents the reelection of successful incumbents.

The aim of this paper is to challenge the traditional view on the political last-term effect. I show that elections can have an additional effect on the behavior of good (public spirited) politicians. Indeed, elections can induce good politicians to signal themselves by manipulating fiscal or policy variables. In this context, term-limits imposed on previously selected" politicians can have the effect of avoiding the need of costly (in terms of welfare) signaling for good politicians.

This result may help to interpret some empirical results on the impact of term limits on policy variables like taxes and spending. Besley and Case (1995) and Besley and Case (2003) study the impact of term limits on U.S. governors on public policy variables[1]. They find that term-limited governors tend to increase both total spending per capita and taxes per capita. This result is then interpreted as an evidence that term-limited governors are less efficient, or are shirking, as a consequences of the lack of accountability cre-

[1]Governors are limited to at most two terms in 33 of the 48 U.S. states.

ated by term-limits. On the same data, Besley and Case (1995) and Besley (2006) show that increasing taxes reduces the probability of a U.S. governor's reelection, which suggest that the voters prefer low taxes and spending.

However this interpretation is problematic from a theoretical point of view: why would voters reelect incumbents for a second and last term if their expected performance is lower than that of a challenger, who would be a first term incumbent facing electoral accountability? One part of the answer is that second-term incumbents are better on average than challengers, thanks to the selection effect of previous elections. Hence the lack of accountability is compensated by a gain in the quality of the incumbent. This increase in the quality of incumbents seem to be confirmed: Besley (2006) shows that governors in their second and last term are more "congruent" [2] with voters preferences, which suggest for the author a strong selection effect. The existence of this selection effect is also confirmed by Alt et al. (2010). This suggest that governors are punished by voters for rising taxes in the first period, but second period term-limited governors raise taxes and spending and are closer to the voters in terms of ideology and preferences. This is this apparent paradox that I address in this paper. Another part of the answer, as I will show, is that the observed last-term effect can in fact represent an increase in performance of the incumbent politicians who are implementing better but electorally risky policies.

This effect is studied in a political agency model of public finance à la Besley and Smart (2007). In the Besley and Smart model, *good* politicians can be seen either as a representation of first best policies, or as myopic benevolent politicians, not affected by reelection incentives. Hence elections have an incentive effect only on *bad* politicians. This is not the case anymore in

[2] Besley (2006) uses rating of governors' and voters' ideology by the Americans for Democratic Action (ADA) and the AFL/CIO's Committee on Political Education (COPE) to match governors' and voters' preferences

the present version of the model, where I explicitly consider that reelection motivations also have an effect on *good*, benevolent politicians.

To have a first intuition on the main result, lets consider the selection process as a way for voters to select good politicians, that is politicians sharing the same preferences on taxes and spending. Suppose that bad politicians want to finance services or goods useless for the voters and unobservable by them; lets call this a "rent". Suppose that the final cost of the public services is uncertain. Then it may be optimal for a good incumbent, candidate to his reelection, to underprovide public services in order to keep taxes low. It is a way for a good incumbent to signal to voters that he is not a rent-seeker. But in our case a term limit will also eliminate the need for signaling for good politicians, who, relieved from the electoral competition, will provide the optimal level of public services. Then changes in behavior by term limited incumbents might be one of less discipline from bad incumbents or a good incumbent returning to optimal policies.

We now have two ways to explain the spending cycles observed in states where politicians are term-limited. Increases in spending and taxes can be both the fact of less-disciplined term-limited politicians or the fact of public spirited politicians freed from the electoral competition. Which effect dominates may be linked to the quality of the selection during the preceding elections.

In the next section I briefly review the relevant political agency litterature. I then present a simple model of political agency. I a fourth section I present a discuss the equilibrium of the model. In a last section, I present some welfare analysis.

2 Related litterature

Contributions to the political agency theory are now numerous; a comprehensive review is proposed in Besley (2006). A part of the litterature (in fact the first models) on the political agency focuse on moral hazard problem only. This suggests that voters vote retrospectively and thereby create political accountability. Models on that vein are for instance Barro (1973), Austen-Smith and Banks (1989), or Ferejohn (1986)). Other works focuse on elections as a way to mitigate adverse selection problems by allowing voters to retain the more competent and public spirited politicians. Based on the observation of past performances, voters try then to detect who, among the incumbent or some challengers, is the best suited for office. This part of the litterature is well reprentated by Besley and Prat (2006), Reed (1994) or Rogoff (1990)).

The most interesting models deal with both moral hazard and adverse selection problems and are presented by Banks and Sundaram (1998), Banks and Sundaram (1993) or Austen-Smith and Banks (1989). Politician that differ in their motivation are central to the analysis of Besley and Case (1995), Coate and Morris (1995), Fearon (1999) For a recent application to public finance problems, see Besley and Smart (2007). Finally, Smart and Sturm (2006) study a case of *pandering* by congruent politician in a related environment.

3 Model

We consider a two-periods political agency model of public finance close to Besley and Smart (2007). In this simple model, a politician (the agent) provides some public goods/public services to a representative voter (the principal). The voter pays taxes to the politician. An election takes place at the end of the first period. This model combine both moral hazard and adverse selection. The moral hazard problem stems from the unobservability for the voter of the real cost of the public goods. The adverse selection problem is introduced through the existence of two kinds of politicians: benevolent (*good*) politicians, and Leviathan (*bad*) politicians. The type of a politician is unobservable for the voter. An important difference from Besley and Smart (2007) is that we suppose that benevolent politicians do maximize over the two periods. Indeed, in Besley and Smart (2007), the *good* politicians are more a representation of the first best, since they always choose the best policies and to not behave strategically or do not face electoral incentives. When the *good* politicians behave strategically, the conclusions of the model can be different. [3]. Another difference from Besley and Smart (2007) lies in the information set of the politicians. I suppose that the final cost of the public goods is uncertain for the incumbent at the time of the choice of the level of public goods, while this cost is known to the incumbent in Besley and Smart.

In this model I concentrate on the heterogeneity of agents (politician) and set aside the problem of aggregation of preferences among voters, or multiprincipals agency problems. We will then suppose that voters are homogeneous in their preference and consider a representative voter as the principal of the political agency relationship.

3.1 Preliminaries

There are two periods are indexed by $t = 1, 2$. In each period t the incumbent provides public services g_t, with $g_t \geq \underline{g}$, where $\underline{g}$ is a minimal level of public services an incumbent has to provide irrespective of his willingness; it may be for example granted by the constitution as services concerning basic needs and automatically produced whatever the preferences of the politician. The provision of public services is entirely financed by taxes[4].

The unit cost of g_t is random and not directly observable. This is only after

[3]The implication of the strategic behaviour by *good* politicians is the Besley and Smart (2007) model is discused by Lockwood (2005)

[4]There is no debt in the model

the provision of g_t that the incumbent knows the true final cost of the public services. In each period the unit cost of g_t is an element of the set $\{\theta_1, ...\theta_N\}$ with $\theta_1 < \theta_2 < ... < \theta_N$ and $\theta_i - \theta_{i-1} = \delta\ \forall i$. Realizations of the unit cost θ are independant across periods. We note $\underline{\theta} = \theta_1$ and $\bar{\theta} = \theta_N$. The cost of the public services is distributed with a probability mass function $p(.)$ and a cumulative distribution function $P(.)$. Cost θ_i happens then with probability $p_i(\theta_i) = p_i$ (and we have $\sum_{i=1}^{N} p_i = 1$) and $P(\theta_j) = \text{prob}(\theta_i \leq \theta_j) = \sum_{i=1}^{j} p_i$. The expected unit cost of g is c: $c = \sum_{i=1}^{N} p_i\theta_i$. The distribution of θ is common knowlege. I finally make the following classical [5] assumption regarding the distribution of θ:

Assumption 1 *The probability density function of the cost θ satisfies the Monotone Likelihood Ratio Property (MLRP) : $\frac{p(\theta_i)}{p(\theta_{i-1})}$ is decreasing in i.*

The utility function of the representative voter is described by the function $U_t(g_t, T_t)$ where g_t represents the public services and T_t represents the taxes. The function U is continuous in both arguments, increasing in g: $\frac{\partial U}{\partial g} > 0$, and decreasing in T: $\frac{\partial U}{\partial T} < 0$.

The optimal level of public services, g_{opt}, maximizes the expected utility [6] $\text{E}[U(g_{opt}, T(g_{opt}))]$. Lets be $U(g_{opt})$ be the expected utility the voter derives from the optimum level of public services g_{opt}.

In the following the utility function takes a quasi-linear form [7]:

$$U(g, T) = H(g) - T$$

where $H(g)$ is continuous and concave: $H'(g) > 0 > H''(g)$ and $H'(0) =$

[5] See for instance Milgrom (1981)

[6] I skip the time subscript when non necessary

[7] this functional form is widespread in the political agency literature; see Persson and Tabellini (2000) or Besley (2006)

$\infty, H^{'}(\infty) = 0$.

Given the expected unit cost of g, the voter's optimal level of public service is given by the first order condition:

$$\frac{\partial H\left(g_{opt}\right)}{\partial g} = c \tag{1}$$

which equalize the marginal utility from g to the expected marginal cost of g. At the end of the first period a representative voter must decide whether to keep the incumbent politician or to replace him with a new, untried, politician.

3.2 The politicians

The politicians may be of two types: *good* politicians or *bad* politicians. All untried policians appear identical ex ante to the voter.

An untried politican is *good* with probability π (with $0 < \pi < 1$). We call the probability that a politican is *good* the *reputation* of the politician and assume that this reputation is common knowlege among all players in the game. The true type of a politician is private information to him. We assume that politicians have an utility level of 0 when unemployed and discount future utility by a factor $\beta \in]0, 1[$

A **good** politician simply values the utility of the voter. The one-period utility function of a *good* type is $V = U(g, T)$.

A **bad** politician does not value the utility of the voter but values the rent r he can extract from his position. This rent may represent for instance financial transfers or the cost of services accorded to himself or to special interests. Thus r represents the part of the tax revenue spent on goods and services useless to the voter. Since the voter observes only T, the exact amount of r is unknown to him.

There is a maximum level R to the rent [8] an incumbent can extract in a given period. This maximum may be explained by some technological constraint or as being a threshold above which an investigation is opened by an external authority. We also assume that the rent cannot be negative. Hence we exclude the possiblity for a politician to manipulate elections by subsidizing the provision of public services. Then: $0 \leq r \leq R$.

The one-period utility function of the *bad* type is linear in r: $Z = r$.

3.3 Sequence of event

3.3.1 Sequence of events:

The following picture shows the sequence of events:

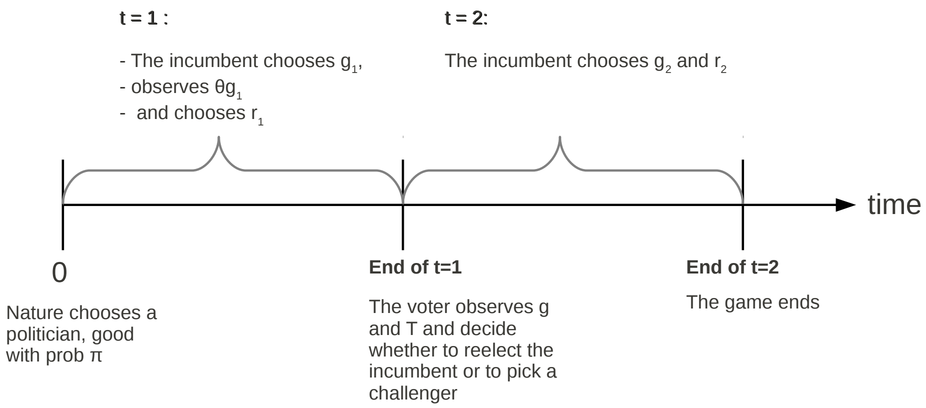

Figure 1: The sequence of events

Events are then:

1. A politician is elected and is of type "good" with probability π
2. The incumbent chooses the level of public services g_1

[8]say more on this rent

3. The unit cost of public service $\theta_{i,1}$ (cost θ_i at $t = 1$) is realized and observed by the incumbent

4. The incumbent chooses a rent r_1 and the voter has to pay taxes $T_1 = \theta_i g_1 + r_1$

5. Election is held, the voter chooses whether to reelect the incumbent or to pick a new politician

6. The second period incumbent chooses g_2, observes $\theta_{i,}$, chooses a rent r_2 and set taxes T_2

7. The game ends

4 The equilibrium

We are looking for a perfect bayesian equilibrium. We solve the game backwards by begining with the second period.

4.1 Second period strategies

In the second period, a politician simply chooses his prefered policy. A *good* politician then plays his optimal strategy, which is $g = g_{opt}$ and gets expected utility $\mathrm{E}(V) = U(g_{opt})$, while a *bad* politician simply chooses the highest level of rent R and the minimum level of public services $(\underline{g})$ is provided. Lets write $\bar{U}$ the expected utility for the voter if the incumbent in the last period is *good* and $\underline{U}$ the expected for the voter if the incumbent in the last period is *bad.*

For the representative voter, the expected profit from reelecting the incumbent relative to electing a new politician is:

$$\hat{\pi}\bar{U} + (1 - \hat{\pi})\,\underline{U} - \left(\pi\bar{U} + (1 - \pi)\,\underline{U}\right) \tag{2}$$

where $\hat{\pi}$ is the probability that the incumbent is *good*. It is straigtforward to see that (2) is positive for $\hat{\pi} > \pi$: since any politician, whether reelected or newly elected, is a lame-duck in the second period, the relevant variable for the voter's decision to reelect or not the incumbent is the difference in reputation $\hat{\pi} - \pi$. Suppose that the reelection rule is the following:

Assumption 2 *for any level of public good $\tilde{g}$ there is a cutoff level of taxes $\tilde{T}_c(\tilde{g})$ such that the incumbent is reelected if $T \leq \tilde{T}_c$ and fired otherwise.*

Given this reelection rule, we can now study the first period best response of the politicians.

4.2 First period strategies

The good politicians' first period strategy

In the first period a *good* politician maximizes his expected utility over the two periods. It is important to keep in mind that the objective of a benevolent politician is to maximize the utility of the representative voter.

To do this, the *good* incumbent has to take into account the impact of his first-period policy on his second period expected utility. Indeed, even if the *good* type knows the expected second period utility he would produce himself, he has to take into account the fact that, unless the probability of reelection is 1, he cannot be sure to be reelected for the next term. If not reelected, he cannot be sure to be replaced by another *good* politician. The $t = 1$ expected utility of the *good* type from playing g' is then:

$$
\begin{aligned}
\mathrm{E}[V_1] = \mathrm{E}\left[U\left(g', T\left(g'\right)\right)\right] + \\
\beta\left\{\sigma_I^e\left(T^e, g'\right)\left(\bar{U}\right) + \left(1 - \sigma_I^e\left(T^e, g'\right)\right)\left(\pi\bar{U} + (1-\pi)\underline{U}\right)\right\}
\end{aligned}
$$

where β is a discount factor, $\sigma_I^e\left(T^e, g^{'}\right)$ is the probability of reelection given $T^e$and $g^{'}$ (to be defined below), T^e is the expected taxes given $g^{'}$, and $\underline{U}$ is the expected utility for the voter from having a bad politician in the last period. Hence the *good* type is reelected with probability σ_I^e and gets in this case the expected utility $\bar{U}$; if not reelected he is replaced by a new politician of reputation π, and in this case his expected utility is $\pi\bar{U} + (1-\pi)\,\underline{U}$.

The problem of a *good* first term incumbent can then be reduced to:

$$\underset{g\geq\underline{g}}{\text{Max}}\ \left\{\mathrm{E}\left[U\left(g,\theta_i\right)\right] + \beta\sigma_I^e\left(T^e, g\right)(1-\pi)\left(U_{opt} - \underline{U}\right)\right\} \tag{3}$$

Lets g^* be the solution to this problem.

4.2.1 The bad politicians' first period strategy

In the first period the *bad* type knows that for any $g \neq g^*$, that is for any level of public services different from what a good type would have provided, his type would be fully revealed to the voter who would fire him with probablity 1. Given that constraint, a *bad* politician has the following alternatives in the first period:

1. to take the maximum rent R, or
2. to pool on g^*, then observe θ_i and choose a level of rent r^* such that $r^* = \underbrace{\arg\max}_{0\leq r\leq R}\ r + \sigma_I\left(g^*, T\right)\beta R\ \mid \theta_i$ (note that here $T = \theta_i g^* + r^*$)

In the first alternative the incumbent raids the government and does not engage in the production of any public services. In this separating behavior the incumbent forgoes any chance of reelection [9] and his utility is R.

[9] exept in the limit case where $g^* = \underline{g}$, more on that below

In the second alternative the *bad* incumbent first keeps a chance of reelection by mimicking the policy of a *good* politician. This is only after the observation of the final cost of g^* that the incumbent chooses how much rent he wants extract from the government. The *bad* type can then choose to play the reelection and to get $r^* + \beta R$ or to forgo the reelection and to get R.

Clearly the second alternative dominates the first alternative in terms of utility for *bad*: $R \leq \text{Max}\{R, r^* + \beta R\}$.

Then *bad* always chooses to pool on g^*.

given that the voter uses a reelection rule on the form of a cutoff value T_c we can now study the best response of a *bad* politician to this reelection rule. We already know that a *bad* type first pools on g^*, that is provides the same level of public services choosed by a *good* politician. The incumbent then observes the final cost of g and chooses a level of rent $r \leq R$, taking into account the effect of his rent-seeking behavior on his probability of reelection. The equilibrium strategy of *bad* is:

Lemma 1 *:*

1. *for* $\theta_i \in \left\{\underline{\theta}, ..., \frac{T_C - R}{g^*}\right\}$ *: take* R *and then* $T_1 = \theta_i g^* + R$*. We note* θ_A *the highest* θ *in this set.*
2. *for* $\theta_i \in \left\{\frac{T_C - R}{g^*} + \delta, ..., \frac{T_C - (1-\beta)R}{g^*}\right\}$ *: take* $r_i < R$ *such that* $T_1 = T_c$*. We note* θ_B *the highest* θ *in this set.*
3. *for* $\theta_i \in \left\{\frac{T_C - (1-\beta)R}{g^*} + \delta, ..., \bar{\theta}\right\}$ *: take* R *and then* $T_1 = \theta_i g^* + R$

Proposition 1 shows the following: When the cost of the public services is in the first set of values, that is for a low cost, it is possible for a *bad* politician to take the maximum rent and still being reelected, since the total cost is under the cutoff: $\theta_i g^* + R \leq T_C$.
When the cost is in the second set of values, the incumbent cannot take the

maximum rent and still being reelected, but it is profitable for him to reduce his first period rent to a level $r^*(\theta_i) < R$ as a way to just satisfy the cutoff rule and to be reelected: $r^* + \beta R \geq R$, where $r^* = T_C - \theta_i g^*$.
When the public cost of public services in the third set of values, the sacrifice necessary to get reelected is too high: the incumbent do not seek reelection and leaves with the maximum rent R.

4.2.2 The voter's reelection rule

Finally, for an equilibrium, we need the representative voter to behave rationally.

At the end of the first period, the problem of the voter is to decide who is expected, between the incumbent and a new, untried politician, to give him the higher last period utility. Since a politician last period behavior, and then voter's last period expected utility, depend only on the type of the politician, the relevant choice variable for the voter is the difference in reputation between the incumbent and the challenger. The vote is then prospectif. The voter must then update the incumbent's reputation given the observable variables T and g:

For any $g \neq g^*$, that is for any level of public services different from the equilibrium level produced by a *good* type, the politician is *bad* with probability 1 and then has a reputation $\pi = 0$.

For $g = g^*$, the incumbent can be of both types with positive probability: a *good* type playing his optimal strategy or a *bad* type pooling on *good*'s policy. Then given T and politicians' strategies g^* and r^* and using the Bayes rule, the probability that the incumbent is *good*, or the updated reputation of the incumbent is:

$$Pr\left(good \mid T,g^*\right) = \frac{\pi Pr\left(T \mid g^*\right)}{\pi Pr\left(T \mid g^*\right) + (1-\pi)\, Pr\left(T \mid g^*, r^*\right)} \tag{4}$$

Lemma 2 *The best strategy for the voter is to reelect the incumbent iff $Pr\left(good \mid T,g^*\right) \geq \pi$ and to replace him with an untried challenger otherwise.*

Since any politician (a reelected incumbent or a challenger) always plays his optimal strategy in the last period, the best strategy for the voter is to reelect the incumbent whenever he has a reputation at least as good as the reputation of a new, untried politician whose reputation is π.

For a cutoff value $\tilde{T}_c$, and given g^* and the equilibrium behavior of the *bad* type, the voter updates the reputation of the incumbent on the following way:

1. for $T < \tilde{T}_c$: $Pr\left(good \mid T,g^*\right) = \frac{\pi p\left(\frac{T}{g^*}\right)}{\pi p\left(\frac{T}{g^*}\right)+(1-\pi)p\left(\frac{T-R}{g^*}\right)}$
2. for $T = \tilde{T}_c$: $Pr\left(good \mid \tilde{T}_c, g^*\right) = \frac{\pi p\left(\frac{\tilde{T}_c}{g^*}\right)}{\pi p\left(\frac{\tilde{T}_c}{g^*}\right)+(1-\pi)[P(\theta_B)-P(\theta_A-\delta)]}$
3. for $T > \tilde{T}_c$: $Pr\left(good \mid T,g^*\right) = \frac{\pi p\left(\frac{T}{g^*}\right)}{\pi p\left(\frac{T}{g^*}\right)+(1-\pi)p\left(\frac{T-R}{g^*}\right)}$

As we know from Proposition 2 it is optimal for the voter to reelect the incumbent only if $Pr\left(good \mid T,g^*\right) \geq \pi$. The optimal cutoff T_c is then a value satisfying

$$\max\left\{T \mid Pr\left(good \mid T,g^*\right) \geq \pi\right\}$$

Lemma 3 *:*

$Pr\left(good \mid T_c,g^*\right)$ is decreasing in $\tilde{T}_c$. There is therefore a unique value T_c such that $T_c = max\left\{T \mid Pr\left(good \mid T,g^*\right) \geq \pi\right\}$

Proof: see appendix.

Then a low level of taxes T, given g^*, represents some "good news" for the voter (in the sense of Milgrom (1981)) since it provides favorable evidence regarding the type of the incumbent. This property relies on the Assumption 1. Hence given the strategies of both types of politicians, there is a critical level of taxation T_c beyond which the imcumbent is not reelected, because of insufficient reputation.

The voter's reelection rule is then:

- $g \neq g^* \Rightarrow \sigma_I = 0$: do not reelect the incumbent and choose and pick a challenger.
- g^* and $T \leq T_C \Rightarrow \sigma_I = 1$: reelect the incumbent.
- $T > T_C \Rightarrow \sigma_I = 0$: do not reelect the incumbent and pick a challenger.

We have now proved that there is an equilibrium described in the the following proposition:

Proposition 1 *The following is an equilibrium: The representative voter's reelection rule is reelect the incumbent if $g = g^*$ and $T \leq T_c$. The good type of politician chooses a level $g^* \leq g_{opt}$ and is reelected with a probability $P\left(\frac{T_c}{g^*}\right)$. The bad type of politician mimics the good politician's policy g^*; when $\theta \leq \theta_A$ the bad politician takes R and is reelected; when $\theta_A < \theta \leq \theta_B$ the bad politician takes $r < R$ and is reelected; when $\theta_B < \theta$, the bad politician takes R and is not reelected.*

Proposition 2 *Suppose that $\frac{\pi p\left(\frac{\hat{T}}{g}\right)}{\pi p\left(\frac{\hat{T}}{g\underline{f}}\right)+(1-\pi)p\left(\frac{\hat{T}-r}{g}\right)} \geq \pi$, where $\hat{T} = \underline{g\theta} + \underline{r}$ and $\underline{r} = (1-\beta)\,R$. Then the equilibrium in proposition 1 is stable in the sense of Cho and Kreps (1987).*

A *good* politician's equilibrium behaviour is given by the maximization problem (3). To caracterize g^*, we first need to study the relation between the expected probability of reelection σ_I^e and the level of public services g.

For a *good* type, the probability to be reelected given his equilibrium strategy g^* amounts to the probability that the cost of g is equal or lower than the cutoff T_c. We can then write for the *good* type:

$$\sigma_I^e = Pr\left(T \leq T_c\right) = Pr\left(\theta_i g^* \leq T_c\right) = Pr\left(\theta_i \leq \frac{T_c}{g^*}\right)$$

Since the cutoff T_c set by the voter is a function of the *good* type equilibrium strategy g^*, then, from the point of view of the *good* type, the cutoff T_c can be represented as a cutoff in the unit cost of the public good: $\frac{T_c(g^*)}{g^*} = \theta_c\left(g^*\right)$, and then:

$$\sigma_I^e = Pr\left(\theta_i \leq \theta_c\left(g^*\right)\right) \tag{5}$$

Therefore to understand the impact of the level of public good g on the probability of reelection σ_I^e we must understand the impact of g on the critical level of unit cost $\theta_c\left(g\right)$. The next proposition gives us this relationship:

Lemma 4 *:*

*The equilibrium cutoff expressed in terms of taxes (T_c) is **increasing** in g; the equilibrium cutoff expressed in terms of cost (θ_c) is **decreasing** in g*

(see the appendix for a proof)

Proposition 4 means that for $g < \tilde{g}$ then $\theta_c\left(g\right) = \frac{T_c(g)}{g} > \frac{T_c(\tilde{g})}{\tilde{g}} = \theta_c\left(\tilde{g}\right)$. When g increases, the voter increases the cutoff T_c since the expected total cost of the public services increases as well. But the increases in T_c is less than proportional than the increase in g. The reason is that T becomes more noisy as g increases[10], and as a corollary the higher the g the less a given "observed"

[10]the variance of T given g is $g^2 \sum_{\theta_i} \left(\theta_i - c\right)^2 p\left(\theta_i\right)$

unit cost of the public good $\tilde{\theta} = \frac{T}{g}$ represent some "good news" regarding the type of the incumbent. The voter then require a better "performance", that is a lower $\frac{T}{g}$, to compensate for a less informative observable variable T.

Another way to understand Proposition 4 is that the higher the level of public spending, the higher the room for a *bad* politician to extract some rent without being detected; thus a higher level of public services g means on average more frequent participation by *bad* politicians (that is, *bad* politicians choose less often to take the maximum rent and to reveal their type). In turn, a more frequent participation by *bad* politicians means a lower quality of selection, and then a lower second period expected utility. To compensate for this lower quality of selection, the voter require a higher "performance" in terms of $\frac{T}{g}$.

To understand the implication of Proposition 4 on the behaviour of a *good* politician it is usefull to go back to the maximization problem of the *good* type of politicians (3) and to evaluate it at the first best level of public services g_{opt}:

$$\mathrm{E}\left[V_1 \mid g_{opt}\right] = \mathrm{E}\left[U\left(g_{opt}, \theta_i\right)\right] + \beta\sigma_I^e\left(g_{opt}, T^e\right)(1-\pi)\left(U_{opt} - \underline{U}\right)$$

Because the utility function U is maximized at g_{opt}, any move from g_{opt} would decrease $\mathrm{E}\left[U\left(g_{opt}, \theta_i\right)\right]$. Since we now know that σ_I^e is decreasing in g, we also know that the first period choice of g by the *good* type, g^*, cannot be bigger than the optimum g_{opt}. Indeed it would decrease both $\mathrm{E}\left[U\left(.\right)\right]$ and the probability of reelection σ_I^e. But since σ_I^e is decreasing in g, it may be possible to **increase** the expected two-period utility by choosing g^* lower than g_{opt}. This reasoning leads to the following result:

Proposition 3 *:*
The first period level of public services is not bigger than the optimum level: $\mathbf{g^* \leq g_{opt}}$

Hence it may be optimal for the *good* type to keep the size of the govenement (low g and low T) below the optimum as a way to signal himself as non-rent seeker. The *good* type then chooses to give up some utility in the first period as a way to increase his probability of reelection and therefore the probability the probability of the implementation of the optimal polity g_{opt} in the next period.

The standard explanation for observed variations in spending and taxes when politicians are term-limited is that lame-duck incumbents divert more ressources on rents. This create spending cycles as observed by Besley and Case (1995). Proposition 3 gives us an alternative explanation. Variations in spending and taxes during binding terms may be explained by increases in spending in public services praised by voters. Since a benevolent lame duck is not under electoral pressure any more, he can take the risk of a positive shock on the cost of the public services. Spending cycles may also be explained by signaling behaviour in preceding terms. This alternative view on the last term effect may also help to cast some light on the apparent emprirical paradoxe mentionned in the introduction to this paper: last term governors at the same time spend and taxe more, and are more congurent with voters preferences.

5 Some welfare analysis

(This part needs further developments).
The aim of this welfare analysis is to study the circunstances under which the signaling behaviour by public spirited politicians is really benefical to the voters.

5.1 Analysis of discipline and selection effects

Besley and Smart (2007) identify *discipline* and *selection* as the two roles of the political process. Following their argument we can specify the extend of both effect.

We first set as the benchmark the expected utility (let it be Z) for the voter when there is no possiblity for reelection, that is when any politician is a lame duck and plays his preferred strategy:

$$Z = \pi U_{opt} + (1 - \pi) \underline{U} \tag{6}$$

The expected present value of the voter's welfare over the two periods is then $(1 + \beta) Z$. We use this as a benchmark to study the impact of the election process on the voter's welfare. The general idea is that the difference between the expected welfare with elections (W) and the benchmark is positive and is explained by an increase in discipline: on average the *bad* politician takes less rent in the first period, and an increase in selection, on average the second period incumbent has a better reputation:

$$W - Z = \text{(D)iscipline} + \text{(Se)lection}$$

The discipline effect represent the electoral incentive's effect on *bad* politician's behavior in the first period. The effect is presented in the next proposition:

Lemma 5 *The electoral process provides a disciplining effect on bad politicians. This effect is:*

$$D = (1 - \pi) \left[\underbrace{U(g^*, cg^*) - U\left(\underline{g}, \underline{cg}\right)}_{1} + \underbrace{\sum_{\theta_i = \theta_A}^{\theta_B} p(\theta_i)\left(R - T_c + \theta_i g^*\right)}_{2} \right] > 0$$

(see appendix for a proof)

This discipline effect is composed of two part: the first one represent the gain in utility for the voter from having the *bad* politician pooling on g^* instead of having the minimum level of public services $\underline{g}$. Since $\underline{g} \leq g^* < g_{opt}$ this difference is positive. The second part of the effect represent the restraint in rent seeking from the *bad* politician when the cost of the public services is in the second set of value in Proposition 1: *bad* lowers his rent to be reelected and this has a positive impact on the voter's utility (between θ_A and θ_B : $T_c \leq \theta_i g^* + R$ and then $R - T_c + \theta_i g^* \geq 0$; see Proposition 1).

The selection effect represent the gain in expected welfare from having on average a better "quality" of second period elected politicians: without election, a second period elected politician has always the same reputation: π, whereas a reelected poltician has a reputation higher or equal to π.

The electoral process allows to keep politicians with a higher reputation for the second period. Let π_2 be the reputation of a politician reelected for a second term. The selection effect is then:

$$Se = \beta\left(\pi_2 - \pi\right)\left(U_{opt} - \underline{U}\right) = \beta\pi\left(1-\pi\right)\left(P\left(\theta_C\right) - P\left(\theta_B\right)\right)\left(U_{opt} - \underline{U}\ \right) > 0$$

where $\theta_C = \frac{T_C}{g^*}$

The selection effect is then composed of the gain in the average quality of the politicians in the second period $(\pi_2 - \pi)$ times the gain in utility from having a *good* politician instead of a *bad* politician in office for the last term. It is easy to see that this effect is positive, the probability that a *good* politician is reelected $(P\left(\theta_c\right))$ is higher than the probability that a *bad* politician is reelected $(P\left(\theta_B\right))$. This selection effect is higher for an average initial reputation of the politician (and the highest when $\pi = 1/2$). Indeed when the initial reputation is high (π close to one), the selection is not a big problem for the voter; when the initial reputation is poor, the selection process is not efficient since even when the incumbent is fired he will high probability being replaced by a *bad* politician.

Given the positive impact of both the discipline and the selection effects, the political process is welfare improving for the voter:

$$W = (1 + \beta) Z + D + Se > (1 + \beta) Z \quad (7)$$

5.2 Welfare effect of *good* politicians' signaling behaviour

So far we have analyzed the role of elections as a device to both constrain rent-seeking behavior by non-rent-public spirited polticians (discipline effect) and increase the quality of the politicians in office (selection effect). This analysis was focused on the deviant behavior of the *bad* politicians. The voter wants to keep only the best politicians in office and in doing so he provides some incentives to *bad* politicians to improve their performance ahead of the election. But a third effect, not intended by the representative voter, takes place in the electoral process: *good* politicians try to signal themself as non-rent-seekers; doing so they improve their probability of reelection (see Proposition 4).

We can now turn to the impact of the signaling behavior by the *good* politician on the welfare of the voter. By having an impact on the probability of reelection, the signaling behavior by *good* politicians is expected to have an impact on both the discipline effect and the selection effect; this is what I call the *indirect* effects on the voter's welfare; by choosing an under-optimal level of public services in the first period, *good* also generate a *direct* effect on the welfare, which is trivially expected to be negative.

We must then examine the difference between the voter's expected welfare at the equilibrium of the game: W, and the voter's expected welfare from the *good* politician implementing the optimal policy g_{opt} in both periods: $\tilde{W}$, which is the case without strategic behavior by the *good* politician. This difference can be decomposed in three parts: one effect on the discipline (indirect effect), one effect on the selection (indirect effect), and one signaling effect (direct effect) (Si):

$$W - \tilde{W} = D - \tilde{D} + Se - \tilde{Se} + Si \tag{8}$$

Lemma 6 *:*
The impact of the signaling behavior by good on the voter's utility can be decomposed in three effect: a direct effect on the first period utility, which is negative:

$$\underbrace{\left(U\left(g^{*}, cg^{*}\right) - U_{opt}\right)}_{\textit{direct effect} < 0} \tag{9}$$

an indirect effect on the discipline, which is negative:

$$\underbrace{(1-\pi)\left[\sum_{\theta_i=\theta_{A,*}}^{\theta_{B,*}} p\left(\theta_i\right)\left(R - T_{c,*} + \theta_i g^{*}\right) - \sum_{\theta_i=\theta_{A,opt}}^{\theta_{B,opt}} p\left(\theta_i\right)\left(R - T_{c,opt} + \theta_i g_{opt}\right)\right]}_{\textit{indirect effect on discipline} < 0} \tag{10}$$

and an indirect effect on the selection, which is positive [11]*:*

$$\left(\pi_{2,*} - \pi_{2,opt}\right)\left(U_{opt} - \underline{U}\right) \tag{12}$$

[11] The difference in selection effects is:

$$\underbrace{\pi\left(1-\pi\right)\left(U_{opt} - \underline{U}\right)\left(P_{*}\left(\theta_c\right) - P_{opt}\left(\theta_c\right) + P_{opt}\left(\theta_B\right) - P_{*}\left(\theta_B\right)\right)}_{\text{indirect effect on selection} > 0} \tag{11}$$

with $\pi_2 - \pi = \pi\left(1-\pi\right)\left(P\left(\theta_c\right) - P\left(\theta_B\right)\right)$

(see appendix for a proof)

The direct effect represent the decrease in utility in the first period due to the underprovision of public services. This loss happens with probability one, since the *bad* politician pools on the same policy. This is the cost of the signal. A lower g means less room for *bad* to hide a rent in T. Hence the probability that the *bad* politician restrain his rent-seeking behavior in order to be reelected is lower the lower the g. To put it differently *bad* takes more often the full rent R. As a consequence the indirect effect of the signal on the *bad* politician's discipline is negative. The purpose of the signal by the *good* politician is to improve the selection of second-period politicians. It is then not surprising to find that this effect is positive: a *good* politician is reelected more often and a *bad* politician is reelected less often since the sacrifice to get reelected is more likely to be too high.

As a consequence the net welfare effect of the signal is ambiguous. Indeed it will depend on whether the improved selection will compensate for the direct loss of first period utility and for the loss in disciplining incentives

Proposition 4 *The signaling behavior by good may decrease the welfare of the voter, depending on the respective impacts of the signal on the first period utility, on the discipline and on the selection.*

The intuition behind Result 4 is that a *good* politician underestimates the cost of his signal: by taking into account only the impact of his signal on his first term performance and on his probability of reelection, a *good* politician neglects the impact of the signal on the discipline effet and underestimates the *direct effect*, since he does not take into account the fact that *bad* pools on his first period policy.

6 Conclusion

We present an alternative ways to explain the spending cycles observed in states where politicians are term-limited. Increases in spending and taxes can be both the fact of less-disciplined term-limited politicians or the fact of public spirited politicians freed from the electoral competition. Which effect dominates may be linked to the quality of the selection during the preceding elections.

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Appendices

Proofs

Proof of Lemma 3

We first need to show that

$$\frac{\pi p_c}{\pi p_{\theta_c} + (1-\pi)\left(P_{\theta_B} - P_{\theta_A - \delta}\right)} \tag{13}$$

(where $p_{\theta_c} = p\left(\frac{T_c}{g}\right)$,$P_{\theta_B} = P\left(\frac{T_c-(1-\beta)R}{g}\right)$ and $P_{\theta_A-\delta} = P\left(\frac{T_c-R}{g} - \delta\right)$)
is decreasing in T_c. But this amounts to show that the likelihood ratio $\frac{P_{\theta_B}-P_{\theta_A-\delta}}{\pi p_{\theta_c}}$ is increasing in T_c.

Suppose that T_c is increased a small amount such that the likelihood ratio becomes
$\frac{P_{\theta_B+1}-P_{\theta_A-\delta+1}}{\pi p_{\theta_c+1}}$. We then have to show that

$$\frac{P_{\theta_B+1} - P_{\theta_A-\delta+1}}{\pi p_{\theta_c+1}} > \frac{P_{\theta_B} - P_{\theta_A-\delta}}{\pi p_{\theta_c}} \tag{14}$$

Writing $\sum_A^B = P_{\theta_B+1} - P_{\theta_A-\delta+1}$, (14) is equivalent to

$$\frac{\sum_A^B - p_{\theta_A} + p_{\theta_B+1}}{p_{\theta_c+1}} > \frac{\sum_A^B}{p_{\theta_c}} \tag{15}$$

or to

$$\frac{p_{\theta_B+1} - p_{\theta_A}}{\sum_A^B} > \frac{p_{\theta_c+1} - p_{\theta_c}}{p_{\theta_c}} \tag{16}$$

Lets define $B_i = \frac{p_{\theta_B+1-i} - p_{\theta_B-i}}{p_{\theta_B-i}}$ and $W_i = \frac{p_{\theta_B-i}}{\sum_A^B}$ (and obviously $\sum_{i=0}^{\theta_B-\theta_A} W_i = 1$). The inequality (14) is then reformulated as

$$\sum_{i=0}^{\theta_B-\theta_A} W_i B_i > \frac{p_{\theta_c+1} - p_{\theta_c}}{p_{\theta_c}} \tag{17}$$

For inequality (17) to be true, it is enough to show that each element B_i on the left-hand side is strictly bigger than the right-hand side: for $i = 0$ we have $\frac{p_{\theta_B+1}-p_{\theta_B}}{p_{\theta_B}} > \frac{p_{\theta_c+1}-p_{\theta_c}}{p_{\theta_c}}$, which amount to $\frac{p_{\theta_B+1}}{p_{\theta_B}} > \frac{p_{\theta_c+1}}{p_{\theta_c}}$: since $\theta_B < \theta_c$ this is true by Assumption (1). Furthermore, since $\theta_B - i$ is decreasing in i, Assumption (1) ensures that B_i is increasing in i.

Proof of Lemma 4

Suppose that the *bad* type is not playing strategically in the sense that he always take the maximum rent R. The problem for the voter is the same and the optimal rule is to reelect the incumbent if and only if his posterior reputation is at least as good as the reputation π of an untried politician picked from the pool. There is then a cutoff $T_{c,NS}$ (where the subscript NS means "non strategic") such that

$$\text{Prob}\left(good \mid T_{c,NS}, g^*\right) = \frac{\pi p\left(\frac{T_{c,NS}}{g^*}\right)}{\pi p\left(\frac{T_{c,NS}}{g^*}\right) + (1-\pi)\, p\left(\frac{T_{c,NS}-R}{g^*}\right)} = \frac{\pi p\left(\theta_{c,NS}\right)}{\pi p\left(\theta_{c,NS}\right) + (1-\pi)\, p\left(\theta_{c,NS} - \frac{R}{g^*}\right)} \geq \pi$$

where $\theta_{c,NS}$ is the cutoff expressed in terms of the cost of public services.

1. for a given $g : \theta_{NS} > \theta_S$

   The condition for reelection can be expressed as a likelihood ratio:LR= $\frac{p_b\left(\theta_{c,NS}-\frac{R}{g^*}\right)}{p_g\left(\theta_{c,NS}\right)} \leq 1$ and we know that LR is increasing in the argument. The MLRP assumption implies that the distribution of θ is unimodale; as a consequence $p_b\left(\theta_{c,NS} - \frac{R}{g^*}\right)$ is increasing in $\theta_{c,NS} - \frac{R}{g^*}$ and $p_g(\theta_{c,NS})$ is decreasing in $\theta_{c,NS}$. Now suppose that the *bad* type behaves strategically and that the voter uses the same cutoff as in the non-strategic case:$\theta_{c,NS}$. The likelihood ratio at the cutoff would be:

$$\tilde{\mathrm{LR}} = \frac{P\left(\theta_{c,NS} - \frac{(1-\beta)R}{g^*}\right) - P\left(\theta_{c,NS} - \frac{R}{g^*}\right)}{p_g(\theta_{c,NS})} = \frac{\sum_{r_i=\frac{R}{g^*}}^{\frac{(1-\beta)R}{g^*}} p_b(\theta_{c,NS} - r_i)}{p_g(\theta_{c,NS})}$$

. Since $p_b\left(\theta_{c,NS} - \frac{R}{g^*}\right)$ is increasing in $\theta_{c,NS} - \frac{R}{g^*}$ $\sum_{r_i=\frac{R}{g^*}}^{\frac{(1-\beta)R}{g^*}} p_b(\theta_{c,NS} - r_i) > p_b\left(\theta_{c,NS} - \frac{R}{g^*}\right)$ and $\tilde{\mathrm{LR}} > \mathrm{LR} \leq 1$ and $\theta_{c,NS}$ is not the optimal cutoff for the voter when the *bad* type behaves strategically. Since $\tilde{\mathrm{LR}}$ is increasing in θ_c the optimal cutoff when the *bad* type behaves strategically must be inferior: $\theta_{c,S} < \theta_{NS}$.

2. $g_1 < g_2 \Rightarrow \theta_{NS1} > \theta_{NS2}$

   Starting from an initial level of $g = g_1$ and the equilibrium condition $\frac{p_b\left(\theta_{c,NS,1} - \frac{R}{g_1}\right)}{p_g\left(\theta_{c,NS,1}\right)}$ suppose that g increases from g_1 to g_2 ($g_1 < g_2$) and that the voter uses the same cutoff $\theta_{c,NS,1}$. The likelihood ratio at the cutoff will then change from $\mathrm{LR}_1 = \frac{p_b\left(\theta_{c,NS,1} - \frac{R}{g_1}\right)}{p_g\left(\theta_{c,NS,1}\right)}$ to $\mathrm{LR}_2 = \frac{p_b\left(\theta_{c,NS,1} - \frac{R}{g_2}\right)}{p_g\left(\theta_{c,NS,1}\right)}$

   Since $p_b\left(\theta_{c,NS,1} - \frac{R}{g_1}\right)$ is increasing in $\theta_{c,NS,1} - \frac{R}{g_1}$, $\mathrm{LR}_1 < \mathrm{LR}_2$ and $\theta_{c,NS,1}$ is not the optimal cutoff when $g = g_2$. Since LR is increasing in θ_c, is has to be that $\theta_{c,NS,1} > \theta_{c,NS,2}$

3. 1. and 2. $\Rightarrow \theta_{S1} > \theta_{S2}$ for $g_1 < g_2$

   To see that we cannot have $g_1 < g_2$ and $\theta_{S1} < \theta_{S2}$, find a $g_x > g_1$ such that $\theta_{c,NS,x} = \theta_{c,S,1}$. Then we have $\theta_{c,NS,x} = \theta_{c,S,1} < \theta_{c,S,x}$. But this means that $\theta_{c,NS,x} < \theta_{c,S,x}$ which is in opposition to result 1.

Proof of Lemma 6

The effect of the signaling on the discipline effect is:

$$\underbrace{(1-\pi)\left[\sum_{\theta_i=\theta_{A,*}}^{\theta_{B,*}} p(\theta_i)\left(R - T_{c,*} + \theta_i g^*\right) - \sum_{\theta_i=\theta_{A,opt}}^{\theta_{B,opt}} p(\theta_i)\left(R - T_{c,opt} + \theta_i g_{opt}\right)\right]}_{\text{indirect effect on discipline}<0} \tag{18}$$

To see that this effect is negative, see that:

1. $\sum_{\theta_i=\theta_{A,*}}^{\theta_{B,*}} p(\theta_i) < \sum_{\theta_i=\theta_{A,opt}}^{\theta_{B,opt}} p(\theta_i)$: from the proof of proposition we know that $p(\theta_c)$ is decreasing in θ_c. Thus $p(\theta_{c,opt}) > p(\theta_{c,*})$. Since $\frac{P_{A,opt}-P_{B,opt}}{p(\theta_{c,opt})} = \frac{P_{A,*}-P_{B,*}}{p(\theta_{c,*})}$, it must be that $P_{A,opt} - P_{B,opt} > P_{A,*} - P_{B,*}$
2. the same argument shows that $p(\theta_i)$ is increasing over the set $\{\theta_{A,*}, ..., \theta_{B,o}\}$
3. the expected rent is computed in both cases from R to $(1-\beta)R$
4. then it has to be that $\sum_{\theta_i=\theta_{A,*}}^{\theta_{B,*}} p(\theta_i)\left(R - T_{c,*} + \theta_i g^*\right) < \sum_{\theta_i=\theta_{A,opt}}^{\theta_{B,opt}} p(\theta_i)\left(R - T_{c,opt} + \theta_i g_{opt}\right)$