

Signaling in political budget cycles:

Competency or opportunism?

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Abstract: Political budget cycles can be seen as a signaling game. This paper analyzes how asymmetric information in two dimensions affects the signaling game. Voters face a double uncertainty: they do not observe the competency and the character of politicians. Competency is the efficiency in running the government. Character is the degree of opportunism. Political budget cycles can lead to a separating equilibrium only if the degree of opportunism is low. Since the driving force of many political careers is to be reelected at almost all costs, a separating equilibrium does not exist. What can be expected instead is a semi-separating equilibrium. Institutional restrictions that limit cycles may improve welfare.

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1. Introduction

Politicians want to be reelected. This ambition can lead to political budget cycles before elections. This paper analyzes the characteristics of these cycles under asymmetric information about both the competency and opportunism of incumbents.

Rogoff and Sibert (1988) showed that, under asymmetric information about competency, political budget cycles can be interpreted as part of a signaling game. Rogoff (1990) reformulated the signaling game in a fully optimizing framework with only two types of competency, high and low. The equilibrium is separating: cycles signal that an incumbent has high competency, while incompetent incumbents do not distort policy and simply reveal their type.

Politicians, however, also differ in their opportunism, or dishonesty, as Stein and Streb (1999) stress. The two dimensions of competency and character are important in many fields. For example, we want a physician to be both competent, to give us the right treatment, and honest, to not prescribe a costly treatment we do not need (Covey et al., 1995, pp. 240-1). This adverse selection problem is at the heart of the Akerlof (1970) lemons model: the problem with lemons arises not only because there are different quality cars, but also because there are dishonest sellers who are willing to mistate the quality of the car.

The Rogoff (1990) result on the informative content of cycles assumes that opportunism of incumbents is observable. However, the degree of opportunism is a parameter of the individual's utility function, i.e., it is not observable. The fact that opportunism is not observable is at the root of the twin uncertainty of voters about

¹ I want to thank Jeffrey Frieden, George McCandless, Juan Pablo Nicolini, Federico Weinschelbaum and, very specially, Ernesto Stein for their stimulating ideas and insights.

competence and opportunism. Once we drop observability, voters do not know exactly how far an incumbent is willing to go to get reelected.

This paper demonstrates that with two-dimensional information asymmetry, there is a separating equilibrium as in Rogoff (1990) only if the degree of opportunism is limited. Otherwise, there is a semi-separating equilibrium where opportunistic incumbents distort policy. Cycles no longer need be informative.

The voters' information problem leads to a setup that is close to Riley's (1997) analysis of the Spence signaling model. The principal -a firm rather than voters- is uninformed, while the agents -workers rather than politicians- send a signal. Riley shows that the separating equilibrium of the Spence model is sensitive to the presence of noise. Some unproductive workers might have low signaling costs (in terms of years of formal education), while some productive workers might have high signaling costs. Hence, four types of agents, instead of two, coexist. In the present framework, two-dimensional asymmetric information also leads to four types of agents: competent and incompetent incumbents, which can be opportunistic or not. However, unlike Riley, the signaling costs of different agents differ.

Section 2 lays out a signaling model under two-dimensional asymmetric information, where competency differences have both transitory and permanent components. The results are related to Rogoff (1990) and Stein and Streb (1999), which can be seen as special cases of this signaling game. Section 3 presents the conclusions.

2. The signaling model

This Section presents a one-dimensional signaling model based on Rogoff (1990), where competency is not contemporaneously observable by rational forward

looking voters. Competency can be signaled through higher provision of public goods that are more salient to voters.

It would be equivalent to have competent incumbents signal through lower current taxes. The relevant issue is the distortion between more and less visible budget items. Tufte (1978) is an early reference to spending and tax cycles. Alesina and Roubini (1997) note that deficits tend to rise before elections. This pattern is consistent with this paper, that implies that the gap between visible public goods and taxes rises (there is no debt in the model).

The difference with Rogoff is that there is two dimensional incomplete information about both competency and opportunism. Stein and Streb (1999) adopt a similar approach to model the manipulation of exchange rates before elections.

2.1. The players

Each term lasts two periods. There are elections at the end of every even period, $t=2,4,\dots$. In line with the constitutional restriction in place in the U.S. constitution, I assume incumbents face a two term limit. The president can only seek one reelection (this is not essential, but it simplifies the argument below). Elections depend on how voters perceive the incumbent's competency and personal appeal.

Competency c_t can be interpreted as the administrations' IQ to provide public services. Competency is the sum of permanent and transitory components, $c_t=c+e_p+e_{np}$. In Machiavelli's words, we can think of e_p as virtue (competent or incompetent) and e_{np} as fortune (good or bad luck). To track Rogoff (1990) as closely as possible, the timing of shocks is as follows. The incumbent receives the transitory shock in the odd, off-election, period $t-1$, $e_{t-1} \circ e_{t-1,np}$; the permanent shock, in the even, election, period t , $e_t \circ e_{t,p}$. The e_{t-1} and e_t shocks take either a high or low value, $e_{t-1}, e_t = \pm e$. The source of asymmetric information is that shocks are only observable with a one period lag. Voter's priors are that both e and $-e$ shocks have probability $\frac{1}{2}$.

(Erro! Argumento de opção desconhecido.)

$$c_{t-1} = c + \mathbf{e}_{t-1,np} + \mathbf{e}_{t-2,p} \quad \text{and} \quad c_t = c + \mathbf{e}_{t,p} + \mathbf{e}_{t-1,np}$$

This formulation supposes that, in the first half of the term in office, overall competency is affected by the permanent competency of the predecessor. This is in accord with the behavior of U.S. voters. Voters do not take into account the president's full four year term to evaluate his performance, only the last two years, acknowledging that the first two years are affected by the policies of the previous president.²

The administrations' personal appeal or charm η_t stands for other dimensions in which candidates differ, and is observable in the current period. Personal appeal follows an MA(1) process, $\mathbf{h}_t = q_{t-1} + q_t$ (though charm can also have a permanent component, this is not central to the discussion below). The q_t shocks have an uniform distribution over the interval $[-q, q]$. Total provision of public goods depends on the incumbents' competency. The government has a choice between g_t and k_{t+1} . Only g_t is visible in period t . Voters observe k_{t+1} the following period.³

(Erro! Argumento de opção desconhecido.) $g_t + k_{t+1} = c_t$

Voters have separable, strictly concave utility functions in public goods, $u(g_t) + v(k_{t+1})$, where $u' > 0$, $v' > 0$, and $v'(0) < \infty$ (to assure an interior solution). By budget restriction (2) and the process that governs competency c_t , utility of public goods is a function of visible goods, $U(g_t, c_t) = u(g_t) + v(c_t - g_t)$. Utility of voters is linear in the personal appeal of incumbent \mathbf{h}_t . Lifetime utility Y is the discounted sum of total per period utility.

² I owe this observation to Jeffrey Frieden.

³ Note that the assumption that voters observe k_{t+1} with a one period lag does not suffice for voters to infer \mathbf{e}_t ex-post, unless \mathbf{e}_{t-1} is known. This requires either that competency shocks be observable ex-post, or a long enough string of events so there are at least two consecutive shocks with the same sign.

(Erro! Argumento de opção desconhecido.)
$$Y = \sum_{t=0}^T \frac{h_t + U(g_t | c_t)}{(1 + d)^t}$$

Politicians have the same preferences as voters, but for the fact that they attach value $K > 0$ to being in office, the satisfaction or “ego-rent” for being the leader. This is the source of opportunistic behavior. Let $z_t = 1$ when candidate is incumbent, and 0 when not. Z gives the politician's lifetime utility,

(Erro! Argumento de opção desconhecido.)
$$Z = Y + \sum_{t=0}^T \frac{z_t K}{(1 + d)^t}$$

Rogoff (1990) assumes the level of ego-rent is observable. However, K is not obvious to voters, because it is a parameter of the subjective utility function of the candidate. Assume that the incumbent can either be non-opportunistic, $K_{nop} = 0$, as a benevolent social planner, or opportunistic, $K_{op} = K > 0$ (more generally, opportunism could be either low or high). As with competence, let the probability somebody is opportunistic be $r = 1/2$. Ego-rents and competence are independently distributed.

This setup implies there are four types of incumbents: either competent or incompetent, and either opportunistic or non-opportunistic.

2.2. Voting rule

Even and odd periods can be analyzed separately. Let $t+1$ be an odd, off election, period. The incumbent's actions in $t+1$ are only affected by the trade-off between current and capital expenditure, since no signaling is at stake: before elections in $t+2$, voters observe $g_{t+1} + k_{t+2} = c + e_t + e_{t+1}$. The incumbent's intertemporal optimization problem (4) at $t+1$ reduces to maximizing $U(g_{t+1} | c_{t+1})$. For a given e_t , equating marginal utility on both types of goods, the solution is $g_{t+1}^*(e_{t+1})$ or $g_{t+1}^*(e_t)$, which can take values $g_{t+1}^*(-e)$ or $g_{t+1}^*(e)$.

In even period t , voters decide their vote after observing the government's spending decision. Voters must compare the incumbent with the opposition candidate. What is at stake is the permanent competency of the alternative

candidates. Denote the perceived probability that the incumbent has a positive permanent competency shock, $e_t^1 = e$, by q_t^1 . Perceptions will depend on what the signaling game indirectly reveals about competency. In the case of the opposition candidate, e_t^0 cannot be revealed in any way, so the expected value of $q_t^0 = 1/2$. As to the personal appeal of candidates, both q_t^1 and q_t^0 are observed before elections, so $E[q_{t+1}^i | j] = q_t^i$, for $i=0,1$. To simplify the notation, the super-indices for incumbent are dropped: $e_t^1 \circ e_t$, $q_t^1 \circ q_t$, $q_t^0 \circ q_t$.

If the incumbent runs for reelection, the government track record matters. For a known e_t , $E[U(g_{t+1}^*) | e_t] = 1/2 U(g^*(e) | e_t) + 1/2 U(g^*(e) | e_t)$. However, voters do not know e_t , only the probability q_t for incumbent up for reelection, and priors $q_t^0 = 1/2$ for opposition candidate, that $e_t = e$. Voter's decisions do not affect expected utility from public goods in $t+1$, only utility in periods $t+2$ and $t+3$: with incumbent, $E[U(g_{t+j}^*) | q_t] = q_t E[U(g_{t+j}^*) | e_t = e] + (1 - q_t) E[U(g_{t+j}^*) | e_t = -e]$ for $j=2,3$ (and $j=1$); with opponent, $E[U(g_{t+j}^*) | q_t^0 = 1/2] = 1/2 E[U(g_{t+j}^*) | e_t = e] + 1/2 E[U(g_{t+j}^*) | e_t = -e]$, for $j=2,3$. The decision of optimizing voters in period t will be to reelect incumbent if expected utility is greater than with alternative candidate.⁴

(Erro! Argumento de opção

desconhecido.)
$$\sum_{j=2}^3 E[U(g_{t+j}^*) | q_t] + q_t > \sum_{j=2}^3 E[U(g_{t+j}^*) | q_t^0 = 1/2] + q_t^0$$

For the incumbent, the results of elections are uncertain because the appeals shocks q_t and q_t^0 are only revealed after expenditure decisions. To maximize (4), subject to voting behavior (5), incumbents have an incentive to create the perception they are competent: a higher q_t increases the probability of reelection $p(q_t)$. To fix ideas, note that (5) implies that when the incumbent is perceived to be

⁴ If the term limit is binding and the incumbent cannot run for reelection, voters only dispose of information about the expected personal appeal of the alternative candidates. The voting rule reduces to $q_t > q_t^0$.

competent with probability $q = \frac{1}{2}$ the probability of reelection is $p(q = \frac{1}{2}) = \frac{1}{2}$. i.e., there is no incumbency bias).

If voters only care about economic competency, voting rule (5) simplifies. In that case, the incumbent only needs to establish it has above-average competency, i.e. that $q > \frac{1}{2}$ to be reelected for sure. Otherwise, an opportunistic incumbent has an incentive to establish $q=1$, to make $p(q)$ as high as possible.⁵

2.3. Signals in a separating equilibrium

Rational voters form their perception of q_t on the basis of visible expenditure, so the probability of reelection, $p(q(g_t))$, depends on g_t .

(Erro! Argumento de opção desconhecido.)

$$\begin{aligned} g_t \geq g_t^s &\rightarrow q = 1 \\ g_t < g_t^s &\rightarrow q = 0 \end{aligned}$$

In a separating equilibrium, picking (at least) the separating signal $g_t = g_t^s$ gains the incumbent a reputation of competence, $p(q(g_t^s)) = p(1) > \frac{1}{2}$. Not signaling leads to lose any such reputation, $p(0) < \frac{1}{2}$.

For a given e_{t-1} , the optimal decision for an incumbent that does not signal is to pick $g_t^*(e_t)$, since it does not distort the optimal intertemporal allocation of public expenditure. To verify that the separating equilibrium is indeed $\{g_t^*(-e) \text{ for } e_t = -e, g_t^s \text{ for } e_t = e\}$, it must be true that neither type of incumbent wants to deviate unilaterally, taking into account voter's expectations in (6).

The no deviation condition can be expressed through the temptation to signal $T(g_t^s, e_t)$: the difference between expected utility at g_t^s , $E[Z(g_t^s) | e_t]$, and at $g_t^*(e_t)$, $E[Z(g_t^*(e_t)) | e_t]$. The temptation to signal can be rearranged into the gains minus the costs of signaling.

⁵ In Stein and Streb (1999), as in Persson and Tabellini (1990), the possibility of reelection only depends on competency. That can be seen as a special case of the current signaling model.

(Erro! Argumento de opção desconhecido.) $T(g_t^s / e_t) = Gain(g_t^s) - Cost(g_t^s / e_t)$

The gain from signaling is the increased probability of being in office the next two periods, and does not depend on competency, only on the ego-rent K_i , for $i=nop, op$.

(Erro! Argumento de opção desconhecido.) $Gain(g_t^s) = (p(1) - p(0)) \sum_{j=1}^2 \frac{K_i}{(1+d)^j}$

The cost of signaling has both a variable and a fixed component, $Cost(g_t^s / e_t) = CV(g_t^s / e_t) + CF(g_t^s / e_t)$. The variable component CV is due to cycle, that distorts visible expenditure in relation to optimal level $g_t^*(e_t)$, and is zero when $g_t^s = g_t^*(e_t)$. The fixed part CF is due to the reduction in the chances an above-average c_t candidate is in office in periods $t+2$ and $t+3$ (the effects of permanent competency on $t+1$ are already predetermined).

(Erro! Argumento de opção desconhecido.)

$$CV(g_t^s / e_t) = U(g_t^*(e_t)) - U(g_t^s / e_t)$$

$$CF(g_t^s / e_t) = (p(1) - p(0)) \sum_{j=2}^3 \frac{E[U(g_{t+j}^*) / q_t^0 = 1/2] - E[U(g_{t+j}^*) / e_t]}{(1+d)^j}$$

Figure 1 depicts the signaling game. The minimum signaling costs for the incompetent are at $g_t^*(e_t)$, where $CV(g_t^s / e_t = e) = 0$, and minimum signaling costs for the competent are at $g^*(e)$. The fixed cost is negative for a competent candidate, so there is a “fixed benefit” to voters, $BF(g_t^s / e_t = e) = -CF(g_t^s / e_t = e) > 0$.

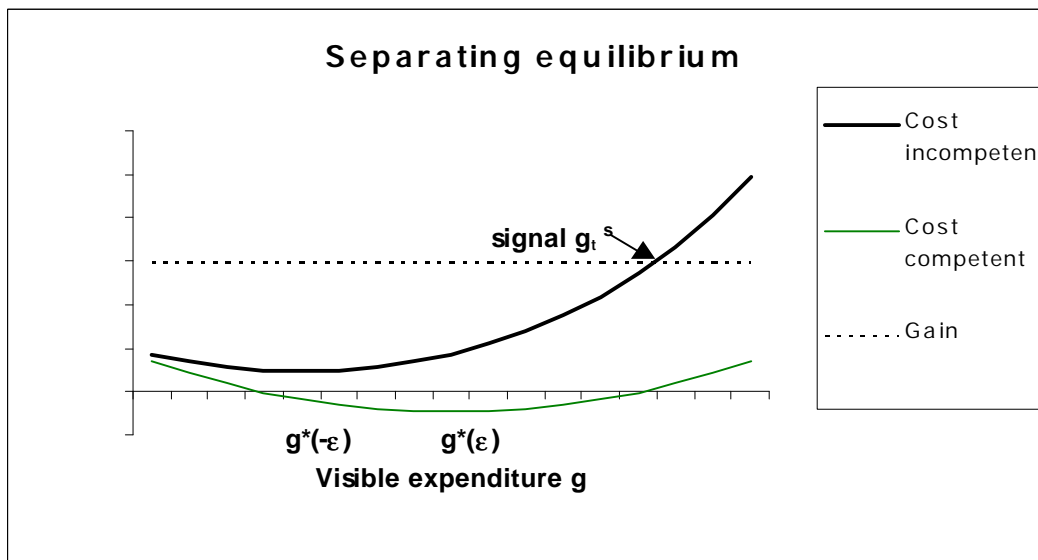


Figure Erro! Argumento de opção desconhecido.

By concavity, variable costs are increasing for $g_t^s > g_t^*(e_t)$. For $g_t^s > g_t^*(e_t)$, marginal costs are larger for an incompetent incumbent.

(Erro! Argumento de opção desconhecido.)

$$\frac{\partial CV}{\partial g_t^s} = -\frac{\partial U(g_t^s / e_t)}{\partial g_t^s} = \frac{\partial v(c + e_{t-1} + e_t - g_t^s)}{\partial g_t^s} - \frac{\partial u(g_t^s)}{\partial g_t^s} \geq 0 \quad \text{for } g_t^s \geq g_t^*(e_t)$$

Opportunistic incumbents have a positive gain from being reelected, while non-opportunistic incumbents do not. Even if there is two-dimensional asymmetric information, the Rogoff results on a separating equilibrium can still stand. However, this requires that the degree of opportunism be limited.

Let K_{max} be ego-rent where $CV(g_t^s, e) = BF(g_t^s, e)$ for a competent incumbent, so its signaling costs are zero. This is the point where the temptation to signal of a non-opportunistic competent incumbent becomes zero (and beyond which the temptation becomes negative).

Proposition 1. A separating equilibrium, given by $\max\{g_t^s, g^*(e)\}$, exists if $K^{op} < K_{max}$.

Pf. The separating signal is determined at point g_t^s where the temptation to signal for an incompetent, opportunistic, incumbent becomes zero, i.e. $Gain(g_t^s) = Cost(g_t^s - \frac{1}{2}e)$.⁶ When $K^{op} < K_{max}$, signaling costs are negative for a competent incumbents at g_t^s . Both types of competent incumbents (opportunistic and non-opportunistic) are willing to signal because their temptation to signal is positive. Incompetent incumbents pick $g_t^*(-\epsilon)$, because their temptation to signal is zero or negative.

Let K_{min} be ego-rent where $g_t^s = g_t^*(e)$. When $K < K_{min}$, $g_t^*(e) > g_t^s$ and the competent can signal their type without distorting current expenditure.

Note that cycles only arise when $K > K_{min}$, since $g_t^s > g_t^*(e)$.

2. 4. Signals in a semi-separating equilibrium

The separating equilibrium exists when the degree of opportunism is low. However, the standard assumption in political science is that politicians are willing to sacrifice the interest of voters to further their own interests and be reelected. I now analyze what happens when at least some politicians are willing to do that, so their degree of opportunism is higher than K_{max} .

In this setup, expectations are as in (11), as shall be now established.

$$g_t \geq g_t^s \rightarrow q = 1$$

(Erro! Argumento de opção desconhecido.) $g_t \geq g_t^{ss} \rightarrow q = \frac{1 - r}{1 - r + lr}$

$$g_t < g_t^{ss} \rightarrow q = 0$$

Proposition 2. For $K^{op} > K_{max}$, only a semi-separating equilibrium exists.

Pf. When $K^{op} > K_{max}$, a competent incumbent that is non-opportunistic prefers $g_t^*(e)$ to g_t^s , since the temptation to signal is negative. An incompetent, opportunistic, incumbent can mimic $g_t^*(e)$ to gain a non-zero reputation of competency.

⁶ At that point, the opportunistic incompetent is actually indifferent between $g_t^*(-e)$ and g_t^s . Voters will indeed take g_t^s as a separating signal if the probabilities $(l, 1-l)$ the incompetent mixes between g_t^s and $g_t^*(-e)$ are $(0, 1)$. So the convention in the text can be rephrased as follows: if the incompetent is indifferent between signaling or

In a semi-separating equilibrium, if $(I, 1-I)$ are the probabilities with which incompetent, opportunistic, incumbents mix between $g_t^*(e)$ and $g_t^*(-e)$, $g_t^*(e)$ will be associated with a reputation of competency $q=(1-r)/(1-r+rI)$. Let $x^o(1-r)/(1-r+rI)$. A semi-separating equilibrium requires the following two conditions, the first for the competent, non-opportunistic, incumbent, the second for the incompetent, opportunistic, incumbent, to not deviate:

(Erro! Argumento de opção desconhecido.)

$$\frac{U(g_t^*/e) - U(g_t^s/e)}{p(1) - p(x)} > \sum_{j=2}^3 \frac{E[U(g_{t+1}^*)/e_t = e] - E[U(g_{t+1}^*)/q_t^0 = 1/2]}{(1+d)^j}$$

$$\sum_{j=1}^2 \frac{K}{(1+d)^j} \geq \frac{U(g_t^*/-e) - U(g_t^*(e)/-e)}{p(x) - p(0)} + \sum_{j=2}^3 \frac{E[U(g_{t+1}^*)/q_t^0 = 1/2] - E[U(g_{t+1}^*)/e_t = -e]}{(1+d)^j}$$

Over a certain range of ego-rents, there exist a multiplicity of equilibria: by (12) a competent non-opportunistic incumbent takes into consideration a fixed benefit of signaling smaller than in separating equilibrium (since $x \geq 1-r > 0$), while the variable cost is the same. Given expectations in (11), a semi-separating equilibrium exists for some $K^{op} < K_{max}$. Hence, there is a range over which both separating and semi-separating equilibria coexist. In this range, the equilibrium will depend on the specification of voter beliefs for $g_t < g_t^s$ according to (6) or to (11).

2. 5. Relation to other models

Rogoff (1990) can be seen as a special case of the present model, when voters know the incumbent's opportunism. If uncertainty on this dimension is eliminated, voters either observe the separating signal or low expenditure.

Though Stein and Streb (1999) have a very different background model, they have a signaling game that can be seen as a special case of this paper. When the

not when $I=0$, then the incompetent will prefer not to signal.

incumbent does not face any exogenous uncertainty on electoral results, so elections only depend on competency and not on personal appeal of the candidate, the semi-separating equilibrium is such that either there is high or low provision of visible public goods. This is exactly the result in Stein and Streb (1999), where only the incompetent, opportunistic incumbent distorts (in this model, both types of opportunistic incumbents distort policy).

3. Conclusions

This paper analyzes the signaling game under political budget cycles. Under two dimensional asymmetric information, the Rogoff (1990) result on the separating character of political budget cycles only holds if opportunism is limited. In that case, assuming that there are some non-opportunistic incumbents, political budget cycles are welfare improving.

With high opportunism, there is a sharp result: there is only a semi-separating equilibrium, where opportunistic incumbents distort policy. This can be informative if it is done by a competent incumbent, non-informative if it is also done by an incompetent incumbent. This is welfare reducing.

An extension of the paper (currently in progress) is to analyze the welfare properties of cycles, and the effect of different institutional restrictions. Also, the analysis of political budget cycles can be considered as a moral hazard problem, following Lohman (1996), so it is relevant to see what two-dimensional asymmetric information implies in this instance for cycles.

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