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# THE POLITICAL BUSINESS CYCLE AND THE PEACOCK'S TAIL

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**Abstract**

Signalling models of the Political Business Cycle interpret deviations from optimal fiscal rules on election years as signals of competence by high ability incumbents. The signalling argument explicitly or implicitly treats increased expenditure and/or tax cuts before elections as efficient in the sense that it helps bring a high(er) ability candidate to office. We challenge this view by employing a simple, single-dimensional model of the PBC that enables us to examine voter welfare. We show that signalling can be very detrimental to voter welfare in some cases and derive conditions under which the PBC can be mitigated (JEL Classification: H39, C72, C73).

## 1. Introduction

A re-examination of the the signalling argument for the Political Business Cycle (PBC) is attempted with focus on voter welfare. As the uncertainty created by the electoral process forces a move from socially optimal fiscal choices, signalling through fiscal policy distortions is viewed as efficient as it ensures that a competent government will come to office. In this context, can it be argued the Political Business Cycle marks a shift from first best policies towards second best ones? Not necessarily we argue, as the welfare loss due to policy distortion might very well outweigh the benefits from choosing a more competent government.

The complexity of existing models of Rational Political Business Cycles leaves little room for analysis of welfare issues from the voters' point of view.

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We overcome this difficulty by employing a simple model of the Political Business Cycle under the assumption of voter rationality. Using only one policy dimension allows us to replicate all standard results of PBC models on the one hand and examine the welfare effects of signalling on the other. This proves to be a non-trivial exercise as it leads to results that challenge existing wisdom, showing the possibly devastating effects of signalling.

The existence of macroeconomic cycles that coincide with the electoral cycle has been addressed by three main strands of literature under the assumption of voter rationality. In *Rational Partisan Theory* models, ideological parties minimise different social loss functions. Socialist parties exploit the uncertainty generated by the electoral process to reduce unemployment and boost inflation whereas the reverse is the case with conservative parties. In Alesina (1987) and Alesina (1988), the wages are set by rational wage setters and contracts are signed. On election years, the expectation of inflation before the elections, when labour contracts are signed is different than the *ex post* inflation when policy is implemented by the elected government. In the presence of a Phillips-curve such a discrepancy between expected and actual rate of inflation can have real effects and cause booms and recessions.

The signalling or *Rational Political Business Cycle* models, first developed by Rogoff and Sibert (1988) and Rogoff (1990), explained the political business cycle under the assumption of uncertainty about the incumbent's ability. A high-ability incumbent will increase expenditure or seignorage, or will cut taxes beyond the socially optimal level in order to signal his ability. He will do so up to a level where a low or average ability candidate would not find it profitable to follow. Rogoff (1990) views signalling as a second best solution under asymmetric information as it ensures that a high ability government will come to office.

The third class of models dealing with the effect of elections on the economy, focuses on how an incumbent can use, *Debt Policy as a Strategy*. Persson and Svensoon (1989), Aghion and Bolton (1990), Alesina and Tabellini (1990a), Alesina and Tabellini (1990b) and Milesi-Ferretti and Spolaore (1994) are models in which an incumbent manipulates public debt to make the opposition post-election policy more difficult to implement. Aghion and Bolton (1990) propose that a conservative incumbent has incentive to accumulate public debt since by doing so it deprives a socialist party of the possibility of future spending through debt policy and hence its appeal to its constituency.

This paper is related to Rational Political Business Cycle models. In a very simple framework, we develop a signalling model of the political business cycle. Drawing on Rogoff (1990), we only model public expenditure, which enables us to examine what happens to voter welfare when the incumbent signals. As mentioned earlier this is a question left unanswered in the political business cycle theory. Rogoff (1990) only mentions in brief that signalling helps achieve second best by making sure that a more able government comes to office.

We argue that this might be very far from the truth. If there is uncertainty about the government's ability, the incumbent can take a series of actions in order to reveal his type to the voters. The voters deduce the incumbent's ability and if it is high they vote for him, otherwise they vote for the opposition. We present a one-dimensional model in which signalling only occurs through the amount of public expenditure chosen by the government. To signal high ability, a government increases public expenditure beyond the socially optimal point and as a result underinvests. We prove existence and uniqueness of a separating equilibrium in which a high ability government overspends and underinvests and a low ability government cannot mimic. Pooling equilibria are ruled out.

The simplicity of the model allows us to examine the welfare properties of the equilibrium. The deviation from the socially optimal level of expenditure can be so costly that the voters would prefer *ex ante* a non-signalling low ability government to a signalling high ability one. Signalling takes place nevertheless, as rational voters, once faced with signalling, can do better only by voting for the most competent party. Under such circumstances, signalling is welfare-reducing and a mechanism that forces the incumbent to reveal his type without distorting fiscal policy will be preferred by the voters. A punishing game is considered in which a low ability government that signals high ability is not voted again. Conditions under which such strategies are implementable and optimal are investigated.

## 2. The Model

In this paper we model a simple public sector. We develop a one-dimensional variant of Rogoff (1990) which enables us to focus on voter welfare when the incumbent signals. As in Rogoff (1990), if signalling is to have any informational value, two conditions have to hold.

Firstly, ability has to exhibit serial correlation. The incumbent's performance can only be an indicator of his future ability, if ability is correlated in time. Then by signalling now he passes on information about future expected ability and rational voters will vote for him as their future welfare is thus maximised. Secondly, informational asymmetry is necessary. Clearly in the full information case (as will be shown below), no signalling is necessary. Signalling through expenditure has meaning when it helps overcome informational asymmetries. Hence it is necessary that the voters are unable to observe the incumbent's ability and the level of public good. If the level of public good was observable, the voters would be able to infer the incumbent's ability. In this we duplicate Rogoff's (1990) informational structure, adjusted to accommodate our single-dimensional model. The informational structure of the game is presented in detail below and a discussion about the assumptions made ensues. Our game is as follows

## 2.1 **The** Game

The government or incumbent has in each period income $y_t$. This is produced by the government in the beginning of the period using last period's savings according to (3). It will be divided between consumption in period *t* and investment for production in period $t + 1$. For simplicity we concentrate on the public sector disregarding the private sector. On election years, the voters observe the incumbent's actions and try to deduce his ability. They then vote rationally to maximise their expected welfare. We analyse the government's strategies both on and off election years to rule on the existence of the Political Business Cycle.

ASSUMPTION 1. *The incumbent's ability at time t is a moving average process:*

$$a_t = e_t + e_{t-1} \tag{1}$$

$$e_t = \begin{cases} e^H & \text{with propability} \quad p \\ e^L & \text{with probability} \quad (1-p) \end{cases}, \; e^H > e^L \tag{2}$$

A binomial ability is assumed for simplicity. Assuming a continuously distributed ability does not alter our results. What is of importance is that an above average candidate can always signal that he is of above average ability if he has an incentive to do so.

ASSUMPTION 2. *The production function of the public sector is:*

$$y_t = a_t f(I_{t-1}), \tag{3}$$

with $f'(\cdot) > 0$, $f''(\cdot) < 0$. *Here, $I_{t-1}$ is the capital investment from period t-l.*

We assume a diminishing returns production function. We assume that ability enters multiplicatively although more general specifications should not alter our results but could require further technical assumptions.

**ASSUMPTION** 3. *The voters are assumed to be rational. Their utility at time t is given by:*

$$U^V_t = U(D_t), \tag{4}$$

*where $D_t$ is the consumption of the public good in period t and $U'(\cdot)>0, U''(\cdot)<0$.*

**ASSUMPTION 4.** *The income is either consumed or used in next period's production:*

$$y_t = D_t + I_t \tag{5}$$

ASSUMPTION 5. *The opposition's ability is drawn from the same distribution as the government's ability, namely according to (1).*

Again this symmetry assumption is made for simplicity. Another distribution shouldn't alter our results as long as high competence incumbents' expected ability is higher than the opposition's average ability.

## 2.2 The Timing of Events

The timing of the events in this game is as follows: At time $t = 0$, the government comes to office. It has "inherited" an amount of capital $I_0$ from the previous government. It uses $I_0$ to produce $y_1$ and then decides on the expenditure $D_1$ and the investment $I_1$. The voters can observe $D_1$ but not $I_1$ or $e_1$ until the beginning of the second period. In the beginning of the second period ($t = 1$), the government produces $y_2 = a^i f(I_1)$, $i = H,L$ being its type. Again, it decides the amount of expenditure $D_2$ and investment $I_2$. The voters observe $D_2$ but cannot observe either $I_2$ or $e_2$ until after the elections. At the end of the second period, the elections take place and the new government comes to office. The timing of events is summarised in figure 1.

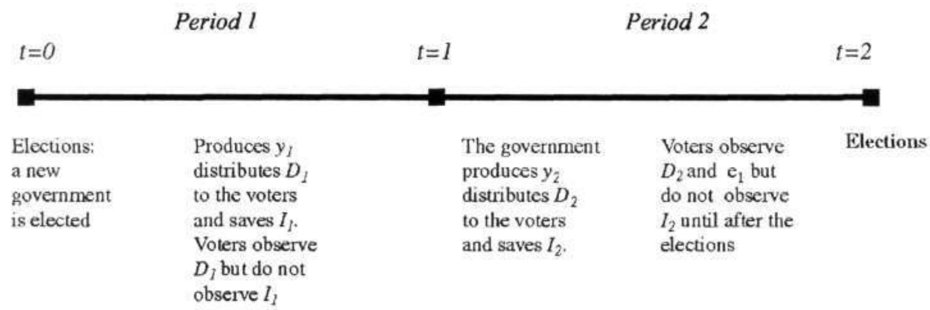
## 2.3 Objectives **and** Strategies

### *2.3.1 The incumbent*

The incumbent's strategy consists of pairs of $(D_t, I_t)$, such that $y_t = D_t + I_t$. To illustrate better the results of the model we solve it under both the assump-

FIGURE 1

The timing of events




tions of an "unselfish" government which maximises the voters' welfare and a "selfish" government which seeks to be re-elected. In the first case, the unselfsh incumbent will simply maximise the voters' utility:

$$\begin{aligned} &\max_{\{Dt+s\}} E_t \sum_{s=0}^{\infty} \delta^s U\ (D_{t+s}) \\ s.t.\ &D_t + I_t = a_t^i . f(I_{t-1}) = y_t \qquad (6) \\ &I_0 = \bar{I} \end{aligned}$$

We can write the Bellman equation:

$$_t\,(I_t) = \max_{D_t} \left[ U(D_t) + \delta . E_t \quad _{t+1}(I_{t+1}) \right]$$

where $\Omega_t$ is the valuation function at time $t$.

Suppose, on the other hand that a government has an incentive to be re-elected. This can be introduced into the model in a simple way: constant wage per period in office. This wage can be interpreted either as wages of the people working for the government or, as in Rogoff (1990) as "ego rents" received by the government. In this case the government maximises its objective function. Let

$$V\ (D_t)\ =\ U(D_t)\ +\ \delta E_t \Omega_{t+1}(I_{t+1})$$

be the expected utility function as a function of $D_t$. Then the government's objective function is:

$$\Gamma(\mathbf{D}) = V(\mathbf{D}) + \delta . \mathrm{G}(\hat{p}) . [\mathrm{W} + kW] \quad (7)$$

Here, $W$ is the government's rents and $G(\cdot)$ is the probability of getting re-elected as a function of the voters' beliefs about the government's type given the government's strategy: $\hat{p}(D_t)$. Assume (in accordance with voters' rationality) that $G(0) = 0, G(1) = 1, 0 \leq \mathrm{G}[\mathrm{p} \in (0,1)] \leq 1$, that is the probability that a government to which the voters assign zero probability (probability 1) of being high ability will be elected with zero (1) probability. (Also let $g$ be the density function of $G$, with $G(\hat{p}) = G'(\hat{p}) \geq 0$. That is, the higher the probability the voters assign to having a high ability government, the higher the probability that this government will get re-elected.

*2.3.2 The voters*

The voters maximise their discounted expected utility:

$$E_0 V_t = E_0 \sum_{t=0}^{\infty} \delta^t U(D_t), \quad (8)$$

where $\delta$ is the discount factor with $0 < \delta < 1$. The voting strategy is as follows: Let 5 = 1 denote voting for the incumbent and S = 0 denote voting for the opposition. Then,

$$S_t = \begin{cases} 1 \text{ if } E_t(V_{t+1}^G) \geq E_t(V_{t+1}^O) \\ O \text{ otherwise} \end{cases} \quad (9)$$

Here $V_{t+1}^G$ $(V^O_{t+1})$ denotes the next period's voter utility in case the incumbent (opposition) gets elected.

## 2.4 The Equilibrium Concept

In the unselfish government case, the incumbent maximises the voters' welfare and the voters vote for him if he is of high ability and for the opposition if he is of low ability as will be shown in the next section. Any solution of the government's maximisation game is an equilibrium of the game.

The equilibrium notion used in the selfish government case is *Sequential Equilibrium* and will be referred to henceforth as "the Equilibrium". We will prove the existence of a unique *Perfect Bayesian Equilibrium.* Since this is a multi-stage game of incomplete information with independent types and each player has at most two possible types *(H* or L), Fudenberg and Tirole's (1991) assumptions are satisfied and the sets of Perfect Bayesian Equilibria and Sequential Equilibria coincide. We shall restrict the analysis to pure strategies. Let $D^i$, where i = *H,L* be the high and low ability government strategy respectively and *S* the strategy of the voters. Then a pair ($D^i$,S) constitutes a Perfect Bayesian equilibrium if:

i. *S* is set according to equation (9), given the voters' beliefs about the strategies played by the government

ii. $D^i$ is set by the government to maximise (7), given the voters' beliefs.

iii. The voters update their beliefs according to Bayes' Rule: if $D^H \neq D^L$, then $\hat{p}(D^H) = 1$ and $\hat{p}(D^L) = 0$. If $D^H = D^L$ then $\hat{p}(D^H) = \hat{p}(D^L) = $p.

## 3. Solving the Model

### 3.1 The Unselfish Government Benchmark

*3.1.1 The unselfish government*

First we examine the case of a government that is not concerned with getting re-elected. Such a government will maximise equation (6). This is a dynamic programming problem with general solution:

$$\frac{U'(D_t)}{U'(D_{t+1})} = \delta E_t \alpha^i_{t+1} \cdot f'(I_t)$$

The greater the marginal product of investment is expected to be in the next period, that is the more competent the government will be, the more it pays to sacrifice expenditure now (higher marginal utility of consumption now) to increase expenditure in the future *($U'(D_t+1)$* is lower relatively to *$U'(D_t)$).* This leaves us with pairs of *($D_t$, $I_t$)* which optimise the intertemporal utility of the representative voter.

*3.1.2 A graphical representation of the problem*

From (3), (5) we can derive the budget constraint:

$$\text{Period 1: } \left.\begin{aligned} y_1 &= a_1 . f(I_0) \\ y_1 &= D_1 + I_1 \end{aligned}\right\} \Rightarrow a_1 . f(I_0) = D_1 + I_1$$
$$\text{Period 2: } \left.\begin{aligned} y_2 &= a_2 . f(I_1) \\ y_2 &= D_2 + I_2 \end{aligned}\right\} \Rightarrow a_2 . f(I_1) = D_2 + I_2 \tag{10}$$

Given the known shock in the government's ability in the previous period ($e^i_{t-1}$), the government's ability can take one of the following values:

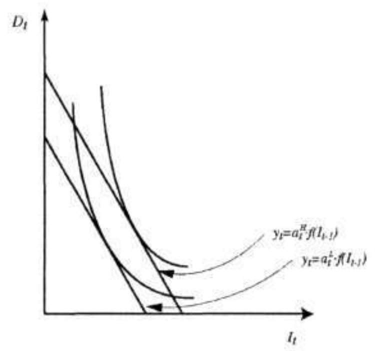
$$a_t = \begin{cases} e^i_{t-1} + e^H \\ e^i_{t-1} + e^L \end{cases} \tag{11}$$

For convenience we will refer to the first case as the high ability government (denoted $a^H$) and to the second case as the low ability government (denoted $a^L$).

From (10) and (11), in figure 2, we draw a graph of the budget constraint in *(D, I)* space for each type of government. Also, from the voters' intertemporal utility function, we can draw their indifference curves in *(D, I)* space.

FIGURE 2

Optimal expenditure and investment



**Lemma 1.** *The indifference curves derived from the voters' expected utility function are decreasing and convex in $(I_t, D_t)$ space.*

*Proof* Consider the voters' expected utility:

$$V_t(D_t) = U(D_t) + \delta E_t \Omega_{t+1}(I_{t+1}) \tag{12}$$

where $E_t$ denotes the expectation taken at time $t$ with respect to the government's ability distribution function. Now totally differentiating (12), yields:

$$dV_t = U'(D_t).dD_t + \delta E_t \frac{{}_{t+1}}{{}_{t}} dI_t = 0 \tag{13}$$

$$\Leftrightarrow \frac{dD_t}{dI_t} = -\frac{\delta}{U'(D_t)} E_t \frac{{}_{t+1}}{I_t} < 0$$

The last inequality comes from the fact that $\frac{{}_{t+1}}{I_t} > 0$ (See Appendix A.1). Also, from (13), differentiating with respect to $I_t$, we get:

$$\underbrace{U''(D_t))}_{-ve}.\underbrace{(\frac{dD_t}{dI_t})^2}_{+ve} + \underbrace{U'(D_t)}_{+ve}.\frac{d^2D_t}{dI_t^2} + \delta.\underbrace{E_t \frac{{}^{2}\ {}_{t+1}}{I_t^2}}_{-ve} = 0$$

$$\Rightarrow \frac{d^2D_t}{dI_t^2} > 0$$

In the Appendix A.2, it is shown that $\Omega_{t+1}$ is a concave function of $I_t$ and hence $E_t \frac{{}^{2}\ {}_{t+1}}{{}^{2}\ {}_{t}} < 0$.

We can now draw the indifference curves in $(I_t, D_t)$ space. The point of tangency with the budget constraint gives the optimal level of government expenditure and investment, given the government's type (figure 2). Higher government ability implies higher consumption in both periods (that is now and in the future) if consumption in both periods is a normal good.

### 3.2 The Case of a Government Trying to get reelected

A government with an incentive to be reelected will maximise equation (7) subject to the budget constraint. We first examine the full-information case. If the voters can observe the government's type, there is nothing a government can do to influence the elections outcome. Then $G = 1$ if the government is of high ability and $G = 0$ if it is of low ability. This is because as shown in Proposition 1 high ability government is preferred by the voters to the opposition which is in turn preferred to a low ability government. In the full information case the government maximises its objective by choosing the socially optimal amount of expenditure as in the "unselfish" government case.

**Proposition 1.** *Once the expenditure $D_t$ has been set, the voters maximise their expected future utility by voting for the government ($S = 1$) if its type is high an for the opposition ($S = 0$) if the government is of low ability.*

Proof. In the first period of being in office, a government always chooses D to maximise the voters' welfare V (D). Since the after-election ability of the government does not depend on its ability in the first period, the government does not have an incentive to signal its ability in period 1 (in fact he doesn't have an incentive to signal in any odd-numbered period 1, 3,...). A government hence will maximise (7) by maximising V (D). Hence all we have to prove is that:

$$E_t(\ {}^{H}_{t+1}) \geq E_t(\ {}^{O}_{t+1}) \geq E_t(\ {}^{L}_{t+1}),$$

where the superscripts denote high-ability government, opposition and low-ability government respectively.

Now, next period 's expected income if a high ability government remains in once is given by:

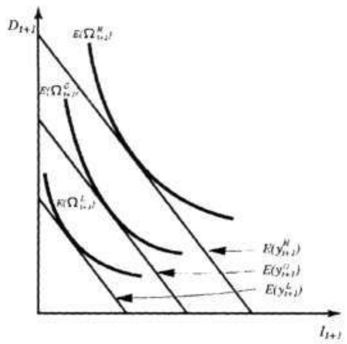
$$E(y^H_{t+1}) = E(a^H_{t+1}) \,.\, f(I_t) = \left[(1+p)e^H + (1-p)e^L\right] . f(I_t)$$

If a low ability government remains in office, next period's expected income is given by:

$$E(y^L_{t+1}) = E(a^L_{t+1}) \,.\, f(I_t) = \left[pe^H + (2-p)e^L\right] . f(I_t) \tag{14}$$

FIGURE 3

Expected utility for the Different Government Types




Finally, if the opposition comes to office, the voters' expectation of next period's income is given by:

$$E(y^{O}_{t+1}) = E(e_t + e_{t+1}) \, . \, f(I_t) = \left[ 2pe^{H} + 2(1-p)e^{L} \right] . \, f(I_t) \qquad (15)$$

Clearly, since $e^H > e^L$ and $0 \leq p \leq 1$, it follows that

$$E_t(V^{H}_{t+1}) \geq E_t(V^{O}_{t+1}) \geq E_t(V^{L}_{t+1})$$

The three cases are depicted in figure 3. The high ability government's budget constraint lies above the opposition's budget constraint which in turn lies above the low ability government's budget constraint. The points of tangency between the indifference curves and the budget constraints give the expected utility in each case. It is clear that $E_t(\;^{H}_{t+1}) \geq E_t(\;^{O}_{t+1}) \geq E_t(\;^{L}_{t+1})$. By voting for the government if it is of type $H$ or for the opposition, if the government is of type $L$, the voters maximise their expected utility.

Clearly, Proposition 1 holds for the asymmetric information case as well once when the government has signalled its ability.

Proposition 2. *There exists a threshold wage W* such that for W >= W*, the gain (to the government) of getting reelected will offset the loss in welfare from choosing a suboptimal level of expenditure. In such a case, there exists a unique separating Perfect Bayesian Equilibrium, in which a high ability government will signal its type and a low ability government cannot mimic a high ability one.*

*Proof.* I. The case in which maximising V(D) involves a level of expenditure that signals high ability, that is a level of expenditure that lies to the left of $I^H$ in figure 4, is trivial. A low ability government cannot mimic this level of expenditure since it lies beyond its budget constraint. The high ability government will choose *D* to maximise the voters' utility and will get reelected with probability 1.

II. If maximising V(D) involves a level of expenditure that the low ability government can achieve (that is a level of expenditure lower than $D^H$), then let

$$\max\left\{\frac{V(D^{*L},a^L)-V(D^H,a^L)}{\delta.(1+\delta.[1-G(p(D^{*L}))]},\frac{V(D^{*H},a^H)-V(D^H,a^H)}{\delta.(1+\delta.[1-G(\hat{p}(D^{*H}))]}\right\} \tag{16}$$

where $V(D^i,a^j)$ denotes the utility enjoyed if a government of type *j* chooses a level of expenditure $D^i$ where Di is the level of expenditure of type *i* in equilibrium (in a pooling equilibrium $D^L = D^H$ of course). From (16), it follows that for $W \geq W^*$

$$V(D^H,a^L)+\delta(1+\delta)\ W \geq V(D^{+L},a^L)+\delta(1+\delta)\ G(\hat{p}(D^{*L})).W$$

This implies that for any level of expenditure less than $D^H$, a low ability government will have an incentive to mimic a high ability government.

If $D \geq DH$, it cannot choose the high ability expenditure level since this lies beyond its budget constraint.

Also, from (16), we obtain

$$V(V^H,a^H)+\delta(1+\delta)\ W \geq V(D^{*H},a^H)+\delta(1+\delta)\ G(\hat{p}(D^{*H})).W$$

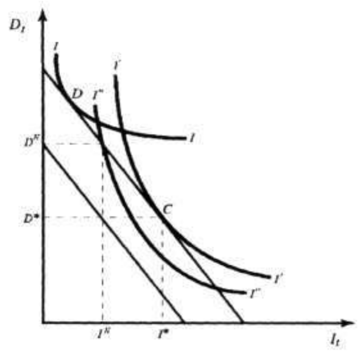
which simply implies that a high ability government prefers to signal its ability and get reelected with probability 1 to choosing the optimal level of expenditure and get elected with probability $G(\hat{p}(D^{*H}))$. The voters will form their beliefs accordingly: $\hat{p}(D^H)=1$, $\hat{p}(D^{*L}) = 0$ and will vote for the government. A high ability government cannot choose a level of expenditure less than $D^H$ since a low ability government would have an incentive to mimic this.

The two cases can be depicted in figure 4

I. The point of tangency *(D)* between the indifference curve *II* and the budget constraint lies to the left of $I^H$. The government can choose a level of

**FIGURE 4**

Separating Equilibrium



expenditure and investment ($D^*$, $I^*$) that maximises the voters' utility and signals high ability as a low ability government cannot choose any level of expenditure greater than $D^H$.

II. The point of tangency between the indifference curve *IT* and the budget constraint lies to the right of $I^H$ (point *C* on the graph). The level of expenditure corresponding to C is feasible for a low ability government. In such a case, a high ability government will choose a suboptimal level of expenditure ($D^H$) to signal its competence. This corresponds to a lower indifference curve *I"I"*. This clearly shows the welfare loss due to signalling.

So far we have established that for a range of wages $W >= W^*$, there is a unique separating equilibrium. We haven't ruled out the possibility of pooling equilibria. *If p* is high enough, there might be some pooling equilibria in the game. These equilibria will maximise the high ability government's objective, since the probability of a low ability government that will cheat and come to office is small. Hence a high ability government might find it optimal to pool. In a pooling equilibrium, the strategies chosen by a low and a high ability government coincide ($DH = DL = D^{*H}$) and the voters' beliefs are formed accordingly: $p(D^H) = p(D^L) = p$. The refinement used to rule out this possibility is the "intuitive criterion", introduced by Cho and Kreps (1987)

**Definition 1 (The Intuitive Criterion).** *A pooling equilibrium ($D^H$, $D^L$) is unintuitive, if there exists a level of expenditure D such that:*

$$\Gamma(\overline{D},1,a^H) > \Gamma(D^H,\hat{p}(D^H),a^H)$$

and

$$\Gamma(\overline{D},1,a^{L})>\Gamma(D^{L},\hat{p}(D^{L}),\, a^{L})$$

What the intuitive criterion states is that a pooling equilibrium is unintuitive if there exists a level of expenditure which both the high and the low ability types would prefer if it would get them elected with probability 1.

**Proposition 3.** *There exists a threshold wage W** such that for W > W**, all pooling equilibria are unintuitive.*

*Proof.* Let:

$$W^{*}\equiv\max\left\{\frac{V(D^{L},a^{L})-V(\overline{D},a^{L})}{\delta.(1+\delta.[1-G(p)]},\frac{V(D^{L},a^{H})-V(\overline{D},a^{H})}{\delta.(1+\delta.[1-G(p)]}\right\},\tag{17}$$

For any $W > W^{**}$, it follows from (17) that:

$$\Gamma(\overline{D},1,a^{H})>\Gamma(D^{H},p,a^{H})$$

and

$$\Gamma(\overline{D},1,a^{L})>\Gamma(D^{L},p,a^{L}),$$

that is, there exists an amount of expenditure $D$, which for $W > W^{**}$, both the high and the low ability governments prefer to the pooling equilibrium expenditure if by choosing $D$ they get elected with probability 1 ($G(1) = 1$).

Hence we have shown that if the "stakes" are high enough, there will be a separating equilibrium in which the high ability government will reveal its type and the low ability government cannot mimic. We have also shown that even though there might be some pooling equilibria, these are unintuitive.

With rational voters, a government which sets $D_t$, $I_t$ to signal high ability will get reelected, even if $I_t$ is not optimal. That is because once $I_t$ is set, the voters can maximise future income only by voting for the most competent party.

A high ability government that wishes to signal its ability will have to do so by setting the expenditure in the second period up to at least $D^H$, the least-cost separation expenditure. The corresponding level of investment will be no more than $I^H$. This is not guaranteed to be the socially efficient level of expenditure, that is the level of expenditure an "unselfish" government would choose through optimising the representative voter's intertemporal maximisation programme, unless we are in a trivial separating equilibrium, as in case I. A level of investment that would be optimal could very well lie to the right of $I^H$.

### 3.3 Signalling and the Political Business Cycle

Once a government has signalled its ability, the voters can only maximise their future consumption by voting for this government: the investment level is set and next period's income depends only on the ability of the government.

In the first period in office a government has no incentive to signal its ability since this is not indicative of what the ability will be after two periods.

From Proposition 2, it follows that for as long as the rents from being in office are high, in period 2 (the period preceding the elections), a high-ability government will have the incentive to signal its type. This involves a level of expenditure, $D^H$, greater than is socially efficient. It follows that an increased level of expenditure due to signalling will be observed only in the pre-election period: the business cycle is created only by the elections.

### 3.4 Welfare Implications of Signalling: The "Peacock's Tail Effect

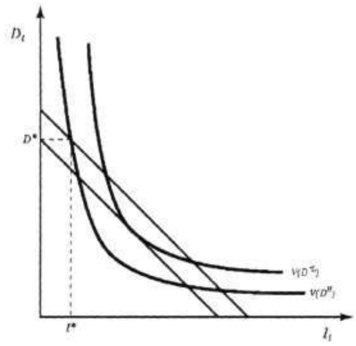
So far, it has been shown that in a signalling equilibrium, a certain loss in welfare is likely to result: the indifference curve at $(D^H\ I^H)$ is lower than the optimal one $(D^*,I^*)$ as is shown in figure 4.

The reduction in future expenditure (and in welfare) is a premium the voters have to pay to make sure that the government elected is competent. The government also suffers the loss in utility in order to signal strength. This is parallel to what is called in Behavioural Biology "the handicap principle[1]", first formulated by Zahavi (1975): in sexual selection males with extreme traits such as long and heavy tails signal stamina and are more likely to be chosen by females. Petrie (1994) observes how peacocks with long and elaborate trains are more likely to be chosen by peahens. The same principle applies to this model. A government that wishes to show competence has to be "handicapped", that is to suffer a loss in utility. If it can afford this loss, it signals its strength to the voters.

An important implication of the model is that signalling is not necessarily efficient. As has been mentioned earlier, signalling models of the political business cycle implicitly treat signalling equilibria as second best and the loss in welfare

FIGURE 5

The welfare cost of signalling: The peacock's tail



due to signalling as an informational premium that the voters have to pay in order to make sure that an unwanted, low ability government won't be elected.

Here we demonstrate a very different case. In our model it is not guaranteed that the voters are *ex ante* willing to suffer a loss in welfare as a result of signalling, in order to make sure that the government will be competent. Under particular parameterisations of the model, it might be so costly to signal high ability, that a low ability, "unselfish" government would be preferred to a high ability signalling one (this would be the case because in order to signal its competence, a high ability government might have to reduce investment and hence future revenues drastically). An example of this can be depicted in figure 5.

Signalling in such a case is inefficient and welfare reducing. The voters' loss in welfare cannot be offset by the fact that they choose a more competent government. The voters would *ex ante* prefer a non-signalling, low ability government. However, as proposition 1 implies, once faced with the choice (that is when It is set), they will vote for the high ability signalling government as this is an optimal strategy.

## 4. Punishing the Government

### 4.1 Voters as a Principal. The Punishing Game

In this section we examine if there is a way for the voters to force the government to signal its type without distorting fiscal policy. We derive conditions under which such a strategy is sustainable. We do so in a principal-agent framework, in which the voters act as the principal and the government as the agent. A low ability party that "cheats", that is a party that distorts fiscal policy to signal high ability when it is of low ability is punished: the voters lose their confidence in it and this party won't get elected after it is caught cheating. Under some conditions derived below, this will be sufficient to induce revelation of the government's true type.

In an efficient signalling equilibrium, a limit has to be set on the government's wage. We are assuming a two-party system. The second party serves as a punishing device for a low ability government that signals high ability. The second party's ability is assumed to be drawn by the same distribution as the government's ability.

Suppose that a government receives a rent of W per period of being in office. Let $D^*2$ be the expenditure that maximises $V(D_2)$, $\delta$ the discount factor and $q$ the exogenous probability[2] of a party being elected when this party is not in power.

A low ability government that cheats will be caught after the elections, in period 3: the voters observe $I_2$ in the beginning of period 3 and deduce $\alpha_2$. If a government is caught cheating, the voters lose their faith in it and do not vote for it in the next elections (that is the elections in the end of period 4).

**Proposition 4.** *If the government's wage is restricted below a critical wage $W^{***}$, there exists a Bayesian-Nash Equilibrium in pure strategies of the game described above, in which the government chooses the optimal amount of expenditure $D^*$ and the voters vote for the government if it is of type $H$ and for the opposition if the government is of type $L$.*

*Proof* The equilibrium is specifed by the following strategies and beliefs:

i. $D(i) = D^*(i)$, that is whatever the type of government, the government chooses the amount of expenditure that maximises the voters' welfare.

ii. $S(D) = 1$ if $D(i) = D^*(H)$ and $S(D) = 0$ if $D(i) = D^*(L)$. The voters vote for the government when the latter chooses the high ability optimal expenditure and for the opposition if the government chooses the low ability optimal expenditure.

iii. Along the equilibrium path, the voters update their beliefs according to Bayes' Rule: $\hat{p}(D^*(H)) = 1$, $\hat{p}\cdot(D^*(L)) = 0$.

iv. Off the equilibrium path, the voters "lose their confidence in the government" if it cheats and believe that the latter is of low-ability no matter what: $\hat{p}(D^c) = 0$. Here, the superscript C denotes the level of expenditure a government that has cheated in the last period chooses.

Clearly, a high ability government does not have an incentive to deviate. Choosing the socially optimal level of expenditure $D^*$, maximises its utility and will get it reelected. A low ability government by cheating gains the rents from being in office next period: $\delta(1+\delta)W$ and suffers the loss in welfare from choosing a suboptimal level of expenditure $V(D^*) - V(D^C)$ plus potential rents from coming to office as an opposition party in the future. Now let $\Gamma^0$ denote the value of being in opposition[3]. Also, let:

$$W^{***} \equiv \frac{V(D_2^*, a^L) - V(D_2^C, a^L) + \delta(1-\delta^2)\Gamma^0}{\delta(1+\delta)} \tag{18}$$

Then clearly, for $W \leq W^{***}$, we have:

$$W \leq W^{***}$$

$$\Leftrightarrow \delta(1 + \delta)W \leq V(D^*_2, a^L) - V(D_2, a^L) + \delta(1 - \delta^2)\,\Gamma^0$$

$$\Leftrightarrow \Gamma(D^C_2, a^L) \leq \Gamma(D^*_2, a^L)$$

and it is optimal strategy for a low ability government not to cheat. The rents from being in office next period are not sufficient to offset the loss in welfare and the punishment for cheating.

It should be pointed out that this is not a *Perfect Equilibrium* as the out-of-equilibrium-path beliefs of the voters are vulnerable if a cheating government signals high ability in the future: the voters would then have to punish it despite the fact that it has proven it is of high ability. However, as mentioned above, it should be viewed along the lines of a principal-agent framework where the principal (voters) induce truthful revelation from the agent (government). Furthermore, we believe that the off-the-equilibrium-path beliefs are not unreasonable. When a party cheats, there is a confidence effect: the voters do not trust it no matter what it does in the period after it has cheated. Finally, if the voters are patient enough, it is not difficult to construct a model in which the future gains from punishing severely a cheater by far outweigh the loss from not electing a competent government.

## 4.2 Some Comparative Statics

We next examine briefly how the efficient signalling wage $W^{***}$, varies with the parameters of the model. From (18), it follows that $W^{***}$ will be higher:

i. The higher the loss in welfare $(V(D^*2) - V(D_2))$ from choosing a suboptimal level of expenditure is.

ii. The higher the expected utility of the opposition party, $\Gamma^0$ is. With a high $\Gamma^0$, losing the election is not a big loss for a government and the incentive to cheat decreases.

iii. If the government discounts the future too heavily, that is if $\delta$ is close to 0. Then it doesn't have an incentive to reduce welfare now in order to gain rents in the next period.

A final point can be made here about the critical level of rents $W^{***}$ that triggers the costly signalling. It will be higher, the longer the punishment period for the government is. However for the voters to make a credible threat not to vote for the government for a number of elections greater than one, there have to be potential entrants. That is because if the voters can only choose between two parties, punishing a party for a number of periods $n_y$ involves voting the other party for $\eta$ periods. But that could entail playing a dominated strategy if the party they are to vote for $\eta$ periods happens to be of low ability in one of these periods. If there are potential entrants, they can commit to punish a cheater for $\eta$ periods, since they can pick one of the potential entrants when the party in office signals low ability during the punishment period.

An analogy can be made with the number of entrants in an oligopolistic market and the sustainability of competitive equilibrium: increasing competition between parties in the electoral process reduces the severity of distortions in the economy.

## 5. Discussion

The voters' welfare on election periods has been in the focus of the analysis in this paper. We examine it under the assumption that policy distortions on electoral years are due to signalling. Asymmetric information is crucial to our results and the driving force for signalling. The macroeconomic model we used is a very basic one: A simple production function by a government that uses as inputs only past savings and its ability. We assume that although public spending is observable by the voters immediately, savings and investment are only revealed to them with a lag. This asymmetry in information drives a high ability government to distort optimal fiscal policy in order to signal its competence. Signalling takes place only on election years which accounts for the existence of the Political Business Cycle.

Once faced with signalling, rational, utility maximising voters' optimal strategy is to vote for this high ability incumbent. In this sense signalling increases welfare by bringing the most competent government to office. This is in accordance with existing Political Business Cycle Theories.

We make a clear distinction between the voters' preferences before and after signalling. If signalling involves a high level of distortion in fiscal policies, the voters might *ex ante* prefer a less competent party that doesn't signal to a more competent, signalling one. However, *ex post*, once faced with the choice, the voters always prefer the most competent party. This is because once signalling has occurred, the loss in welfare has been suffered and the voters maximise their utility by voting for the most able candidate.

A high ability government can take advantage of this and choose to distort fiscal policy and reduce welfare if the stakes are high, that is if the rents from being in office are high. In this context signalling is not efficient. The cost involved in signalling might be more than just a deviation from first-best policies under symmetric information. A way of eliminating signalling would be welfare increasing for the voters.

The last section focuses on conditions under which elimination of signalling and true revelation can be achieved. For this, punishing cheating governments is necessary as the attraction of coming to office can lure low ability governments into distorting fiscal policy in order to pass as high ability ones.

We conclude this paper by considering some possible extensions of the model. A first suggestion would be to allow borrowing and examine the signalling effects on the budget and future welfare for the generations that will have to pay off the debts. Another possible extension would be to endogenise the government's ability. This would relate the analysis to the patent-races literature and allow the party in office to improve its position relative to the opposition. In such a framework, signalling could be easier for a party with experience in being in office and the Political Business Cycle would be mitigated.

Also, a more formal treatment of the multi-period punishing game could result in some interesting suggestions about the effects of political competition on signalling through policy distortions and how this could mitigate the elections-related fiscal policy cycles.

Finally, a proper moral hazard model in which the incumbent puts effort into the production of the public good could produce a trade-off between the adverse effects on welfare of high wage levels (due to signalling) and the desirability of high wage levels (due to increased incentive for the candidates to exert effort).

## Notes

1. Signalling games of sexual selection in which the male with an extreme value of some phenotypic trait, such as a very long and heavy tail are discussed in Smith (1982) and Krebs and Davies, eds (1997). Grafen (1990a) and Grafen (1990b) give a classification of interpretations of why costly signals provide information to the receiver.

2. In equilibrium $q$ is equal to $1-p$. That is because in an efficient signalling equilibrium, a government always signals the truth. Hence the probability that a party that is not in office will be elected in the next elections is equal to the probability that the party in office is of low ability, that is $1 - p$.

3. Being in opposition holds some value since it is possible that in the future the opposition will be elected (with probability $q$).

# Appendix A

## A.1 Monotonicity of the Valuation Function

*Proof.* Suppose not: $\frac{{}_{t+1}}{{}_{t}} \le 0$. This means that an increase from $I_t$ to $I_t'$ will either lead to a reduce in $\Omega_{t+1}$ or leave it unchanged. But,

$$
\begin{aligned}
{}_{t+1} &= \max_{D_{t+1}} [U(D_{t+1}) + \delta \quad {}_{t+2}(I_{t+2})] \\
&= U(D^{*}_{t+1}) + \delta \quad {}_{t+2}(I_{t+2}) \\
&= U\left[a^{i}_{t+1} \cdot f(I_t) - \delta \quad {}_{t+2}(I_{t+2})\right] \\
&< U\left[a^{i}_{t+1} \cdot f(I_t') - I^{*}_{t+1}\delta \quad {}_{t+2}(I_{t+2})\right] \\
&\le \max\left\{U\left[a^{i}_{t+1} \cdot f(I_t') - I_{t+1}\right] + \delta \quad {}_{t+2}(I_{t+2})\right\} \\
&\equiv \Omega_{t+1}(I'_{t+1})
\end{aligned}
$$

Contradiction.

The strict inequality comes from the strict monotonicity of U (·) and f (·). Hence, it must be the case that $\frac{{}_{t+1}(I_{t+1})}{I_t} > 0.$

## A.2 Concavity of the Valuation Function

*Proof.* Let

$$
{}_{n}(I) \equiv \max_{0 \le D \le F(1)} \{U(D) + \delta. \quad {}_{n-1}(F(I) - D)\} \tag{19}
$$

Where $F(I) \equiv af(I)$. Note the change in notation. Here the subscripts denote the number of periods (horizon) of the maximisation problem, that is the number of periods over which the government maximises. We need to show that $\Omega_n(I)$ is concave in $I$.

We prove it by induction:

– For $n = 1$: $\Omega_1(I) = U(D)$ is concave (trivially).

– Suppose that $\Omega_{n-1}$ is concave, that is for $\lambda \in (0, 1)$,

$$\Omega_{n-1}[\lambda I_1 + (1-\lambda)I_2] \geq \lambda\Omega_{n-1}(I_1) + (1-\lambda)\Omega_{n-1}(I_2)$$

– We need to show that:

$$\Omega_n[\lambda I_1 + (1-\lambda)I_2] \geq \lambda\Omega_n(I_1) + (1-\lambda)\Omega_n(I_2)$$

Indeed,

$$\Omega_n[\lambda I_1+(1-\lambda)I_2]$$

$$= U[y-\lambda I_1-(1-\lambda)I_2]+\delta\Omega_{n-1}[F(\lambda I_1+(1-\lambda)I_2)-\lambda D_1+(1-\lambda)D_2]$$

$$\geq U[y-\lambda I_1-(1-\lambda)I_2]+\delta\Omega_{n-1}[\lambda(F(I_1)-D_1)+(1-\lambda)(F(I_2)-D_2)]$$

The last inequality holds because of the concavity of the production function and the increasing property of $\Omega$. Hence,

$$\Omega_n[\lambda I_1+(1-\lambda)I_2]$$

$$\geq \lambda U(D_1)+(1-\lambda)D_2+\lambda\delta\Omega_{n-1}[F(I_1)-D_1]+(1-\lambda)\delta\Omega_{n-1}[F(I_2)-D_2]$$

$$= \lambda\Omega_n(I_1)+(1-\lambda)\Omega_n(I_2)$$

The last inequality is due to the concavity of U $(\cdot)$ and $\Omega_{n-1}(\cdot)$.

We have proven that $\frac{{}^{2}\;{}_{t+1}}{I_{t+1^2}} < 0$. But then, by the Envelope Theorem we get $\frac{{}^{2}\;{}_{t+1}}{{}_{2}\;{}_{t}} = \underbrace{\underbrace{\frac{{}^{2}\;{}_{t+1}}{{}_{2}\;{}_{t+1}}}_{-ve}\underbrace{[af'(I_{t-1})]^2}_{+ve}}_{-ve}$

and this completes the proof.

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