Cosseting and Pulling the Rug On Incumbents: The Media and the Political Budget Cycle

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Abstract

Building from Rogoff's (1990) seminal work on Equilibrium Political Budget Cycles, I embed politically motivated media into an environment where taxes and spending in the provision of two public goods must be set in order to meet a balanced-budget condition, elections are held every other period, and there is technological uncertainty in the production of one of the public goods. Uncertainty originates in the incumbent's competency level, which is not observed by voters. However, there is a superiorly informed agent (the media) able to elicit with some probability a perfectly correlated signal about this competency shock, and who is able to spread this information across the polity. Yet, due to political preferences that are independent of the politician's skill in power, this agent might find in her best interest to withhold information when found, in order to alter the electoral outcome at the polling station in favour of those preferences. There is a range for the parameters considered in this model for which there is manipulation of agents' beliefs about the incumbent's capacity in manoeuvring the economy, in spite of all agents being fully rational and in spite of all of them knowing how strong the informed agent's preference for or against the incumbent is. As an important aside, we are able to find a new theoretical micro-founded model for Political Budget Cycles (JEL: 131, D82, D83, D84, D72, D78, H30).

Keywords. Equilibrium Political Budget Cycles, Expert Advice, Belief Manipulation, Technological Uncertainty, Media Bias, Public Information, Political Accountability, Electoral Control.

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1 Introduction

In this paper I embed politically motivated media into a standard dynamic Political Economy Fiscal Policy decision-making problem, where an office-motivated incumbent who seeks reelection sets, every period, and constrained by a balanced-budget condition, taxes and the provision

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of public goods. Elections are held every other period (every mandate last two periods), and all agents —voters, producers, and politicians—, are fully rational. I show that due to the media's intervention over political affairs, economic actions in such environment are disturbed in equilibrium, making the average level of taxes and current public expenditures fluctuate around electoral years unlike the way they do during non-electoral ones. I bring forth, therefore, a new micro-founded theory for Political Budget Cycles (PBCs) —as defined in Rogoff [25].

Herein, the PBC is originated in an attempt on manipulating voter's inference of the incumbent's competency, which although not being observed by voters, may be learnt with some probability by a better informed agent that we call the media, and who is also the agent exerting the manipulation over voters' beliefs. Competency takes here a very simple form. In the provision of one of two public goods, the politician must hire or acquire in the private market economy intermediate inputs that are produced by competitive price-taking firms. The ablest he is as a politician (which here takes the form of an exogenous shock), the fewer units of this input, at a given price, he will need in order to comply with the delivery of public goods that he is expected to come up with[1]. In addition to this technological uncertainty emerging from the political arena, production of this public good is also exposed to a simultaneous and exogenous shock which is independent of the incumbent's competency, and absolutely out of the polity's control. Agents observe the equilibrium price for input z and therefore extract valuable information from prices, though this process is limited. Indeed, due to their combined effect these shocks make agents' inference of each shock considered alone imperfect. Voters in the economy are willing to have the head of state as skillful as possible, and because administrative performance is correlated over time, the election is the opportunity for getting rid of those incumbents who do not come above a certain level of expected average competency. The sources for uncertainty leading to the 'informational' or 'signal extraction' problem, can be subdued to some extent by the media, who may learn the politician's competence and share this information before trading in the market for the intermediate good is carried out, refining thereby expectations and affecting for the better decisions at the polling station. However, the media may have political preferences and may not find in its best interest to spread the news when information about competence is revealed to them.

Indeed, the media is owned by a group of negligible mass, the elite, who noticeably have preferences for the incumbent that are independent of his/her skill in manoeuvring the economy and the polity. The key implication of this environment lies in that the media will have the incentive *and* power to either 'protect' their likeminded incumbent when there are bad news on his competence, or else to cast a shadow of doubt when good news about the incumbent have come to light and the media are not in favour of him. This is true despite all voters knowing on which side the media is on and how strong their political preference is, as I assume in this model. How far will the media go in protecting a bad incumbent or in harming a good one is among the issues we try to address in this paper[2].

[1] In the jargon of Hirshleifer [18] the competency level is then the source of technological uncertainty in this economy.

[2] Throughout the paper I use media both in its singular and plural form, indistinctly. This distinction will be important, however, when I study in an extension of the basic model the effects that pluralism within the media system (which must not be taken for the number of active outlets in the industry) has upon manipulation

The way through which the media inform voters and, from time to time, manipulate their beliefs, is as follows. The media play essentially two roles: they are able to elicit hard information on the incumbent's competence, with some probability (i), and they are able to spread information about this competence across citizens (ii); two fairly, yet perhaps optimistic, descriptive features of any mass media system. So whatever the media knows, everyone knows as long as the media decides to spread the news. But, and most importantly, the media might not learn something about the incumbent, and independently of having learnt something or not, it cannot lie about it. The hard information assumption constrains thus the media, who would have to bring forward any evidence supporting its reporting on the politician's competence if requested (we assume this is constitutionally enforceable). However, it can strategically decide to withhold information when found, if by doing so they are able to influence voters' decision at the polling station to their advantage. Indeed, if the media's preference in favour of the incumbent is strong enough and when their signal about the politician's competence level is not high enough for reelection purposes, they might decide to 'protect' him by sending a non-informative message[3]. This will affect the economy through two channels. First, producers of the intermediate input used in the production of one of the public goods, will have to forecast prices and demand with less information, facing two sources of uncertainty instead of one. Though being potentially important in terms of the model's economic variables' variation, this effect does not necessarily generate itself fluctuations around electoral years that differ from those obtained in non-electoral ones. Indeed, a second and more interesting channel is one bearing a 'suspicion effect' (as coined by Anderson and McLaren [3]) in agents' expectations. Agents in the economy know on which side the media is on, and know that if good news —that is, competence being greater than the expected competence of any politician drawn from the population at large— on the incumbent's competence had come to light, the media would have scrambled to spread the news[4]. They will conjecture, rightly, that if known, the competence parameter would lie somewhere between its lowest possible value and its unconditional mean, which implies tilting the posterior competence parameter's density function downwards, in such a way that the economy as a whole, in equilibrium, will fluctuate during electoral years in ways that differ from 'normal' years. This suspicion effect is, to be sure, the source for PBCs in this model.

To wrap up, the incumbent's competence affects the economy together with, and because of, the decision he makes on the amount of taxes and public good provision. By spreading the news the media draws closer together, stochastically speaking, producers' forecasted demand with actual demand in the market economy, and holds accountable the politician at the polling station; by withholding it, instead, they change the polity's economic performance and alter the inference that voters make on the politician's competence through observed prices. The latter may affect in turn decisions at the polling station[5]. Due to the existence of two independent

of voters' beliefs.

[3]Out of symmetry the argument applies the other way round: the media may decide to withold information when against an incumbent found to be highly competent.

[4]Certainly, as I show below, it is a dominant strategy to spread the news when the found competency of a favoured (not favoured) incumbent lies above (below) the unconditional expected competence value.

[5]Indeed, as it will be clear below, without this possibility the media would not have incentives to manipulate the economy, and the model would have to be dismissed all together.

stochastic shocks inference is imperfect, and there lies the power and interest of the media in manipulating, from time to time, the economy. This is despite all voters being fully rational. As a consequence of this conflict, we are able to find a new micro-foundation for Political Business Cycles, which enriches the predictions on this political cycle by introducing a simple monitoring technology which also captures some important aspects of real world monitoring of politicians quality through mass media reporting.

A Related Literature

This paper brings together two strands of the major category of Political Economy literature which have had until now nothing in common except that their authors all belong to the same academic cadre. On one hand, it follows much of the recent literature on Media Bias when choosing the features that one is willing the media to have without losing tractability, in particular the assumptions on the supervision technology —which is able to hold politicians accountable—, and its related implicit slanting technology: the withholding of information (see in Besley and Prat [5] and Anderson and McLaren [3] application of this supervision technology). On the other hand, it provides an alternative answer to why Political Budget Cycles are created, a topic that remains to present an unresolved puzzle in the literature on the Political Business Cycle. A first contribution of this paper is, therefore, intersecting these two seemingly unrelated bulks of literature. By doing so I provide a new model for PBCs and extend or bridge gaps in each of these literatures considered alone.

Indeed, though much has been said on Mass Media Bias[6], much less has been said about its consequences upon ultimate economic outcomes. It is true that in this literature media bias *may* have consequences on some political decisions, which in turn, it is presumed, will affect the economy; but the link is thin at best, and never explicit. The present paper attempts filling in, to some modest extent, this gap, by focusing on one particular Political Economy type of problem, namely the theory of PBCs.

The link with the literature on Political Business Cycles initiated by Nordhaus [24], is of a different kind. This literature is large, and has been running now for more than 35 years (Drazen [10]). One of its most remarkable features is that in spite of having plenty of evidence on pre and post electoral Political Business Cycles on the empirical side, there is still no agreement on how these cycles are created. There is consensus though in that the monetary approach (such as the one stressed by several of Alesina's and other authors' contributions (see for example Alesina [1] and Alesina and Roubini [2]) is unsatisfactory in explaining them[7]. A more auspicious avenue of research seems to be one exploiting either models combining both monetary and fiscal policies, or models featuring only fiscal issues instead (such as Rogoff [25] and Rogoff and Sibert [26])[8]. In this paper I take the latter route, which though sharing much of their

[6]See Besley and Prat [5], Baron [4], Stromberg [27], Ellman and Germano [11], and most remarkably, the piece by Anderson and McLaren [3], for supply-driven bias. On demand-driven bias, see Gabszewicz et al. [12] , Mullainathan and Shleifer [22] and Gentzkow and Shapiro [13]. Most prominent empirical work includes Groseclose and Milyo [16], DellaVigna and Kaplan [8] and Gentzkow and Shapiro [15]. See Gentzkow and Shapiro [14] for a review with discussion of most interesting results from this disperse if eclectic literature.

[7]As Drazen points out: "... after twenty-five years, monetary surprises as a driving force of a PBC just do not provide a very convincing story" (see Drazen [10], page 95).

[8]For a discussion of all these and other related issues see Drazen [9] and Drazen [10].

environment and motivation, differs in several aspects to the ones found in those related works studying the Political Budget Cycle. In particular, I provide a new micro-foundation for PBCs which does not hinge on a signaling game between the incumbents and the voters. Besides, I also enrich the description and characterization of the PBC, as compared to these and other works, providing a wider range of possible outcomes and predictions. That said, the extent to which the media can influence the cycle in my model is limited by pluralism and the degree to which media exhibits politically motivated behaviour.

More generally, the supervision technology and information transmission conflict in the present paper follows Milgrom and Roberts [21], the media being the interested and informed party, and the voters and producers the uninformed agents who request information to the informed one in order to make-up a decision. The model can also be interpreted as a strategic comunicational game between an informed sender (the media) and an uninformed receiver (private agents in the economy) who takes an action that affects the welfare of both (see Crawford and Sobel [7]). The more the sender's welfare function resembles that of the receiver, the less noise there will be in the transmission of information. In the present paper this is also true: the stronger is the pull in favour or against the incumbent (the receivers being neutral in this respect), the more scope there will be for manipulation, and the more volatile the cycle will be.

2 The Basic Model

A The Representative Citizen and her Preferences

The economy is composed of a large and constant number of *ex-ante* identical agents, each indexed by i in [0,1], of overall mass equal to 1. Agents in this polity and economy derive utility from consumption of private and publicly provided goods. The publicly provided goods are produced, managed and supplied by a citizen (a politician) appointed in power through a majoritarian election rule held every other period[9]. The representative agent[10] cares for the expected value of his utility function, $E_t(W_t)$, where E denotes rational expectations based on the representative agent's belief on the state of the economy, t is a time subscript, and

$$W_t = \sum_{s=t}^{T} [U(c_s, g_s) + V(k_{s+1})]\delta^{s-t} \tag{2.1}$$

In equation (2.1) c is the representative citizen's consumption of the private good, in units of final output y, g is current government expenditures, and k is the publicly provided good which uses in its production an intermediate privately produced input z (see below).Both g and k are non-storable. Most importantly, the realization of k is only observed and "consumed" with a lag, reflecting thereby the realization of long-term reforms and projects that only come to light with time. $U(.)$ and $V(.)$ are standard strictly concave and twice differentiable increasing

[9]This electoral timing serves fundamentally one purpose. It allows us two assess and then compare, fluctuations in the main macroeconomic variables of interest — taxes and current expenditures — for both electoral and non-electoral years.

[10]Hereafter I will refer to this agent indistinctly as a "citizen", "consumer", or "voter".

functions with $U'(0) = V'(0) = \infty$. Further, we assume that neither private consumption c, nor consumption of the publicly provided good g, are inferior goods. That is

$$U_{cg} + U_{gg} < 0 \text{ and } U_{cg} + U_{cc} < 0 \tag{2.2}$$

Some additional conditions on $V(.)$ are introduced, in order to make sure that the price for the intermediate good is decreasing (or that demand is downwarly sloped) in the politician's competence. Thus

$$V''(k)k + V'(k) < 0 \tag{2.3}$$

In addition, we assume

$$\lim_{x \to \infty} V'(x) = 0 \tag{2.4}$$

and

$$\lim_{x \to 0} V'(x) = \infty \tag{2.5}$$

Finally, $\delta < 1$ is the representative citizen's discount rate and T his/her time horizon, which may be infinite. I assume all consumers and voters form expectations rationally using Bayes rule.

B Technology and Production

At the beginning of every period, and exogeneously, all agents receive y units of income. Most importantly, in the production of the publicly provided and non-storable good k_{t+1}, the government must hire or acquire units of a non-storable intermediate input (with free disposal), z. In the provision technology of k_{t+1} the government uses the following technology

$$k_{t+1} = \vartheta_t \varepsilon_t Z_t \tag{2.6}$$

where ε is the politician's actual competence[11] and Z is the governmental demand for input z. The higher the politician's competence, the fewer units of input z she would have to acquire in the market for this input, at a given price, in order to deliver a given amount of k_{t+1}. Importantly, the level of competence is only known to the politician (private information)[12], and therefore is, from the point of view of other agents in the economy, a source of technological uncertainty in the production of k_{t+1} (see Hirshleifer [18]). There is however another source of uncertainty, captured by parameter ϑ, which is an independent shock not observed by any agent, capturing uncertainty in the provision of the long-term project k_{t+1} that is out of the polity's control[13]. I assume ϑ to be a i.i.d random shock drawn from common knowledge

[11] Likewise, it can be interpreted as the combined efficiency of members of the political party or coalition in power, or of those members of the party with formal responsabilities in the government.

[12] Main results would remain essentially unchange if he did not observe his competence, as it is assumed in some recent related works (see Bonfiglioli and Gancia [6]).

[13] The state of the world economy, international stability, wars, etc.

probability distribution $F_1(\vartheta)$ with density $f_1(\vartheta) > 0$, in the support $(0, \tilde{\vartheta}]$. In addition I assume $E(\vartheta) = \bar{\vartheta} = 1$.

Note that given the implicit timing in equation (2.6), the competence parameter will be learnt by all agents with certainty, but with a lag. Changing the time length that the long-term project k takes for its realization (say, k_{t+i}, with $i > 1$), will not change the results qualitatively[14]. For simplicity's sake, I assume that the amount of the external shock ϑ is known a period ahead of its realization. That is, at the beginning of every period t, ϑ_{t-1} is revealed to all agents in the economy.

We shall now turn to production of input z, which deserves special attention. Production of z is carried out by a large number of *ex ante* identical and scattered atomic producers. For the time being I assume producers to be a group of agents that do not coincide with the representative agent described above[15]; a more general approach is tackled in an extension to our basic setup. Furthermore, for simplicity I assume that members of this group do not vote[16], and for that reason I have excluded them in our description of the representative agent. I will not consider therefore their decision problem when voting, and will spare myself from imposing any particular form on the final material welfare that these agents have, for it is uninteresting for the task before us. Because these producers to not bear any consequence upon the election, other than the information they generate through their expectations and prices, for simplicity I assume that they have total mass equal to 1.

In order to introduce expectations in a simple way, we assume that in any period, production of the non-storable input z takes some time, and must be carried out at the very beginning of the period, before the government's demand of z for the production of k_{t+1} is set (there's a small interval of time —an interim interval — within each period, where production of z must be carried out). In fact, under this assumption, the quantity of z is supply-determined. What the government will set, is the price (the amount to be paid) for total supply of z (given z's perfect divisibility, all supply is absorbed by the government, but at different prices).

So at the beginning of every period, total supply of input z, z^S, is produced in a competitive industry with a large number of identical small firms (all price takers), maximising each the following expected profit function

[14]However, its combination with the mandate's length and the stochastic process for competence (to be described below) is not a nuance in the model and should be addressed in extensions to the basic setting being described here. In passing, note that k is not an accumulating factor, that we would be tempted to interpret as public investment.

[15]For example they own or are endowed with a productive factor used in the production of z to which other agents in the economy do not have access to.

[16]If the reader is uneasy with this assumption, one alternative interpretation with identical properties is that producers do not constitute a majority. As a consequence, as long as ordinary consumers constitute the majority in every election, their preferences, and not those of producers, will be considered when setting taxes and spendings. This assumption does not alter our results to any extent, as long as producers do not own the media. In this latter case, they would always use information about the incumbent if found in order to maximise profits (see below), but not necessarily share this information with other constituencies as long as there are political motives for doing so, as we assume the elite owning the medias has. In any case, we would not observe in that case a budget cycle, though the media would still influence the election: in our model voter's signal extraction is weaker and its consequences upon politicians' accountability more severe, if producers own the media.

$$E_t\tilde{\pi}_t = E_t\tilde{p}_z z - C(z) \tag{2.7}$$

where $C(.)$ is a cost function satisfying all standard assumptions ($C' \geq 0$, $C'' > 0$, and $C(0) = C'(0) = 0$). So production is certain: for given expected price, once the planned amount z is decided upon there's no way back. Note that the equilibrium price, at the time production of z has to be carried out, is a random variable. E denotes the expectations operator and $E\tilde{p}_z$, therefore, is the price of input z expected to prevail at the end of the period, when trade for z takes place. By doing this we are introducing in a very simple way short-period variations in an industry with lagged production of a commodity which cannot be stored[17].

Several important remarks are in order before continuing with the description of the model. First note that, as will become clear below, without the aggregate shock ϑ affecting production of k_{t+1} (and therefore demand of z), there would be a perfect mapping from the final observed price of input z to the competency parameter ε, which would erode away any incentive by the media of withholding information when found: agents would learn the politician's competence before they vote. Technological uncertainty in the production of k_{t+1}, therefore, becomes an interesting informational problem due to the introduction of the price of input z as an informative though not perfect signal of the state of the economy. And, as we will see, a more interesting one due to the media's interference. So when fleshing out Anderson and McLaren [3]'s model, in order to embed it into a specific Political Economy issue, rationality imposes further restrictions on the scope for media manipulation, as we show below.

But the introduction of a signal extraction problem, through price of input z is not merely a modelling choice. It explicitly introduces agents in the economy (producers) who will have incentives to heed (and pay for) the media's message in order to decide upon actions that have consequences on their private material welfare. It is indeed a key element in our approach, conforming to recent work on the role of the media in political affairs (see in particular Anderson and McLaren [3] and Stromberg [27]) where the paradigm is that of having readers buying newspapers out of the private benefit they get from doing so (because there is information improving the decision-making process of private actions). This approach is a convenient way of not having to address the difficult task of rationalizing politically motivated behaviour among uncoordinated rational agents. In our model we do not resort to Kantian arguments to justify why people want to buy newspapers to decide what to vote[18]: newspapers exist because producers are willing to pay for information released by the media in order to maximise expected profits.

[17] I follow here Grossman [17]'s simple setting when introducing Muth [23]'s seminal concept of rational expectations. One way of making explicit this environment for production of z is that "producers" own, or are endowed with, a fixed non depreciating capital good exhibiting decreasing returns which, together with a commodity (say h) that is itself salable in international markets to which these producers have access but are not able to influence (the international price for h is constant), serves in the production of z. This capital good cannot be expropiated and we assume all of them holding an identical amount $\bar{l} > 0$ of this production factor (it may help thinking this factor as land or human capital, or some other production factor that is fixed in the short run).

[18] As it is stressed in the voting literature, purchasing newspapers in order to be informed on public affairs and make up a decision regarding an impending election only is not optimal from an individual cost-benefit point of view.

Finally, I assume that in every period the government runs a balanced-budget. Importantly, in order to produce k_{t+1} the politician buys units of the intermediate input in the private economy. To finance total spendings, it applies a lump-sum tax τ. Thus,

$$\tau_t = g_t + p_{zt} Z_t \tag{2.8}$$

C The Structure of Elections and the Incumbent's Utility Function

Every presidential mandate lasts two periods (elections are held every other period). But a politician may run for office an indefinite number of times[19]. We assume that candidates are withdrawn randomly from the population, and have same preferences as the representative agent (see equation (2.1)). In order to study the media's intervention in the clearest way, I assume that any rents from holding office are taken arbitrarily to zero, and that a politician is obliged to go for reelection at the end of his mandate (he cannot step aside)[20]. By assuming this I shut down any possible signaling game, as the found in Rogoff [25]'s, where the incumbent manipulates τ and/or g in order to signal his ability as a politician.

No wonder, the incumbent will act as an automaton under this framework. In an extension to the present model I show how the signaling game described in Rogoff [25]'s is modified by the media's intervention[21], but first we must understand well the main mechanism through which the media can influence strategically both the budget cycle and electoral outcomes without the incumbent's participation.

D Utility Function and Special Properties of the Elite

A small group that we name 'the elite' and denote with e, of arbitrarily small mass ($e < 1$ and $e \longrightarrow 0$), exhibits the following three properties:

Assumption 1 (**The elite owns the media**). *The elite owns the media, and is able to spread messages in the form of public announcements that reach every corner of the polity. It also can use the media's technology to find out the incumbent's contemporaneous competency shock.*

Assumption 2 (**The elite holds Superior Information**). *The elite, through their exclusive ownership of the media industry, can use the media's technology in order to produce superior information concerning the publicly provided good's technological uncertainty.*

The way superior information is generated and modeled here is simple. With probability π the media are able to find out the incumbent's contemporaneous competence shock; with

[19] So if an incumbent elected for the first time in history is reelected at the end of his first mandate, his overall time in power will last at least four periods. And so on.

[20] An alternative, rendering similar qualitative results, would be to assume that the incumbent does not know his competency.

[21] In that case, and following Rogoff [25], welfare of the incumbent is augmented by a fixed parameter, say X, capturing ego rents of running office, making sure as a result that the incumbent is willing to serve another presidential period. In that case, the incumbent's expected utility at period t would be $E^I(W_t) + \sum_{s=t}^{T} \delta^{s-t} X \gamma_{s,t}$, with $\gamma_{s,t}$ the probability of being reelected at time s according to information at time t. Note that with X sufficiently high, the incumbent would have incentives to manipulate taxes and spendings in order to alter $\gamma_{s,t}$ (the probability of reelection is controlled to some extent by the politician), by costly signaling to voters his "type".

probability $1-\pi$ it learns nothing. As for the ordinary citizens, they never learn the incumbent's competence level contemporaneously unless the media makes a public announcement revealing it. The power of making these messages spread across the polity's constituencies is monopolised by the elite. We assume further that the extracted information is hard information (in the spirit of Milgrom and Roberts [21]'s informed but interested party). That is, the media can provide evidence (proofs) on the declared incumbent's competence only when it has learnt its value[22]. Because this is common knowledge, it is optimal for producers and voters to heed what the media says when making up a decision.

Assumption 3 (**The elite is political**). *We assume that at the beginning of every period, once a politician has been elected, and before production is carried out, the elite learns their preference for the incumbent, which is independent of the politician's competence, if known. Importantly, the value of this partisan preference is known to all agents in the economy.*

This is the source of bias and heterogeneity among the fellow citizens with respect to their preferences (being the information they handle another source of disparity of course). In all other respects, note that all citizens are equal. In particular regarding the component of welfare that is purely economical and their rational behaviour.

This political preference is captured by parameter λ, that enters linearly into the representative elite's utility function (see equation (2.1)). The higher is λ the stronger is the elite's preference for the incumbent[23].

To keep things simple we capture this property by assuming a stochastic preference shock that enters linearly into the elite's overall welfare. So in every period the elite have the same preferences as the representative voter except for a taste parameter measuring their closeness to the politician[24] that we denote λ. The elite's instantaneous utility function in period t is therefore described by the following function

$$\Gamma_t^e = \Gamma_t^r + \lambda_t \tag{2.9}$$

With $\Gamma_t^r = U(c_t, g_t) + V(k_{t+1})$ and where subscript r denotes 'representative voter', whose utility function is the one described in equation (2.1); subscript e denotes the elite. The partisan preference follows a short memory process. Indeed, we assume that

$$\lambda_t^{\mathfrak{I}} = \kappa_t^{\mathfrak{I}} + \kappa_{t-1}^i \tag{2.10}$$

With and κ distributed with distribution function $L(\kappa)$ in the support $[-\bar{\kappa}, \bar{\kappa}]$, with density $l(\kappa) > 0$, and $E[\kappa] \equiv \int \kappa dL(\kappa) = 0$. This is common knowledge.

This heterogeneity is the one making the transmission of information from the media to the public a non-trivial matter. As in Crawford and Sobel [7]'s seminal work on strategic

[22]This supervision technology is a direct application of Anderson and McLaren [3] to a specific economic problem.

[23]Note that this preference shock follows the probabilistic voting model approach, first proposed by Lindbeck and Weibull [19].

[24]Some may interpret this parameter as sheer cronyism or a reduced form for bribes. Note that in the latter case, however, under our assumptions voters would observe corruption, and would probably decide to oust a politician independently of his skills in power.

information transmission, the sender (the media) is willing to send some information, but probably not all information, to the receiver (the producers of input z in our economy). This information will be used to make up a decision regarding an action that has consequences on both agents' utility functions. By using Milgrom and Roberts [21]'s environment we of course limit or constrain the possible messages that the media may send, but the basic conflict remains as in the former. Indeed, the closer preferences are between the media and the public, the less scope for manipulation there will be, which is precision enhancing from an *ex ante* perspective.

When the elite/media dislike the incumbent they will have incentives to manipulate beliefs (by withholding information) in order to alter the economy's performance, putting the incumbent into trouble. Conversely, if the elite likes the incumbent then they may withhold information proving the incumbent to be too incompetent, in order to help him staying in power. Being rational, however, producers will suspect the media's withholding of information when messages do not carry any precise information on the competency parameter, and make inferences based on this conjecture, which will affect the economy in turn. As long as messages are non-informative and the political shock is imperfectly disentangled from the non-political one (ϑ), there will be a range of values of the competency parameter for which the media is better off withholding information when found.

So in equilibrium, as we show below, messages sent by the media can influence the production of z and therefore the agents' inference of the politician's contemporaneous competency parameter. I denote with M the message sent by the media and assume that it is either empty: $M = \varnothing$ (when nothing has been learnt or when the media decides to withhold information concerning the competency value if found); or is the revealed competency parameter itself; that is, if the found competency parameter is $\tilde{\varepsilon}$ then $M = \tilde{\varepsilon}$. So M takes values from the support of the competency parameter when it is learnt by the media *and* the media is willing to spread the news.

E Stochastic Structure

All agents can serve as president. But they differ in terms of their ability in producing the publicly provided good k_{t+1} *when* in power. For any citizen i appointed as president, competency evolves according to the following serially correlated stochastic process[25]

$$\varepsilon_t^i = \begin{cases} \frac{1}{2}\alpha_t^i + \frac{1}{2}\alpha_{t-1}^i \text{ if } i \text{ is the incumbent} \\ \alpha_t^i \qquad\qquad \text{if } i \text{ is a challenger or any candidate in an open seat election} \end{cases}$$

We assume that α_t^i is drawn from a distribution function in the support $[\alpha_*, \alpha^*]$, with $\alpha_* > 0$ and $\alpha_* < \infty$. This random variable has density $f_2(\alpha) > 0$, with associated cumulative distribution function $F_2(\alpha)$. We further assume that its unconditional mean is $\bar{\alpha} \equiv E(\alpha) = \int_{\alpha^*}^{\alpha_*} \alpha f_2(\alpha) d\alpha$ and define its unconditional variance as σ_α^2, such that $\sigma_\alpha \equiv \int_{\alpha^*}^{\alpha_*} (\alpha - \bar{\alpha})^2 f_2(\alpha) d\alpha$. This is common knowledge.

[25] This is following closely Rogoff [25].

Hence, the message M sent by the media is either such that $M \in [\alpha_*, \alpha^*]$ or $M = \emptyset$ if no message is to be conveyed.

We assume that shocks are independent across agents and across time when an incumbent has been reelected. Also note that this stochastic structure prevents any incumbent that has proven to be highly competent in his early mandates, to remain in power more than two presidential periods with certainty. The model is exhibiting short memory, capturing realistically the fact that the ability in manoeuvring the economy and the polity may wither off across time[26].

Recall that in period $t+1$, once the public good k is realized and the election is over, ϑ_{t-1} is observed and so is α_t^i. Indeed, the tax level τ and the amount of public good g are observed, and so is the price for input z. Therefore, from (2.8) voters infer z_t. Using (2.6), finally, they infer past competence.

F Information Structure and Timing of events

At the beginning of any period following an open seat election, the competency shock is realised and with some probability, observed by the media. Also, nature draws the elite's preference for the politician, parameter κ, with its value known to all agents. The media then decides what message M to send to the public. At the beginning of period t, once period $t-1$'s mandate and election are over, everybody learns ϑ_{t-1} and thus α_{t-1}^i and ε_{t-1}^i.

After observing the media's message rational producers decide how much input z to produce.

By the time production of the final good is to be carried out, total supply of input z in the economy is predetermined, after using the media's information. Trade in the market for z determines the equilibrium price for this input. Demands is hit at the time trade is carried out, by an aggregate demand shock ϑ. The price the government will pay for Z is realised in equilibrium.

The tax amount τ, current expenditures g, and the price of input z, are all determined simultaneously in equilibrium[27]. These quantities are observed by all parties. At the end of the period voters must decide between keeping the incumbent in power or electing a challenger drawn from the population at random. When doing so they infer the incumbent's competence if no informative message has been publicised by the media, using observation of p_z, the media's preference for the incumbent, and producers' supply of input z. The voting rule v_t is in that case as follows

$$v_t = \begin{cases} 1 \text{ if } E_t(\Gamma_{t+1}^I) \geq E_t(\Gamma_{t+1}^O) \\ 0 \text{ otherwise} \end{cases}$$

Where $v_t = 1$ means voting for the incumbent (I), and $v_t = 0$ commands voting for the opponent (O).

If the media does convey an informative message, then the voting rule is simple. If $M = \varepsilon^M > \bar{\alpha}$ then the voters will keep the incumbent; otherwise they will oust him from power.

[26] In addition, note that, as in Rogoff [25], competency is not something that the politician chooses, but rather an intrinsic individual characteristic.

[27] Consumption is carried over at the end of the period. Recall that the amount of z is predetermined.

3 The Model with Full Information

To build the simplest benchmark, we assume that both the competence parameter and the production shock are known to all parties with certainty. We study hence the solution of our problem for a given pair (ε, ϑ).

As utility of both the politician and his fellow the representative citizen coincide, we consider the incumbent's problem. He must maximise (2.1) subject to the following constraints. First, consumption must equal disposable income, which corresponds to total income minus taxes τ.

Secondly, we assume that the government always runs a balanced budget (equation 2.8). Note that because the incumbent's actions cannot affect economic outcomes further than "t" (except the level of k, observed at time $t+1$, and which he can only affect by investing today in input z), his problem boils down to the maximisation of his current utility. Using (2.6) and (**??**) we have the following program at time "t"[28]

$$\max_{c,g,z\geq 0} U(c,g) + \delta V\left(\vartheta \varepsilon z\right) \tag{3.1}$$

Subject to

$$g + p_z z \leq \tau \tag{3.2}$$

and

$$c \leq y - \tau \tag{3.3}$$

From these equations we show in the appendix that total demand for z, Z, is a decreasing function of the competency parameter.

On the supply side of input z we know that with full information the prevailing price is perfectly anticipated by producers (there's perfect foresight). For a given price, any individual producer maximises

$$\max_{z} \pi = p_z z - C(z) \tag{3.4}$$

the solution to which we denote $z^* = H(p_z)$, with $H(p_z) \equiv \frac{\partial C^{-1}(z(p))}{\partial z} > 0$, the marginal cost's inverse function. Then, total supply of z at the end of the period will be

$$z^S = \int_n H_n(p_z) dn \equiv H(p_z) \tag{3.5}$$

Where n denotes a single producer, the integration variable.

Call p_z^* the price clearing the market. We can now state our first property for the case under complete information.

Property 1. *There exists a unique price p_z^* clearing the market for z, which is strictly decreasing in the politician's competence ε. Consumption c and the publicly provided good g are both stricly decreasing in p_z, whereas the tax level τ is strictly increasing. The representative agent's instantaneous welfare is decreasing (increasing) in the price of input z (competence).*

[28] We drop time subscripts for all variables to ease notation.

Because we have assumed that the politician's competence is known, nothing less is required in order to predict the electoral outcome. Indeed, if the contemporaneous competence shock is above $\bar{\alpha}$ voters will keep the incumbent, and oust him otherwise, just as in Rogoff [25] under full information.

In our case, the incumbent will be reelected if[29]

$$E_t W^*[p_z^*(\varepsilon_{t+1})] - E_t W^*[p_z^*(\varepsilon_{t+1}^O)] \geq 0 \tag{3.6}$$

Where the first term in the LHS of the inequality is given by

$$\begin{aligned} E_t W^*[p_z^*(\varepsilon_{t+1})|\alpha_t = \alpha^i] &\equiv \Omega^i \\ &= \int_{\frac{\alpha^i}{2}}^{\frac{\alpha^i+\alpha^*}{2}} W^*[p_z^*(\varepsilon)] f(\varepsilon) d\varepsilon \end{aligned} \tag{3.7}$$

Because voters cannot learn anything about the opponent's competence we have (they take the unconditional mean)

$$\begin{aligned} E_t W^*[p_z^*(\varepsilon_{t+1}^O)] &\equiv \Omega^O \\ &= \int_{\alpha_*}^{\alpha^*} W^*[p_z^*(\varepsilon)] f(\varepsilon) d\varepsilon \end{aligned} \tag{3.8}$$

Analogously to the case in Rogoff [25]'s, if $\alpha^i > \bar{\alpha}$ then $\Omega^i > \Omega^O$, and $\Omega^i < \Omega^O$ otherwise.

4 The Model with Uncertainty

Now we consider an incomplete information environment. To understand how the media influences the budget cycle, we first analyse the case absent its influence, and from there we move to environments with media. In the latter the emphasis is put on how different messages sent by the media alter the key variables.

A Uncertainty without Media

The key variable making agents heterogenous as to the information they have, is the incumbent's competency. Now we must take into account when retrieving the equilibrium price of z, the beliefs of both the rational producers and the politician himself about the state of the economy (recall that the politician does not know ϑ). The solution and equilibrium concept is that of a Bayesian Rational Expectation Equilibrium (BREE), where a unique state of the economy is described by the pair (ε, ϑ).

[29] I have kept Rogoff [25]'s notation in all parts where the environment coincides to make comparison as neat as possible.

Definition 1. *A Bayesian REE for this economy is the vector* $(z^*, \tau^*, g^*, p_z^*)$ *such that for any state possible state* (ε, ϑ)*:*

1. (z^*, τ^*, g^*) *solves the incumbent's problem;*
2. $p_z^*(\varepsilon, \vartheta)$ *is a price function clearing the market for input* z *at any state of the economy;*
3. z^* *maximises producers' expected profits, given the price function* $p_z^*(\varepsilon, \vartheta)$*;*
4. *Beliefs are update using Bayes law.*

Take the incumbent's problem and consider any state of the economy (ε, ϑ), which is partially known by the incumbent, who knows ε. Note that if an equilibrium exists, the incumbent will know everything after observing the price, from which he will infer the remaining parameter describing a given state, ϑ. Now, suppose that we have a joint distribution function for these parameters conditional on the equilibrium price, that we denote $F(\vartheta, \varepsilon | p_z, H(p_z^e))$ (recall that both producers' expectations and the equilibrium price are known at the equilibrium), where p_z^e denotes the price that producers expect to prevail, which is observed by all parties before trade is carried out. Then the problem the incumbent has to solve is the following

$$\max_{c,g,z \geq 0} U(c, g) + \int \delta V\left(\vartheta \varepsilon z\right) dF(\vartheta, \varepsilon | p_z, H(p_z^e)) \tag{4.1}$$

Solving this problem follows similar steps as those described in the appendix for the complete information case. A key necessary condition for an interior solution, for given expectations from producers, and assuming that the market clears, is the following

$$p_z = \int \delta \delta V'\left(\vartheta \varepsilon z\right) \left(h\left(\vartheta \varepsilon H(p_z^e)\right)\right)^{-1} \vartheta \varepsilon dF(\vartheta, \varepsilon | p_z, H(p_z^e)) \tag{4.2}$$

We look for a REE price. A REE price, as defined in Lucas [20], is a continuous, nonnegative function $p_z(.)$ of the state of the economy, which in this case is described by the pair (ε, ϑ)[30], with the aggregate supply of input z, $H(p_z^e)$, bounded away from zero. For the time being, we assume the latter to hold true, and then check its validity when studying the optimal behaviour of producers. Any REE price of such characteristics also satisfies the following condition

$$h\left(\vartheta \varepsilon H(p_z^e)\right) p_z(H(p_z^e), \varepsilon, \vartheta) = \int \delta V'\left(\vartheta \varepsilon H(p_z^e)\right) \vartheta \varepsilon dG(\vartheta, \varepsilon | p_z(H(p_z^e), \varepsilon, \vartheta), H(p_z^e)) \tag{4.3}$$

Where $G(\vartheta, \varepsilon | p_z(H(p_z^e), \varepsilon, \vartheta), H(p_z^e))$ is the objective joint distributon (using the posterior conditional densities) of the uncertain parameters conditional on the price and $H(p_z^e)$, both observed by the politician and producers in the market for z.

[30]It is implicit in this configuration, that ε is composed of both past and present competency shocks: α_{t-1}, which is known, and α_t, which is only known to the politician. We have omitted such terms to simplify notation. Also note that in the case with media, and in an important way, a state of the economy will also be described by the partisan preference shocks of the media, κ_t and κ_{t-1}, which are known to all parties.

We first note that if there is a solution, this solution is monotonic in $\vartheta\varepsilon$: if $\vartheta_0\varepsilon_0 > \vartheta_1\varepsilon_1$, then $p_z(H(p_z^e), \varepsilon_0, \vartheta_0) \neq p_z(H(p_z^e), \varepsilon_1, \vartheta_1)$. To prove this we proceed by steps. First I define $\varrho = \vartheta\varepsilon H(p_z^e)$. Note that for given $H(p_z^e)$, $\varrho_0 = \vartheta_0\varepsilon_0 H(p_z^e)$ is greater than $\varrho_1 = \vartheta_1\varepsilon_1 H(p_z^e)$ only if $\vartheta_0\varepsilon_0 > \vartheta_1\varepsilon_1$. So proving that any solution would be monotonic in $\vartheta\varepsilon$, for given $H(p_z^e)$, is equal to proving its monotonicity respect to ϱ.

Now, to prove this property, assume on the contrary that is $\varrho_0 > \varrho_1$ is true but $p_z^0 \equiv p_z(H(p_z^e), \varrho_0) = p_z(H(p_z^e), \varrho_1) \equiv p_z^1$. Then from (4.3) we would have

$$h(\varrho_0)p_z^0 = \int \delta V'(\varrho_0)\varrho_0 dG(\varrho|p_z^0, H(p_z^e)) \tag{4.4}$$

and

$$h(\varrho_1)p_z^0 = \int \delta V'(\varrho_1)\varrho_1 dG(\varrho|p_z^0, H(p_z^e)) \tag{4.5}$$

But this is impossible by virtue of equation (2.3).

This implies that the distribution conditional on $p_z(H(p_z^e), \varepsilon, \vartheta)$ and $H(p_z^e)$ is the same as the distribution conditional on $\vartheta\varepsilon$ and $H(p_z^e)$ for all solution functions $p_z(.)$.

Following the standard method, we conjecture next a possible solution, and show that it is indeed a solution, and furthermore, that it is unique for given $H(p_z^e)$. Suppose a solution exists, and denote it $p_z(\varrho) = p_z(H(p_z^e), \varepsilon, \vartheta)$. If $p_z(\varrho)$ is a solution, then a key step is recognizing that at the equilibrium the incumbent would know everything: he will infer ϱ, and, for given and known $H(p_z^e)$, $\vartheta\varepsilon$. And because he knows ε, he infers ϑ. That is, at equilibrium $p_z^* = \psi(\varrho)$, which implies $\varrho = \psi^{-1}(p_z^*)$. But knowing $H(p_z^e)$, implies $\vartheta\varepsilon = \frac{\psi^{-1}(p_z^*)}{H(p_z^e)}$. Indeed, from (4.3), at the equilibrium a solution satisfies the following condition (where we have exploited the incumbent's knowledge of his competence)

$$h(\varrho)p_z(\varrho) = \delta V'(\varrho)\varrho \tag{4.6}$$

or

$$p_z(\varrho) = \frac{\delta V'(\varrho)}{h(\varrho)}\varrho \tag{4.7}$$

We have found the unique solution to our problem, for given $H(p_z^e)$, which as shown in the appendix, is strictly decreasing in the incumbent's competence and producers' supply of the input, and in the general productivity shock ϑ. Yet, because any message sent by the incumbent to voters about θ would not be credible, the fact that the incumbent knows everything at the equilibrium does not mean that voters do. The incumbent cannot credibily transmit that ϑ is the value he has observed. Unless voters observe either the highest or lowest possible price (when $\vartheta_{min}\alpha^*$ and $\tilde{\vartheta}\alpha_*$ are realized, respectively), where inference would be perfect, they only observe the price (note that they cannot observe ϑ and ε nor $\vartheta\varepsilon$). Note that, from equation (4.7)

$$p_z'(\varrho) = \delta\frac{\left[\left(V''(\varrho)\varrho + V'(\varrho)\right)h(\varrho) - h'(\varrho)V'(\varrho)\varrho\right]}{h^2(\varrho)} < 0 \tag{4.8}$$

Importantly, this also implies that the price is strictly decreasing in $H(p_z^e)$. Also note that $p_z(\varrho)$ is a bounded function. Denote $\psi(\varrho) = \frac{\delta V'(\varrho)}{h(\varrho)}\varrho$. We can now gather all these results in the following property.

Property 2. *For a given $H(p_z^e)$ equation (4.3) has exactly one continuous solution $\psi(\varrho)$ on $(0, \infty)$. The function $\psi(\varrho)$ is strictly positive and continuously differentiable. Further, it is the unique equilibrium price function.*

Now we turn to the producers' problem. Given property (2), for given $H(p_z^e)$ (that we denote hereafter by z^* to ease notation), the producers know the solution function, and also know the price function's density function, that we denote by $f_p(p_z) > 0$. Furthermore, we assume that the conditional density $f_p(p|z^*) > 0$ exists and is well defined. Therefore the price expected to prevail, conditional on the quantity of input to be supplied, z^*, is $p_z^{e|z^*} \equiv E[p_z|z^*] = \int p_z f_p(p_z|z^*)$. Then the producers solve at the beginning of any period the following programme

$$\max_z \pi = p_z^{e|z^*} z - C(z) \tag{4.9}$$

The solution to which is $z = H(p_z^{e|z^*})$. Note that there is a unique solution to this problem. Indeed, a solution satisfies: $\Theta \equiv z^* - H(p_z^{e|z^*}) = 0$. Notice that Θ is continuous in all its arguments. Besides

$$\frac{\partial \Theta}{\partial z^*} = 1 - H'(p_z^{e|z^*})\psi'(\varrho)\varrho > 0 \tag{4.10}$$

Which is strictly positive. Further, $\Theta \to \infty^+$ when $z^* \to \infty^+$, and $\Theta \to \infty^-$ when $z^* \to 0$. So there is a unique solution.

Finally, we consider the voters' inference problem. What do we assume the voters know? In this basic setup, we assume they know z^*, and they know the price. Their problem is to compute the next period's welfare if they were to vote for the incumbent, given all the information at hand. This is compared to the expected welfare from picking at random someone from the population at large. In computing the first case they use the conditional density function $f_2(\varepsilon|p_z^*)$, which we assume is well defined. For the opponent they use the unconditional (prior) density function, as shown for the complete information case (see equation (3.8)).

B Uncertainty with Media

In this section we study the case where uncertainty can be held back to some extent by information transmitted by the media. There are several cases to consider. In all of them a Bayesian REE exists. We define this type of equilibrium, which differs to the one above only in that the media is taken into account. Note that a state now also contemplates the variable λ: any state is described by the triple $(\varepsilon, \vartheta, \lambda)$.

Definition 2. *A Bayesian REE for the model with media is the vector $(z_k^*, \tau^*, g^*, p_z^*, M^*)$ such that for any possible state $(\varepsilon, \vartheta, \lambda)$:*

1. *(z_k^*, τ^*, g^*) solves the incumbent's problem;*

2. $p_z^*(\varepsilon, \vartheta, \lambda)$ *is a price function clearing the market for input* z *at any state of the economy;*

3. M^* *maximises the Media's expected welfare;*

4. z_k^* *maximises producers' expected profits, given the price function* $p_z^*(\varepsilon, \vartheta, \lambda)$*;*

5. *Beliefs are updated using Bayes law.*

The easiest case, and one which will be used further on, is the one where the media learns and shares information about the politician's competence. We look to this problem next.

B.1 The Media reports on the Politician's competence

In this case everything is as in the former case, except for production of the intermediate input. In forecasting the price, now producers will use information bore in the media's message, which is truthful. Indeed, $p_z^{e|z^*} \equiv E[p_z|z^*, M] = \int p_z F_p(p_z|z^*, M^*)$.

To show that there is a unique equilibrium is direct, and follows same steps as shown above. Importantly, due to the media's transmission of information, the values that all variables take in equilibrium change, and more importantly, the decision for voters is drastically affected. They do not have to infer the incumbent's competence from prices, but just need to heed what the media had said. The rule at the polling station is, of course, identical to the one in the complete information case.

Note that as long as the media reports at both the beginning and the end of any mandate, the values that the variables of interest would take, on average, during electoral years will not differ to those observed on average in non-electoral ones, from an *ex ante* point of view.

In the next case I show why this is not true when the media withholds information. Incentives and outcomes will significantly differ.

B.2 The Media reports $M = \emptyset$

Because the problem is symmetric, I describe next one out of two of the possible cases[31]. I consider the case in which the media is in favour of the incumbent, so $\lambda > 0$. If the economy is within any mandate's first period, note that everything is as in the case with uncertainty but without media. This is true because the media would not have the incentive to interfere over the voter's political decision. Consequently, if agents observe $M = \emptyset$ they know that it is so because the media has not learnt anything about the contemporaneous competency shock.

But this is not the case at the end of any mandate. All agents know the structure of the economy, and can solve the problem that the media faces when it has found that the competency parameter is not good news for the incumbent's reelection. Indeed, the media has two possible actions to consider: either it tells the truth knowing that it will imply ousting his likeminded politician, or it withholds the information (sometimes the media would not learn anything about the politician, and would not have a choice, but the fundamental question is producers and voters' conjecture on what the media would do under these alternatives with evidence at hand).

[31] To be clear, one case being having the media against the incumbent, and the order having the media in favour of him.

The media knows that if there were a strategy for information transmission, the producers, who are rational and know the structure of the economy, would take into account that strategy when forecasting the final price. Let us take the producers' expectations as given and consider the media's alternative actions.

One possibility is to send an informative message. That is, if ε' is observed, $M = \varepsilon'$. The alternative would be to send a non-informative message, that is $M = \emptyset$.

First note that if $\alpha_t^i \geq \bar{\alpha}$, it is a dominant strategy to spread the news. This is due to the fact, given by the assumption about the stochastic process governing competence through time, that next period's expected competence with the incumbent still in power, would be greater or equal to what the media can possible get with the appointment of an opponent on average. The economy will perfom better, in expected terms, but on top of that the media will also benefit with certainty from having his likeminded politician in power (recall that he expects nothing from an opponent from this dimension, $E(\kappa) = 0$).

A more complicated decision has to be made when $\alpha_t^i < \bar{\alpha}$. His message will not only affect welfare today, but by influencing voters' decision the media might make an incompetent politician stay in power, which in expected terms would be worse than picking someone from the pool of politicians (all citizens indeed). How far will the media go protecting a bad incumbent? Would it go all the way down?

An important step is recognizing that, given the known political preference of the media (λ), if there were a value for α_t^i below which the media is not willing to withhold information, and above which (as long as it is below $\bar{\alpha}$) it is ready to "protect" the incumbent, the producers would infer it, and more importantly, would use this knowledge.

Suppose *that* key threshold is $\tilde{\alpha}$. Let us define the probability that no message will be conveyed as $\rho(\lambda, \tilde{\alpha}, \pi) \equiv 1 - \pi + \pi[F_2(\bar{\alpha}) - F_2(\tilde{\alpha})]$. Then the conditional Bayesian posterior used by producers when forecasting the equilibrium price, that we denote $d(\varepsilon|z^*, \lambda, \tilde{\alpha}, \pi, M = \emptyset, \alpha_{t-1})$ is the following:

$$d(\varepsilon|z^*, \lambda, \tilde{\alpha}, \pi, M = \emptyset, \alpha_{t-1}) = \begin{cases} \frac{(1-\pi)f_2(\varepsilon')}{\rho(\lambda,\tilde{\alpha},\pi)} \text{ if } \varepsilon' < \tilde{\alpha} \\ \frac{f_2(\varepsilon')}{\rho(\lambda,\tilde{\alpha},\pi)} \quad \text{if } \tilde{\alpha} \leq \varepsilon' < \bar{\varepsilon} \\ \frac{(1-\pi)f_2(\varepsilon')}{\rho(\lambda,\tilde{\alpha},\pi)} \text{ if } \varepsilon' \geq \bar{\varepsilon} \end{cases} \tag{4.11}$$

Note that using this posterior conditional density function, the expected price will increase. On average, producers will expect a less competent politician than what they would have expected if they had used the unconditional density function instead (the random variable p_z is increasing in the sense of first-order stochastic dominance in ε). So producers will produce more of input z as compared to the case without media (or with $\lambda = 0$, which is the same). This is the 'suspicion effect' taking place over producers' forecasting and production problem.

Now we must consider the voters' inference problem. They use the price of input z as a signal for the incumbent's contemporaneous competence. The higher the expected value of this parameter, the higher the welfare they expect from keeping the incumbent in the following period. I assume, therefore, that when they vote they compare expected welfare with the incumbent to expected welfare when the average opponent is in power (the problem is essentially

the same as the one described in equations (3.6), (3.7) and (3.8), except for the expected α_i in equation (3.7), which is updated after observing the price). Indeed the posterior density function for parameter α_{ti}, that we denote as $\phi(.|p_z)$, after taking into account the observed (realised) equilibrium price p_z is

$$\phi(\alpha_t|\alpha_{t-1}, p_z^*, z^*) = \frac{f_p(p_z^*|\alpha_{t-1}, \alpha_t) f_2(\varepsilon_t)}{\int f_p(p_z^*|\alpha_{t-1}, \alpha_t) f_2(\varepsilon_t) d\alpha_t} \tag{4.12}$$

Where $p_z^* = \psi(\varrho)$, implying

$$\alpha_t = \frac{\psi^{-1}(p_z^*)}{\tilde{\vartheta} z^*} - \alpha_{t-1} \tag{4.13}$$

Note that α_t has to be inferred because ϑ is not observed. We assume that voters take as the best guess or bet, the rational bayesian belief following the updating process described in (4.12)[32]. Analogously to the complete information case, if $E[\alpha_t|p(\varepsilon\vartheta z^*)] > \bar{\alpha}$ (obtained from using $\phi(.)$) they would vote for the incumbent, and replace him otherwise. However, when deciding what message to convey, this "guess" is uncertain to the media: $E[\alpha_t|p(\varepsilon\vartheta z^*)]$ is a random variable which varies with ϑ, for a given message. Hence, from an *ex ante* perspective, the probability that voters opt for the incumbent, when $M = \emptyset$, is computed by the media as follows. First the media forms its best guess for the upcoming price (which is a random variable for the media before it sends a message), using knowledge of $f(\vartheta)$, producers' expectations' behaviour, and of course actual ε. Importantly, notice that this expected price is not affected by the value that competence takes and which the media know (furthermore, if the media did not use all their knowledge and form beliefs on this price following another principle, this would not change the results below). Let us call this best guess p_z^{E*}. This belief, to be clear, is strictly decreasing, in the sense of first-order stochastic dominance, in the observed contemporaneous competence shock α_t (only observed by the media), as shown in the appendix. Given this belief and their knowledge of ε and z^*, the media know that, for given realization ϑ', the incumbent would be reelected if and only if

$$\frac{\psi^{-1}(p_z^{E*})}{\vartheta' z^*} \geq \bar{\alpha} + \alpha_{t-1} \tag{4.14}$$

This implies that the probability that the incumbent is reelected, $Prob[I|M = \emptyset]$, for given observed competency parameter α' is computed as follows

$$Prob[I|M = \emptyset] \equiv Prob\left[\frac{\psi^{-1}(p_z^{E*})}{\vartheta' z^*} \geq \bar{\alpha} + \alpha_{t-1}\right] = F_1\left(\frac{\psi^{-1}(p_z^{E*})}{(\bar{\alpha} + \alpha_{t-1}) z^*}\right) \tag{4.15}$$

Where, as it must be clear, only the belief on the final price changes with α_t, andF_1 is the probability function of parameter ϑ. This effect would have consequences upon the economic variables that we study. We will turn to them later on. Before I state the main result of this paper in the following theorem.

[32]Note that it is unessential in our framework to have the voters knowing the producers' expectations. Given the fact that there is a unique price function for given expectations, which only vary with the media's message, it suffices to know this message to infer (compute) what the price expectations are.

Theorem 1. *At the last period of any mandate, for given and known Media political preference λ ($-\lambda$), when the contemporaneous competency shock α'_t (and consequently ε'_t) is observed by the media, and $\alpha'_t \geq \bar{\alpha}$ ($\alpha'_t \leq \bar{\alpha}$), it is a dominant strategy not to withhold information: they send the message $M = \varepsilon'_t$. On the contrary, if $\alpha'_t < \bar{\alpha}$ ($\alpha'_t > \bar{\alpha}$) there exists a threshold $\alpha^L < \bar{\alpha}$ ($\alpha^H > \bar{\alpha}$), below (above) which it is strategically optimal for the media to send an informative message $M = \varepsilon'_t$, and above (below) which it is optimal to send a non informative message $M = \emptyset$.*

Proof. We show one case, bearing from the symmetry of the problem. Consider $\lambda_t > 0$: the media is in favour of the incumbent. Also assume that $\alpha'_t < \bar{\alpha}$ had been observed by the media. We consider the media's problem when deciding what message to send. What the media do is compare expected welfare under two possible actions: $M = \varepsilon'$ and $M = \emptyset$. It is convenient to define the following expressions:

$$\Upsilon_t(x) \equiv U_t(x) + \delta V_t(x)$$

and

$$\Delta \equiv \Omega^{M=\emptyset} - \Omega^{M=\varepsilon'}$$

Where

$$\Omega^{M=\varepsilon'} \equiv E_t[\Upsilon_t(\varepsilon'_t)|M = \varepsilon'] + \kappa_t + \delta E_t[\Upsilon_t(\varepsilon'_t)] \tag{4.16}$$

and

$$\begin{aligned}\Omega^{M=\varepsilon'} \equiv & E_t[\Upsilon_t(\varepsilon'_t)|M = \emptyset] + \kappa_t \\ & + \delta Prob[I|M = \emptyset][E_t[\Upsilon_t(\varepsilon'_t)|M = \emptyset] + \kappa_t] + \delta(1 - Prob[I|M = \emptyset])E_t[\Upsilon_t(\varepsilon)]\end{aligned} \tag{4.17}$$

Where in the two last definitions we have used the fact that $E(\kappa) = 0$. Also, $Prob[I|M = \emptyset]$ is the probability that the incumbent is elected *given* the message, and according to voters' inference after observing the price, as defined above (see equation (4.15)). Then, we have

$$\begin{aligned}\Delta = & \overbrace{\{E_t[\Upsilon_t(\varepsilon'_t)|M = \emptyset] - E_t[\Upsilon_t(\varepsilon'_t)|M = \varepsilon']\}}^{<} + \overbrace{\delta Prob[I|M = \emptyset]\kappa_t}^{>0} \\ & + \underbrace{\delta \{Prob[I|M = \emptyset] \{E_t[\Upsilon_{t+1}(\varepsilon'_t)|M = \emptyset] - E_t[\Upsilon_{t+1}(\varepsilon)]\}\}}_{<0}\end{aligned} \tag{4.18}$$

Now, note from equation (4.18) that the first term in brackets, which compares today's expected welfare if no message is conveyed with today's expected welfare if an informative message is sent, is strictly negative, while the second term is strictly positive ($\kappa > 0$). The last bracketed term in braces is the difference in the expected welfare for tomorrow following either strategy, which is strictly negative.

Importantly, notice that $\frac{\partial \Delta}{\partial \varepsilon_t'} > 0$. The higher the observed competence parameter, the higher the chances that the incumbent will be reelected, and the closer, *ex-ante*, will the differences in braces above will be. In addition, observe that

$$\lim_{\varepsilon \longmapsto \bar{\varepsilon}} = \kappa_t > 0 \tag{4.19}$$

and

$$\lim_{\varepsilon \longmapsto \alpha_*} = E_t[\Upsilon_t(\varepsilon_t')|M = \emptyset] - E_t[\Upsilon_t(\varepsilon_t')|M = \varepsilon'] < 0 \tag{4.20}$$

Using the mean value theorem, we have proven that there is a unique value for the competence shock, that we denote ε^L, such that $\alpha_* < \varepsilon^L < \bar{\alpha}$ and $\Delta = 0$.

Using the implicit function theorem, it is direct to show that this threshold is a decreasing function of parameter κ.

This ends proof of the main result. □

5 Predictions on the Political Budget Cycle

It is straightforward from the theorem above to predict how the political budget will behave in this model. I summarize the predicitions that this models has on the Political Budget Cycle:

1. First immediate result is that no Political Budget Cycle as such would emerge if either the media is fully proficient in making politicians accountable ($\pi = 1$), or, on the contrary, they are not able to extract informative signals at all ($\pi = 0$). This is direct from inspection of equation (4.11).

2. If the media is in favour of an incumbent and does not convey an informative message (whether it does because it had not learnt anything about the incumbent's competence, or out of strategic behaviour seeking to protect his likeminded incumbent, it does not matter), producers will anticipate a higher demand for input z than in the case without media, which would lead them to higher production than in "normal times" (that is during the first period of any mandate). This higher production will drag prices down. Thus, an incumbent who is known to be favoured by the media (independently of the value the competency has), will enjoy some slackness in the balanced-budget condition that will lead him to set lower taxes and higher current expenditures g, than what he would possibly make facing the same aggregate shock but without the media's existence. This prediction is consistent to the sign that taxes and spendings' fluctuations take on average in electoral years as compared to non-electoral ones (see Drazen [10]).

3. Contrariwise, if the media is known to be against the incumbent, the suspicion effect will play against the incumbent: taxes will increase and provision of the other public good decrease, as compared to the case where no message is conveyed in a non-electoral year. So "strong" incumbents will face adverse conditions. Note that this does not arise from them following a signaling strategy in order to show that they are "good" incumbents.

4. The higher the pull in favour of an incumbent (the higher the observed realization of parameter λ), and contrariwise, the stronger is the preference of the media against the incumbent, the larger the effect upon taxes and public expenditures will be.

5. Another consequence of our model is that, for given political preference of the media, for intermediate values of competence it is more likely to observe non-informative messages. That is, the more tight is the election, the less informative the media will be. It is under these cases too that the effect upon taxes and public spending will be more severe: the Political Bugdet Cycle will be starker.

6 Extensions

A Pluralism

So far I have assumed that the whole media industry, independently of the number of newspapers or means of communication belonging to it, is either in favour or against the incumbent, exhibiting all the same political preference λ. Yet, however concentrated the media industry is in most economies, we cannot dismiss the possibility of having some degree of political discrepancy, or pluralism, within and across media systems. This may reflect political heterogeneity across the population, or supply forces, such as state intervention or lobbying; it does not matter here. In our context, however little this divergence of interests is within the elite, which in our model can be of minor expression, it will have significant consequences upon the Political Budget Cycle, as I show next.

Without loss of generality, suppose we have two independent news producers, A and B, expressing each different political views within the elite. That is, each newspaper "j" observes a preference shock λ^j drawn from the same distribution function $L(\kappa)$ (with $j = A, B$). In addition, let us assume that they have the same supervision technology: with probability π they learn the competency parameter, and with probability $1 - \pi$ they learn nothing. Finally, as a simplification. let us assume that if either newspaper learns the competency parameter, this is immediately known by the competitor ipso facto.

In this framework then, there will be pluralism in any period t whenever $sign\lambda_t^A \neq sign\lambda_t^B$. The first issue is how to allow for pluralism in the present model. Note that because of the stochastic nature of our problem, in particular regarding the political preference shock for or against the incumbent, pluralism cannot be a permanent feature of the media industry. In fact, in the present model, the media is *stochastically* pluralist. Indeed, in our context to have pluralist media is equivalent to having one media (call it newspaper "A") having a positive preference shock (say $\lambda_A > 0$), and another (or some other) (call it newspaper "B") having a negative political preference shock (say $\lambda_B < 0$), regardless of their relative values. These shocks, along with the assumptions in the model, will be observed by all parties. The main effect of pluralism upon the budget cycle is direct.

For cases where pluralism is observed, whenever only non-informative messages are conveyed (that is $M_A = M_B = \emptyset$), the public will be certain that this is not due to withholding of information: if one of them had learnt something, the other would had too, and from the theorem above, one of them would strictly prefer to spread the news. Hence, producers' expectations would not change as compared to those formed in a non-electoral year when the economy and

polity is lucky to observe pluralism in the media. All in all, therefore, the sole possibility of pluralism should *even* the political budget cycle.

7 Conclusions

In this paper I have proposed a new mechanism through which the Political Budget Cycle is generated. A politically motivated media willing to affect voters' decision on whether to keep an incumbent or not, strategically withholds information, when found, in order to alter the electoral outcome to its advantage. As a consequence, rational agents in the economy form expectations that take into account this incentive. They are suspicious of the media: they know how strong its pull in favour or against the incumbent is. Expectations are affected, and so are all the macro variables in the model, especially taxes and expenditures on publicly provided goods.

Because these incentives are absent at the beginning of any mandate, they way macroeconomic variables evolve during electoral years (at the end of every mandate) differs, stochastically speaking, in respect to what occurs during non-electoral ones.

The scope for electoral manipulation is limited, however, by pluralism within the media, as I also show in this paper.

A Appendix

Proof of Property 1 and the full information case

Consider the full information case, for a given pair of known parameters (ϑ, ε). From (4.1) we can write the problem under the following Lagrangian formulation:

$$L(c, g, z, \lambda_1, \lambda_2) = U(c, g) + \delta V(\vartheta \varepsilon z) + \lambda_1 \left[\tau - g - p_z z\right] + \lambda_2 \left[y - \tau - c\right] \tag{A.1}$$

The Kuhn-Tucker conditions for maximisation of this problem are the following

$$-U_c(c, g) - \lambda_2 + \nu_c \leq 0 \tag{A.2}$$

$$U_g(c, g) - \lambda_1 + \nu_g \leq 0 \tag{A.3}$$

$$\delta V'(\vartheta \varepsilon z)\vartheta \varepsilon + \lambda_1 p_z - \nu_z \leq 0 \tag{A.4}$$

$$\lambda_1 \left[\tau - g - p_z z_k\right] = 0 \tag{A.5}$$

$$\lambda_2 \left[y - \tau - c\right] = 0 \tag{A.6}$$

$$\nu_c c = 0 \tag{A.7}$$

$$\nu_g g = 0 \tag{A.8}$$

$$\nu_z z = 0 \tag{A.9}$$

Where $\nu_c, \nu_g, \nu_z \geq 0$ are the nonnegativity constraints, and $\lambda_1, \lambda_2 \geq 0$ are the lagrangian multipliers. Assuming an interior solution with $\lambda_1, \lambda_2 > 0$ we have

$$-U_c(c, g) - \lambda_2 = 0 \tag{A.10}$$

$$U_g(c, g) - \lambda_1 = 0 \tag{A.11}$$

and

$$V'(\vartheta\varepsilon z)\vartheta\varepsilon - \lambda_1 p_z = 0 \tag{A.12}$$

The aim now is to express τ and g and λ_1 as functions of k, with the solution to λ_1 interpreted as the marginal cost (in terms of foregone utility from private consumption c and consumption of the publicly provided good g) of producing the long-term public good k. Let us assume indeed $\lambda_1 > 0$ and $\lambda_2 > 0$. Then, using (A.5) we have that $g = \tau - p_z \frac{k}{\vartheta\varepsilon}$ and using (A.6) we have $c = y - \tau$. Now, using (A.11) in (A.10) we have

$$\Theta_1 \equiv -U_c\left(y - \tau, \tau - p_z \frac{k}{\vartheta\varepsilon}\right) - \lambda_2 = 0 \tag{A.13}$$

Note that $\frac{\partial \Theta_1}{\partial \tau} = U_{cc} + U_{cg}$, which is strictly negative by the normality assumption. Also, note that $\frac{\partial \Theta_1}{\partial k} = -U_{cg}\frac{p_z}{\vartheta\varepsilon}$, which is strictly negative because we assume $p_z > 0$. Using the implicit function theorem, we have then that $\frac{\partial \tau}{\partial k} > 0$, implying in turn that consumption $c(k)$ is strictly decreasing in k (this is direct from $c = y - \tau(k)$). Now, using (A.11), we find

$$\Theta_2 \equiv U_g\left(y - g - p_z \frac{k}{\vartheta\varepsilon}, g\right) - \lambda_1 = 0 \tag{A.14}$$

Note that $\frac{\partial \Theta_2}{\partial g} = -U_{gc} + U_{gg} < 0$ and $\frac{\partial \Theta_2}{\partial k} = -U_{gc}\frac{p_z}{\vartheta\varepsilon} < 0$. Using again the implicit function theorem we find $g(k)$, which is strictly decreasing. Also, $\frac{\partial \Theta_2}{\partial \lambda_1} = -1 < 0$ and

$$\frac{\partial \Theta_2}{\partial k} = -U_{gc}\left[\frac{\partial g}{\partial k} + \frac{p_z}{\vartheta\varepsilon}\right] + U_{gg}\frac{\partial g}{\partial k} \tag{A.15}$$

Note that the expression in the bracketed parenthesis in RHS of (A.15) is equal to $\frac{\partial \tau(k)}{\partial k} > 0$, which implies that λ_1 is a strictly increasing function of k, that we denote as $h(k)$. This function is positive, increasing and continuously differentiable, and as k tends to zero, $h(k)$ tends to a positive limit, $h(0)$. In addition, using these later results, and (A.12), we have

$$h(k)p_z \geq \delta V'(\vartheta\varepsilon z)\vartheta\varepsilon \tag{A.16}$$

With equality if $\lambda_1 > 0$. Now let us use the market clearing condition for input z. Let us assume that the known supply of z, that we denote z^*, is strictly positive: $z^* > 0$. Imposing

the market condition implies that $k = \vartheta\varepsilon Z = \vartheta\varepsilon z^*$. Then, under complete information and knowing the solution to the optimal REE problem for producers, we have from (A.16)

$$h\left(\vartheta\varepsilon z^*\right) p_z = \delta V'\left(\vartheta\varepsilon z^*\right)\vartheta\varepsilon \tag{A.17}$$

or simply

$$p_z = \delta V'\left(\vartheta\varepsilon z^*\right)\left[h\left(\vartheta\varepsilon z^*\right)\right]^{-1}\vartheta\varepsilon \tag{A.18}$$

Assuming always that the producers' expectations yield a positive supply, note that for given expectations the price solution is monotonic in ε, meaning that the solution is unique for a given pair of (z^*, ϑ). Suppose not. Take $\varepsilon_0 > \varepsilon_1$ and assume that $p_z^0 \equiv p_z(\varepsilon_0, \vartheta, z^*) = p_z(\varepsilon_1, \vartheta, z^*) \equiv p_z^1$. But this is not possible because

$$p_z^0 = \delta V'\left(\vartheta\varepsilon_0 z^*\right)\left[h\left(\vartheta\varepsilon_0 z^*\right)\right]^{-1}\vartheta\varepsilon_0 \tag{A.19}$$

and

$$p_z^1 = \delta V'\left(\vartheta\varepsilon_1 z^*\right)\left[h\left(\vartheta\varepsilon_1 z^*\right)\right]^{-1}\vartheta\varepsilon_1 \tag{A.20}$$

Dividing the last two equations we have

$$1 = \frac{p_z^0}{p_z^1} \neq \frac{V'\left(\vartheta\varepsilon_0 z^*\right)\left[h\left(\vartheta\varepsilon_0 z^*\right)\right]^{-1}}{V'\left(\vartheta\varepsilon_1 z^*\right)\left[h\left(\vartheta\varepsilon_1 z^*\right)\right]^{-1}}\frac{\varepsilon_0}{\varepsilon_1} < 1 \tag{A.21}$$

Where we have used assumption on V's concavity (see equation (2.3)).

Now we turn to the producers. Recall that under complete information they have perfect foresight. That is, if p_z^* is the REE price clearing the market, then $z^* = H(p_z^*)$, by definition. Then

$$p_z^* = \delta V'\left(\vartheta\varepsilon H(p_z^*)\right)\left[h\left(\vartheta\varepsilon H(p_z^*)\right)\right]^{-1}\vartheta\varepsilon \tag{A.22}$$

Now we define $\Theta_3 \equiv p_z^* - \delta V'\left(\vartheta\varepsilon H(p_z^*)\right)\left[h\left(\vartheta\varepsilon H(p_z^*)\right)\right]^{-1}\vartheta\varepsilon = 0$.

Notice that

$$\frac{\partial\Theta_3}{\partial p_z} = 1 - \delta\left[V''\left(\vartheta\varepsilon H(p_z^*)\right)\vartheta\varepsilon H'(p_z^*)\left(h\left(\vartheta\varepsilon H(p_z^*)\right)\right)^{-1} - V'\left(\vartheta\varepsilon H(p_z^*)\right)\left(\frac{\vartheta\varepsilon h'(.)H'(p_z^*)}{\theta(h(.))^2}\right)\right]\vartheta\varepsilon \tag{A.23}$$

Which is strictly positive from $V''(.) < 0$, and the fact that both $h(.)$ and$H(.)$ are strictly increasing in their arguments. Also note that Θ_3 tends to $-\infty$ when $p_z \longrightarrow 0$ (Recall that $h(0) > 0$ and that $lim_{x\longrightarrow 0}V'(0) = +\infty$). Similarly, Θ_3 tends to $+\infty$ when $p_z \longrightarrow \infty$. So there is a unique solution. In addition, we have the following

$$\begin{aligned}\frac{\partial\Theta_3}{\partial\varepsilon} = &-\delta\left[V''\left(\vartheta\varepsilon H(p_z^*)\right)\vartheta H(p_z^*)\left(h\left(\vartheta\varepsilon H(p_z^*)\right)\right)^{-1} - V'\left(\vartheta\varepsilon H(p_z^*)\right)\left(\frac{\vartheta h'(.)H(p_z^*)}{(h(.))^2}\right)\right]\vartheta\varepsilon \\ &-\delta V'\left(\vartheta\varepsilon H(p_z^*)\right)\left[h\left(\vartheta\varepsilon H(p_z^*)\right)\right]^{-1}\vartheta\end{aligned} \tag{A.24}$$

Define $\varrho \equiv \vartheta \varepsilon H(p_z^*)$. Then we have from the equation (A.24)

$$\frac{\partial \Theta_3}{\partial \varepsilon} = -\delta \left[\vartheta \left(\frac{V''(\varrho)\varrho}{h(\varrho)} + \frac{V'(\varrho)h'(\varrho)\varrho}{h(\varrho)} \right) - \left(\frac{V'(\varrho)\, h'(\varrho)\varrho}{(h(\varrho))^2} \right) \right] \tag{A.25}$$

Where in the last step we have used (2.3) again. This implies that the equilibrium market clearing price of input z is decreasing in the politician's competence. This ends proof of property 1. □

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