Rules transparency and political accountability

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Abstract

Rules of allocation and redistribution in the public sector are often less contingent on available information than normative theory would suggest. This paper offers a political economy explanation. Under different rules, even if the observable outcomes of policies remain the same, the informational content which can be extracted by these observations is different. Less contingent rules allow citizens to gain more information on politicians and this improved information may be used to better select politicians. This advantage may overcome the efficiency loss induced by flatter rules.

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1. Introduction

During the 1990s local governments finance in Italy was largely reformed. In particular, the transfers system was deeply changed, by substituting a number of grants, which were contingent on various indicators of regional costs and needs, with flatter rules, basically lump sum per-capita transfers (e.g. Bordignon, 1999).
Behind this choice there was the explicit acknowledgment of a political failure. Historical experience had shown that complex transfer formulas, although in principle better suited to reach redistributive objectives, could in practice be more easily manipulated by politicians and public officials to the advantage of some specific local governments. Flatter rules, it was argued, would have made this hidden political exchange more difficult. Interestingly, the idea was not that they would have made it utterly impossible. In general, policymakers could still find other ways to give more money to favored regions or cities if they wished to do so. But, so the argument went, under a flat transfer rule they had at least to do it openly, thus revealing their preferences for specific groups and regions and hence paying a higher political cost in terms of a better check by public opinion.

This example is of course very special. However, it seems to suggest a more general phenomenon. Indeed, it is commonly observed that real world contracts are often 'simpler', in the sense of being less contingent on available information, than what is suggested in economic theory. Furthermore, at least where a comparison with the private sector is possible, flatter contracts seem to be especially widespread into the public sector (e.g. Dixit, 1996). The Italian example offers a potential explanation. Flatter rules, although generally less efficient\(^1\), may have an important advantage. This is that they are more 'transparent'; i.e. they increase the accountability of policymakers, thereby allowing citizens to better discriminate between politicians who pursue their interest and politicians who pursue other, more sectorial, interests. In turn, this advantage is likely to be specially important in the political context, because of the large difference in information available to policymakers and to citizens, and because of the very weak punishment–reward mechanism that democracy imposes on the politicians. In particular, citizens do not write an explicit incentivating contract with their representatives in Parliament, specifying rewards and punishments according to the results of their policy. In modern democracies, politicians are basically punished and rewarded through the ballot box. Furthermore, this only happens at pre-determined election times. It is with reference to this particular context that the trade-off between efficiency and transparency of rules must be assessed.

The Italian case is an example of this trade-off, but it is not difficult to find other examples. For instance, in discussing corporate income taxation, Slemrod (1990) suggests that among the reasons for simplifying the tax rules in the US in the 1980s, prominent was the objective of making them less assailable by powerful interest groups. Similarly, in discussing about tariff policy, Harberger (1990)

\(^1\)The meaning of efficiency in a political context is not obvious, as it depends on whether political constraints are taken into account in defining the efficiency frontier. In this paper, 'efficiency' will be naively assessed with respect to what voters could obtain if governments were simply maximizers of the welfare of their citizens. For more detailed discussion of the problem, see Wittman (1989), Coate and Morris (1995) and Besley and Coate (1998).
argues that the 1980s move of the Latin American countries towards a single tariff had the objective of reducing the influence of interest groups on tariff policies (see also Rodrik and Panagariya, 1993).

How could we account for these arguments at the theoretical level? The examples given above suggest quite naturally a three-layer structure, involving a Principal (i.e. the Parliament or public opinion at large), an Agent (i.e. the Government or a public agency) which performs a policy on behalf of the Principal, and an Interest group which is affected by the policy and that may influence the choices of the Agent to its advantage and against the wishes of the Principal. Furthermore, there has also to be a way in which the higher ‘transparency’ of flat rules are of use for the Principal. This in itself suggests a dynamic framework, where the improved information on politicians obtained in a period may be used to better select among politicians in subsequent periods.

In this paper we discuss an example which follows quite strictly this structure. An agency (which may be thought of as a public utility, a local governmental agency, or, following the Italian case, even a local government) receives a transfer from the government in order to offer a public good. The policymaker finances the agency by raising money through taxation. There are two sources of asymmetric information. On the one hand, governments can observe the effort exerted by the agency better than citizens can. On the other hand, citizens are unable to tell the degree to which governments are liable to ‘pressures’ exerted by the agency itself. In particular, governments may be ‘bad’ in the sense that they might like to leave some rents to the agency, possibly because they can get part of this money back in the form of bribes or political support. Both informational assumptions are very reasonable. The first is common in the public choice literature and can be easily justified; voters remain rationally ignorant because the expected benefits from becoming informed are small relative to the costs. The second is the one which motivates our analysis; if governments were known for sure to be only interested in maximizing the welfare of citizens, the issue of rule transparency, as we have defined it, would not arise.

For the reason indicated above, we consider a two-period model, to which we add a pre-game constitutional stage in the last part of the paper. At the beginning of the first period, the government chooses taxes and transfers; at the end of this period an election takes place. Citizens observe first period outcomes, revise their expectations about the ‘type’ of the government in charge, and vote consequently. Thus, our model belongs to the class of the ‘reputation’ models of politics, originated with Barro (1973) and Ferejohn (1986) and further developed by a number of writers (see Rogoff, 1990; Besley and Case, 1995; Coate and Morris, 1995). In such a setting, we compare and contrast two possible rules of funding for the agency, which we interpret as constitutional rules. According to the first, which we call the ‘complex’ rule, governments are allowed to write an optimal contract with the agency, using all available information to this end. According to the
second, which we call the ‘simple’ rule, governments can only offer ‘flat’, non-contingent, contracts to the agency.

We ask two questions. First, whether the simple rule, although less capable of eliciting effort from the agency, may dominate the complex one in terms of the expected welfare of citizens. Second, whether a welfare-maximizing constituent, on the basis of rational expectations on the type of the governments, would choose the flat rule. The answer is ‘yes’ in both cases. The intuition is quite simple. Under the complex rule, bad governments are better able to ‘hide’ themselves behind good governments, transferring money to the agency without paying the price of the higher risk of losing the elections. On the contrary, the simple rule does not allow for ‘pooling’ behavior and forces bad governments to reveal themselves before the elections. Hence, the simple rule works as a screening device for the citizens, and this signalling advantage may more than offset the resulting efficiency loss. It should also be stressed that this result occurs in equilibrium even if citizens expect with high probability governments to be only interested in maximizing their welfare. Thus, it is not necessary to have bad expectations on politicians to wish to enforce flatter rules.

Our model makes the case for the flat rule in a rather drastic form, since only separating (i.e. fully revealing) equilibria turn out to be compatible with this rule. This is a result of the very simple structure we adopt in the model in order to get clear-cut results. But we believe the message of the paper is a far more general one. As our previous discussion indicates, what we are suggesting here is that in general, under less contingent rules, governments face higher political costs for transferring money to interest groups, and this advantage may more than compensate for the costs of employing otherwise obviously efficiency-dominated rules.

Our results should be compared and contrasted with the insights offered by several other strands of literature, such as the macroeconomics of monetary rules (e.g. Cukierman and Meltzer, 1986), the literature on delegation (e.g. Armstrong, 1995), the analysis of collusion in the theory of organization (e.g. Tirole, 1991) and the emerging literature on the internal organization of governments (e.g. Tirole, 1994; Roland et al., 1997). Furthermore, our modelling strategy owes a lot to the work of Coate and Morris (1995), who also discuss different ways of transferring money to interest groups in a signalling model of politics. For the sake of clarity, however, we prefer to put off the discussion of these related works to a later section of the paper, after the presentation of our own results.

The rest of the paper is organized as follows. Section 2 sets up the model and describes the game. Section 3 defines and demonstrates equilibria under the two rules. Section 4 performs the (expected) welfare comparison between the two rules, thereby proving the main result of this paper. Section 5 discusses the literature and Section 6 concludes. Appendix A contains the proofs of the results and a brief discussion of mixed-strategy equilibria.
2. The model

2.1. Preliminaries

We consider an economy which lasts three periods. The first period, which we label period 0, is the constitutional stage. Periods 1 and 2 are identical in terms of the choices that have to be made by the economic agents, except that at the end of period 1 an election takes place. There are four agents in the economy: the incumbent government, the citizen, the agency, and the candidate government. At the beginning of each of the two periods, the incumbent government employs the agency to supply a public good. The amount of public good produced is stochastic and its realization depends on the effort made by the agency. For the sake of simplicity, we assume that the effort of the agency can only take two values, ‘high’ and ‘low’. Thus, the agency’s action is \( a \in \{L,H\} \). Output of the public good is \( g \in \{g_1, g_2\} \), with \( 0 < g_1 < g_2 \). The probability of observing output level \( g \) when the action chosen is \( a \) is \( f_g^a > 0 \). In particular, we assume that the probability of observing the higher realization of output is \( f_g^H = \pi > 1/2 \) if the agency chooses action \( H \) and \( f_g^L = (1 - \pi) \) if it chooses \( L \). An higher level of output is thus a signal that the agency has chosen an high effort level.

The agency is risk neutral. Given a transfer \( t > 0 \), its utility when the chosen action is \( a \) is \( u^A(t,a) = t - c^a \), where \( c^a \) is the cost of action \( a \). We assume \( c^H > c^L \geq 0 \).

The citizen pays the tax which is used to finance the agency, and enjoys the benefits of the public good. The expected utility of the citizen at the beginning of each period, if during that period the agency chooses action \( a \), and government tax \( t \), is thus \( u^C(t,a) = \sum_i f_g^a g_i - t \).

In every period, when the government is in charge, its utility is a weighted sum of the utilities of both the citizen and the agency, \( W(t,a) = \lambda u^C(t,a) + (1 - \lambda) u^A(t,a) \), where \( \lambda \in [0,1] \). When the government is not in charge, its utility is zero.

For simplicity’s sake, we let \( \lambda \) take only one of the two extreme values: that is, either \( \lambda = 1 \) or \( \lambda = 0 \). In the first case, we say that the government is of a ‘good’ type, as its welfare coincides with the utility of the citizen; in the second case, we say that the government is of a ‘bad’ type, as its only interest lies in maximizing the agency’s profits. The terminology here reflects the idea that bad governments are such because they expect to share some of the agency’s profits. We do not,

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1 A natural interpretation of the model is that at the beginning of period 2 elections are so far off that the incumbent government does not care about them. Alternatively, one can think of institutional constraints which in practice reduce the life-time of the incumbent government to two periods only, such as for example a binding term limit. For an interpretation along these lines, see Besley and Case (1995).

2 The terminology is borrowed from Coate and Morris (1995).
however, model explicitly the bargaining over ex post profits between the agency and the bad government. We assume this issue has already been settled with a binding agreement before the game starts. The opponent government, were it in charge, would have an utility function of the same form of the incumbent government, except, of course, that its $\lambda$ may be different. All agents in the economy discount future utility at a rate $\delta \in (0,1)$.

Let $W^H = (1 - \pi)g_1 + \pi g_2 - c^H$, and $W^L = \pi g_1 + (1 - \pi)g_2 - c^L$ be the (expected) surplus generated by $a = H$ and $a = L$, respectively. We impose two assumptions on the parameters of the model. First, we assume that the high effort (weakly) Pareto dominates the low level of effort, $W^H \geq W^L$. Second, we assume that the expected surplus generated by the low effort level is high enough to cover even the cost of the high effort: $\pi g_1 + (1 - \pi)g_2 \geq c^H$. If we set $\chi = (c^H - c^L)/W^H$ and $\gamma = (W^L/W^H)$, these assumptions on the parameters of the model can be summarized as:

A1: $0 < \chi \leq \gamma \leq 1$.

2.2. Uncertainty

There are two sources of voter’s uncertainty in our model. The first concerns the ‘type’ of the governments; that is, in the simplified setting we consider here, whether the incumbent and/or its opponent are of the good or bad type. We model this uncertainty as follows. At the beginning of the first period, nature independently chooses both the type of the incumbent government and the type of its opponent. These choices are not observed by the citizen, but only by the governments themselves. The citizen assigns a prior probability $\theta \in (0,1)$ to the event that the incumbent government is of a good type, and a prior probability $\theta' \in (0,1)$ to the event that the opponent is of a good type, where $\theta$ and $\theta'$ may differ. The idea underlying the (possible) difference between $\theta$ and $\theta'$ is that the citizen has been able to form some expectations on the type of the incumbent government by observing its behavior in other related policy situations. No such experience is available for the opponent, as this has not been ‘tested’ yet. Note that in this interpretation, $\theta$ also captures the ‘reputation’ of the incumbent.

The second source of asymmetric information in the model concerns the agency’s effort. Incumbent governments have better information than citizens do on the choices of the agency. To keep things as simple as possible, we assume

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We do not need to make any assumptions about the information on the agency’s effort held by the opponent government, as this information does not play any role in our analysis. In general, one would expect an opposing party to be better informed on agency behavior than the average citizen is. The point is, however, that the opponent has no way of credibly conveying this information to the citizen, as it would always be in its interest to depict the incumbent as ‘misbehaving’.
that the incumbent government can directly observe the effort made by the agency, so that there is no problem of asymmetric information between the government and the agency. The citizen, on the other hand, cannot observe the agency’s level of effort. At best, she can try to recover it from the observation of the realized level of output and the tax she has to pay. Note that these extreme informational assumptions are only made for the sake of simplicity. Indeed, as will be clear from what follows, the presence of a genuine agency problem between the government and the agency would only reinforce our argument, as it would force even the good government to leave some rent to the agency.

2.3. The game

At time 0, the Constitution sets up the rules for financing the agency; in particular, it decides whether a ‘simple’ or a ‘complex’ rule can be used by the incumbent government. As was mentioned in the introduction, the simple rule only allows for ‘flat’ contracts: governments cannot make the payment of the transfer to the agency conditional upon observations of its effort or realized output level. Under the complex rule, on the other hand, governments are entitled to use their ability to observe the agency’s choice, and can directly specify the action to be taken and the corresponding payment.

The sequence of events is as follows. At the beginning of time 1, nature moves and selects a type for the incumbent government and a type for the opponent government. Then, the incumbent moves and chooses the (one period) contract to be offered to the agency, within the constraints imposed by the Constitution. This contract involves the choice of the tax to be imposed on the citizen and the transfer to be paid to the agency, \( t \), and must satisfy the individual rationality constraints of both the agency and the citizen (see next section). It is then agency’s turn to move and choose the optimal level of effort, \( a \), given the contract offered by the incumbent government. Then, nature moves again and determines the level of production of the public good \( g \), given the effort chosen by the agency. Finally, at the end of period 1 and after that \( g \) has been realized, an election takes place. It is now citizen’s turn to move, and either re-elect the incumbent government or elect the opponent.

With the results of the election, period 1 comes to an end and period 2 begins. Whichever government is in charge at this time will again choose a tax on the citizen and a contract for the agency, given the constraints imposed by the Constitution and individual rationality, to which the agency will respond by selecting an optimal level of effort. Once again, given the effort chosen by the agency, nature will select a realization of \( g \). Both period 2 and the game end at this point.

The citizen, who can observe the action prescribed by the government and the payment, but not the chosen level of effort, cannot verify whether the payment to the agency corresponds to the prescribed effort level, or to some other choice.
Clearly, this may open the way to collusion between the bad government and the agency. Notice that the Constitution only determines the form of the contracts: under both rules, governments are, however, free to set the transfer (and the effort level under the complex rule) at the level they wish. We take this as a reasonable assumption on what a Constitution can actually do; we will come back to this in Section 5, when we discuss some related literature.

3. Equilibria

In this section, we study the equilibria of the model under the two financing rules. Our discussion will be confined to pure strategy equilibria as they allow for a more readable interpretation. Appendix A contains a short discussion of mixed strategy equilibria.

A strategy for the incumbent government is a function specifying, for each of its possible types, a contract to be offered to the agency in each of the two periods. A strategy for the challenger specifies the choice of the contract, as a function of its type, in the second period. A strategy of the agency is a choice of effort as a function of the contract offered by the government, in each period. A strategy for the citizen is a choice between the incumbent and the challenger at the end of the first period, as a function of the observed taxes and realized level of the public good.

The notion of equilibrium we use is that of perfect Bayesian equilibrium. That is, at the equilibrium, the strategy of each player must be optimal given the strategies of all other players and the beliefs of the citizen; and, whenever possible, citizen’s beliefs must be updated using Bayes’ rule.

It is well known that this notion of equilibrium is often ‘weak’ in the sense of being unable to predict a definite outcome of the game. To obtain more determinate predictions under each of the two rules, we refine the equilibrium concept by imposing additional restrictions on out-of-equilibrium beliefs. This will allow us to perform the welfare comparison between the two rules in the next section.

3.1. The complex rule

We solve the model by backward induction. In period 2, the incumbent government, whatever its type, does not need to worry about the effect of its choices on the probability of being re-elected, as no election takes place at the end of this period. Thus, the only constraints it faces in setting up the optimal contract

\[\text{Indeed, in our model, as the benefits of the public good go to the citizen, the only way in which the government can transfer resources to the agency is through a payment made using some of the tax levied on the citizen.}\]
are those determined by the participation constraint of the firm and the consumer. The incumbent government’s problem in period 2 can thus be written as:

$$\max_{t, a} W^x(t, a) \sum_i f_i^x g_i t - t \geq 0 \quad t \geq c^a \quad (1)$$

where the suffix $\lambda \in \{0,1\}$ indexes the type of the government. Note that in (1) we set up the optimizing problem as if the government directly chose the effort of the agency. Indeed, under the complex rule, the incumbent can always force the agency to provide the desired level of effort, provided that the participation constraint of the agency is satisfied. The second constraint in problem (1) represents the participation constraint for the agency: the optimal contract must at least cover its cost at any level of effort.

The first constraint in problem (1), on the other hand, captures the idea that there is a limit to the resources which can be expropriated from citizens in a democracy. We model this as a lower bound on the expected utility of the citizen, and for analytic convenience we set this lower bound equal to zero.

Using the suffix $b$ and $g$ to indicate the optimal choices made by the bad and the good government, respectively, we obtain:

**Lemma 1.** With the complex rule, the choices of the two types of government in period 2 are: $a^b = a^g = H, t^b = (1 - \pi)g_1 + \pi g_2, t^g = c^H$.

Lemma 1 is straightforward. Under A1, $a = H$ maximizes total (expected) surplus. Thus, both types of government prefer to choose this action, and then set the tax so as to give all this surplus to the agency, in the case of the bad government, or to the citizen, in the case of the good government. Note that in both cases, the payoff for the incumbent government in period 2 is $W^H$.

Having solved period 2, we now turn to period 1. In period 1 the government faces the same agency problem of period 2 and it is subject to the same individual rationality constraints. But it has a different objective function, as it must also take into account the effect of its first period choices on the probability of being re-elected. In turn, this depends on the optimal strategy of the citizen. Clearly, this is to choose the candidate with the higher probability of being of a good type at the end of period 1. This probability is $\theta$ for the opponent, and it depends on citizen’s revised belief for the incumbent. The citizen’s posterior belief, which we indicate with $\mu(t,g,\theta)$, depends on the observations made in period 1, and on the a priori reputation of the incumbent government. The optimal strategy for the citizen is then to elect the incumbent if $\mu(t,g,\theta) > \theta$ and to elect the opponent if

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We could have written the individual rationality constraint of the consumer in a more general form, for instance adding an exogenous income component to consumers’ budget, without changing the qualitative properties of the model. It is however crucial for our result that the tax level must be chosen before the realization of the public good.
\(\mu(t,g,\theta) < \bar{\theta}\). The citizen is indifferent if \(\mu(t,g,\theta) = \bar{\theta}\); in the following, we assume that in such a case the citizen elects the incumbent. Let \(G(t,a,\theta, \bar{\theta})\) denote the probability that the incumbent is re-elected when choosing \((t,a)\) in the first period. We will be more specific on the form of this function below.

Using this notation, the government’s period 1 problem is:

\[
\max_{a,t} W^A(t,a) + \delta G(t,a,\theta, \bar{\theta}) W^H \sum_i f_i a_i - t \geq 0 \quad t \geq c^a
\]  

To solve problem (2) we must specify the citizen’s beliefs at the end of the first period, as a function of the government’s (and the agency’s) choices. There can be two types of pure strategy equilibria in our game: separating and pooling. We consider them in turn.

3.1.1. Separating equilibria

At a separating equilibrium, the two types of government choose different levels of \(t\) in the first period, \(t^a \neq t^b\). Upon observing the tax in the first period, the citizen discovers the type of the government. This implies \(G(t^a,a,\theta, \bar{\theta}) = 1\), and \(G(t^b,a,\theta, \bar{\theta}) = 0\), for all values of \(a, \theta\) and \(\bar{\theta}\). Given that, at a separating equilibrium, the choice of \(a\) in period 1 does not affect the probability of being re-elected, the bad type will maximize short-term utility and choose the surplus maximizing action, \(a^b = H\), \(t^b = (1 - \pi)g_1 + \pi g_2\). Notice, however, that the bad type has the option of imitating the good type. Its best deviation is to choose \(t^s\), agree with the agency on a low effort level (which cannot be observed by the citizen), and then be re-elected for sure. A necessary condition for the existence of a separating equilibrium is that this deviation must not be profitable:

\[W^H \geq (t^s - c^L) + \delta W^H.\]

Given the individual rationality constraint of the agency, this implies that at a separating equilibrium:

\[c^L \leq t^s \leq c^L + (1 - \delta) W^H.\]

It is easy to see that any value \(t^s\) in this interval can indeed be made part of a separating equilibrium, for example by imposing out of equilibrium beliefs \(\mu(t,g,\theta) = 0\) if \(t \neq t^s\).

In particular, if \(c^H \leq c^L + (1 - \delta) W^H\), there also exists a separating equilibrium in which both types maximize their short-term utility, with the good type also

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8 Alternatively, when indifferent, the citizen could use a mixed strategy. See Appendix A for an analysis of this case.

9 Remember that under our assumptions on the production technology for the public good each \(g\) is realized with positive probability under both effort levels; thus, there is no way the citizen could realize by observing some \(g\) that the agency is playing \(a = L\).
choosing the high level of effort, but imposing a lower level of taxation. Using the notation introduced in the previous section, this condition can also be re-written as
\[ \delta \leq (1 - \chi). \]
Clearly, this condition will not hold if the discount factor is high enough. Intuitively, the higher is the discount factor, the more will the bad government value the possibility of a re-election, and therefore the stronger will be its incentive to imitate the good government. In what follows, we rule out this type of separating equilibrium by assuming:

**A2**: \[ \delta > (1 - \chi). \]

Under A2, the only way in which the good government can credibly signal his type is to choose the inefficient action, \( a^g = L \). Again, many values of \( t^g \) can be sustained by appropriately choosing out of equilibrium beliefs. To restrict the set of equilibria, we use a ‘dominance-based’ refinement\(^\text{10}\). We say that beliefs are ‘reasonable’ if the citizen would assign a zero probability to a given type of government after observing a tax level which could only be chosen as a part of a dominated strategy by that type. The only level of \( t^g \) which can be sustained by reasonable beliefs at a separating equilibrium is \( t^g = c^L \). Indeed, \( t = c^L \) is a dominated action for the bad type: the choice of \( t = c^L \) gives the bad type zero utility in the first period, and, even under the optimistic belief that by playing \( t = c^L \) he would be re-elected for sure, the bad type would rather maximize short-term profits and lose elections: \( W^H > \delta W^H \). The voter should therefore assign probability one to the government being of the good type upon observing \( t = c^L \). Hence, at a separating equilibrium with \( t^g > c^L \), the good type always has a profitable deviation which breaks the equilibrium. We thus have:

**Lemma 2.** Under A2, with the complex rule: (i) at a separating equilibrium the first period choices of the two types of government are:

\[ a^b = H_t b = (1 - \pi) g_1 + \pi g_2, a^L = L_c^L, t^g \leq t^g \leq c^L + (1 - \delta) W^H \]

(ii) the only separating equilibrium sustained with reasonable beliefs is the one in which the first period choices of the two types of government are:

\[ a^b = H_t b = (1 - \pi) g_1 + \pi g_2, a^L = L, t^g = c^L \]

3.1.2. Pooling equilibria

At a pooling equilibrium, the choice of \( t \), which is observable, must be the same for the two types: \( t^g = t^b = \tilde{t} \). This still allows for two types of equilibria. We call full pooling an equilibrium in which the chosen action is also the same, \( a^g = a^h = \hat{a} \), and partial pooling, one in which the (unobserved) choice of action is different

\(^{10}\text{See Cho and Kreps (1987) for a discussion of equilibrium refinements in the context of signaling games. Even if our game is not a standard signaling game because the citizen does not observe the action chosen by the government, we can apply the same type of refinements.} \)
for the two types, \( a^e \neq a^b \). To analyze these equilibria, note first that at a pooling equilibrium, whether partial or full, it cannot be the case that \( a^b = H \). At any such equilibria, the deviation to \( a = L \) is always feasible for the bad type and it allows the latter to raise its short-term utility without worsening its prospects for re-election. The only candidates for a pooling equilibrium are thus full pooling at \( a = L \), and partial pooling with \( a^e = H \) and \( a^b = L \).

3.1.2.1. Full pooling

A necessary condition for the existence of a full pooling equilibrium is that \( \theta \geq \theta_e \), and that neither type prefers to separate and choose the short-term maximizing tax level, in the worst possible case in which this choice causes loss of office for sure:

\[
(\pi g_1 + (1 - \pi)g_2 - \hat{t}) + \delta W^H \geq W^H
\]

\[
(\hat{t} - c^f) + \delta W^H \geq W^H
\]

These two conditions define an interval of candidate values for \( \hat{t} \):

\[
c^f + (1 - \delta)W^H \leq \hat{t} \leq \pi g_1 + (1 - \pi)g_2 - (1 - \delta)W^H
\]

This interval is not empty if \( \gamma \geq 2(1 - \delta) \). For any \( \hat{t} \) in the interval, the equilibrium \((\hat{t}, a = L)\) can be sustained, for example, with out-of-equilibrium beliefs of the form:

\[
m(t, g, u) = 0 \text{ for all } t \neq \hat{t}.
\]

We now argue that no full pooling equilibrium can be sustained under reasonable beliefs. At a full pooling equilibrium, the good type would only play \( \hat{t} > c^f \) if the beliefs of the voter were such that, upon observing \( t = c^f \), she would conclude that the incumbent is with high enough probability of the bad type. However, this out-of-equilibrium belief is unreasonable. The voter should be able to realize that \( t = c^f \) is a dominated action for the bad type, and should therefore assign probability one to the government being of the good type upon observing \( t = c^f \). Hence, at a full pooling equilibrium, the good type always has a profitable deviation which breaks the equilibrium:

**Lemma 3.** With the complex rule, if beliefs are reasonable, no full pooling equilibria exist.

3.1.2.2. Partial pooling

We are then left with partial pooling equilibria: \( a^e = H, a^b = L, \hat{t} \). We now derive conditions to support these equilibria. At any such equilibrium, beliefs are defined, after the observation of \( \hat{t} \) and \( g_t \) by:

\[
\mu(\hat{t}, g, \theta) = \frac{\theta g_t^H}{\theta g_t^H + (1 - \theta)g_t^L}
\]  

(3)
Let \( I(\theta, \tilde{\theta}) \) indicate the set of all indices \( i \in \{1,2\} \) such that \( \mu(i, g, \theta) \geq \theta \). It follows that if \((i, g, \theta)\) is observed and \( i \in I(\theta, \tilde{\theta}) \), the citizen prefers the incumbent. At a partial pooling equilibrium, the total probability of re-electing the incumbent government when the agency plays \( a \) is thus:

\[
G^a(\theta, \tilde{\theta}) = \sum_{i \in I(\theta, \tilde{\theta})} f^a_i
\]

This probability is \( G^H(\theta, \tilde{\theta}) \) for the good type and \( G^L(\theta, \tilde{\theta}) \) for the bad type.

**Lemma 4.** Under \( A1 \) and \( A2 \), with the complex rule, there exists a \( \theta_1 < 1 \) such that, for all \( \theta \geq \theta_1 \): (i) there exist partial pooling equilibria with first period choices

\[
a^* = a^u, a^b = a^b, t^b = t^* = i
\]

(ii) these equilibria can be sustained by reasonable beliefs if

\[
c^H \leq \hat{i} \leq \tilde{i} \equiv \text{Min}[\pi g_1 + (1 - \pi) g_2, c^H + W^H(1 - \gamma)]
\]

**Proof.** See Appendix.

The intuition behind Lemma 4 is rather simple. At a partial pooling equilibrium, \( \mu(i, g, \theta) \) is increasing in \( \theta \) for any realization of the public good. This implies that, for any given \( \theta < 1 \), there is a threshold \( \theta_1 < 1 \) such that \( \theta \geq \theta_1 \) implies that the citizen re-elects the incumbent even upon observing the lowest possible realization of the public good, \( g_1 \). By appropriately specifying out of equilibrium beliefs, it is then easy to support partial pooling equilibria. Furthermore, if we restrict further the admissible interval for \( i \), \( c^H \leq \hat{i} \leq \tilde{i} \), the partial pooling equilibria are also robust to the requirement that out of equilibria beliefs be reasonable. Indeed, under reasonable beliefs, the good type can always guarantee his re-election by playing \( i = c^L \) in the first period; however, this comes at the cost of having to select a low level of effort in the first period. On the other hand, at a partial pooling equilibrium, if \( \theta \geq \theta_1 \), the good type is re-elected for sure while enforcing from the agency the higher level of effort. Provided that \( \hat{i} \) is not too large, the deviation to \( i = c^L \) is clearly not profitable.\(^{11}\)

\(^{11}\)In general, partial pooling equilibria in pure strategy may exist also for \( \theta < \theta_1 \). However, as shown in Appendix A, they cannot be supported by reasonable beliefs except for a very special configuration of parameters. As also shown in Appendix A, mixed strategy equilibria, where the bad type randomizes between choosing his short-term maximizing action and pooling with the good type, exist for all \( \theta \leq \theta_1 \), provided that \( \delta(1 - \pi) \geq (1 - \gamma) \). On the other hand, if \( \delta(1 - \pi) < (1 - \gamma) \), for all \( \theta \geq \theta_1 \) there exists a mixed strategy equilibrium in which it is the good type that randomizes.
3.1.3. Further refinement

The restriction that out-of-equilibrium beliefs be reasonable eliminates full pooling equilibria under the complex rule. On the other hand, if A2 holds, that is, if the future matters enough, a fully revealing equilibrium where each type of government chooses his short-term maximizing action is also impossible under the complex rule, as the bad type would always prefer to pool.

We are thus left with two kinds of pure strategy equilibria under the complex rule: a separating equilibrium in which the good type of government chooses the inefficient action in the first period to signal itself, and the partial pooling equilibria in which the bad type imitates the good type by raising the same tax, and then transfers hidden resources to the agency by reducing the latter’s level of effort. Quite obviously, the partial pooling equilibria exist only if the a priori reputation of the incumbent is high enough. Intuitively, one would like to argue that in this case, when the prior is high enough, the good government would not be willing to pay the cost in terms of short-term inefficiency to separate himself from the bad type, thereby eliminating the separating equilibrium.

An argument to this effect is provided by McLennan (1985), who suggests that ‘justifiable’ beliefs must be based on the presumption that “deviations from the equilibrium path are more probable if they can be explained in terms of some confusion over which sequential equilibrium is in effect”. We can apply this idea to our context in the following way. If \( \theta \geq \theta_1 \), under assumptions A1 and A2 and the restriction to reasonable beliefs, the only pure strategy equilibria in which the citizen could observe \( t = c^H \) are the partial pooling ones. Thus, \( t = c^H \) is a signal to the citizen that a partial pooling equilibrium is being played. In that case, the beliefs of the citizen, after seeing \( t = c^H \) should be consistent with a partial pooling equilibrium. But then the good type will be re-elected with probability one if he chooses \( (H, c^H) \). This is a profitable deviation that destroys the separating equilibrium.

With this argument, if the prior belief of the citizen is high enough, \( \theta \geq \theta_1 \), the set of possible pure strategy equilibria under the complex rule reduces to the partial pooling equilibria. Our analysis of the complex rule can thus be summarized in the following proposition.

**Proposition 1.** Under A1 and A2, with the complex rule, there exists a \( \theta_1 < 1 \) such that, for all \( \theta \geq \theta_1 \), the only ‘justifiable’ equilibria in pure strategy are partial pooling equilibria with first period choices

\[
a^H = H, a^L = L,
\]

We have not been able to select a unique equilibrium. Indeed, under the conditions stated in the proposition, there is a continuum of partial pooling equilibria, all characterized by the same choice of the action, but involving different levels of the tax. Notice though that \( \hat{t} = c^H \) is the equilibrium level of \( t \).
which goes further against our argument here, as it is the level at which the citizen is least exploited by the bad government under the complex rule. For these reasons, in what follows we are always going to refer to the partial pooling equilibrium with $\hat{t} = c^H$ when discussing the complex rule.

3.2. Simple rule

Under the simple rule, the government announces a non-contingent transfer to the agency. Whatever the transfer, the agency will then choose the least cost action, $a = L$. Knowing this, in period 2 a good government will set $t^g = c^L$, and a bad government $t^b = \pi g_1 + (1 - \pi) g_2$. Both types of government obtain the same payoff in the second period, this time equal to $W^b$. As in the previous section, the choice in period 1 must take into account the effects on citizen’s beliefs. The next proposition shows that, under the simple rule, the bad government cannot hide its true objectives.

Proposition 2. With the simple rule: (i) there exists a separating equilibrium with first period choices

$$a^g = a^b = L$$

(ii) this equilibrium is the only pure strategy equilibrium sustained by reasonable beliefs.

Proof. See Appendix.

The proposition is very intuitive. As in the previous section, because of the restriction that beliefs must be reasonable, the good type can always get rid of the bad type by playing $t^g = c^L$ in the first period and then be re-elected for sure in the second period. However, under the simple rule, $t^g = c^L$ is also its short-term maximizing strategy, as the agency will always chooses $a = L$. Hence, the good type will certainly play $t^g = c^L$ in both periods, which also implies that the bad type will separate itself in the first period and be defeated at the elections.

To put it differently, the simple rule ‘forces’ a separating equilibrium. As we showed in the previous section, separating equilibria may exist even under the complex rule. But they cannot be supported at high level of a priori reputation, at least as long as we impose reasonable restrictions on out of equilibrium beliefs.

Thus, the simple rule does not allow for ‘hidden’ transfers to the agency. Even if the observed variables are the same under both rules, a rational voter, by observing the incumbent transfer choice in the first period, can more easily detect collusive behavior and punish it. This is valuable result for the poorly informed voter, as she does not run the risk of re-electing a bad type, as it may happen under the complex rule. However, the simple rule achieves this result at a price in terms
of efficiency: at best, the voter can now obtain only $W^L$ in each period. Is the higher transparency of the simple rule enough to compensate for this efficiency loss?

4. Comparison

In this section we compare the relative merits of simple and complex rules from an ex ante point of view. To do so, it is useful to introduce some new notation. Let $v'(R,T)$ indicate the expected discounted utility of the consumer over periods 1 and 2 under rule $R$, conditional upon government being of type $T$ at the beginning of period 1. $R \in \{S,C\}$ can either be ‘simple’ or ‘complex’, and $T \in \{B,G\}$ can either be ‘bad’ or ‘good’. Thus, for example, $v'(S,G)$ is the expected discounted utility of the voter over periods 1 and 2 under the simple rule when the incumbent is good in period 1. In the following, we assume that the initial reputation of the incumbent government is large enough to satisfy $\theta \geq \theta_1$, so that the partial pooling equilibrium described in the previous section can be supported under the complex rule. Building upon the results of the previous section, the (conditional) expected utility of the consumer in the four possible cases is:

$$v'(S,B) = \delta \theta W^L$$

$$v'(S,G) = W^L + \delta W^L$$

$$v'(C,B) = \pi g_1 + (1 - \pi) g_2 - c^H$$

$$v'(C,G) = W^H + \delta W^H$$

To understand these formulas, take for example $v'(S,B)$. Under the simple rule and bad government, period 1 expected utility of the consumer is zero. However, in period 2, the incumbent is not elected and the opponent takes its place. At the beginning of period 1, the consumer assigns probability $\theta$ to this candidate being of the good type, in which case her period 2 discounted expected utility is $\delta W^L$, and probability $(1 - \theta)$ to this candidate being of the bad type, in which case her period 2 expected utility is zero. Hence, $v'(S,B) = \delta \theta W^L$. By the same token, if the rule is complex and the incumbent is good, the consumer gains $W^H$ in both periods, so that her expected utility at the beginning of the period is $W^H + \delta W^H$. On the other hand, if the rule is complex and the government is bad, the consumer only earns $\pi g_1 + (1 - \pi) g_2 - c^H$ in the first period, and then since the bad type is re-elected for sure, she earns zero in the second period. Finally, under the simple rule and a good government in period 1, the consumer does not run the risk of not re-electing it, so that she gains with certainty $(1 + \delta)W^L$.

It is then easy to check that the citizen is certainly better off under the complex
rule if the incumbent turns out to be good, and she is certainly better off under the simple rule in the other case, provided that $\pi g_1 + (1 - \pi)g_2 - c_H$ is small, that is, provided that $\gamma$ is `sufficiently close' to $\chi$. However, to enforce a partial pooling equilibrium, the reputation of the government in period 1 must be high, so that the second case appears to be more likely. It is possible, nevertheless, that the simple rule dominates the complex rule from the point of view of the citizen? To answer this question, we define:

$$H(\theta, \theta, \delta, \gamma) = \theta v^C(S, G) + (1 - \theta) v^C(S, B) - \theta v^C(C, G) - (1 - \theta) v^C(C, B)$$

In the range of $\theta$ which supports the partial pooling equilibrium, $H(\theta, \theta, \delta, \gamma)$ measures the difference in expected utility for the consumer between the simple and the complex rule, where the ex ante probability of the two types to occur is determined by the citizen’s a priori. Clearly, the simple rule dominates the complex rule, from the point of view of the citizen, if $H(\cdot) > 0$.

**Proposition 3.** Let $\gamma = \chi$. Then, under $A1$ and $A2$, there exists a $\gamma^* < 1$, such that for $\gamma > \gamma^*$, there exists $\theta_\gamma > \theta_1$ such that $H(\theta, \theta, \delta, \gamma) > 0$ for all $\theta \in (\theta_1, \theta_\gamma)$.

**Proof.** See Appendix.

Hence, if the difference in efficiency between the two rules is sufficiently small, there is an interval of $\theta$’s in the support of the partial pooling equilibrium where the simple rule dominates the complex rule, and this interval is the larger, the smaller is this difference. Indeed, for $\gamma \rightarrow 1$, the simple rule dominates the complex rule for all $\theta$’s that supports the partial pooling equilibrium. Quite intuitively, the lower is the cost in terms of efficiency to get rid of the bad type in the second period by enforcing the simple rule, the more the voter would be willing to pay this cost, even for high level of reputation of the incumbent.

This then raises the question on who would choose the simple rule. One could wonder, for instance, if the choice of the rule might be used by the policymaker itself as a signalling device, with, say, a good government choosing the simple rule to signal its type to the voter. Interestingly, this turns out not to be possible in our case. As an inspection of the formulas above clearly show, both types of government are indeed better off under the complex rule. The bad type, because the complex rule allows it to pool, and so to extract more resources from the citizen. The good type, because the complex rule allows it to maximize the welfare of the citizen. Thus, if asked, each government, upon observing its type, would vote for the complex rule, although for opposite reasons.

One could then ask if a Constituent could choose the simple rule, interpreting here the Constituent as is in the tradition of public choice theory (e.g. Buchanan and Tullock, 1963), that is, as a higher level agent who, behind a ‘veil of ignorance’ but understanding the results of the game being played by the agents in
the economy, sets up the rules so as to maximize consumer’s welfare. The answer, perhaps unsurprisingly, is yes, provided that again the difference in efficiency between the two rules be not too large.\footnote{See the working paper version of this work (Bordignon and Minelli, 1998) for a formal proof. There, we model the notion of the veil of ignorance by assuming that the Constituent, unlike the citizen, does not observe the prior \( \theta \) on the type of the incumbent government, but only knows the cumulative function \( F(\theta) \) from which these priors are drawn. As an interpretation, one may think that the reputation of a single government regards just that policymaker, while the Constituent, in making its choice, must take in account the ‘average’ reputation of all the policymakers playing the game. Thus, the result referred to in the text is obtained by assuming that the Constituent maximizes expected consumer welfare, where expectations are taken with respect to the function \( F(\theta) \) in the interval \([\theta, 1]\).}

While this result follows easily from the above proposition, it is worthwhile pointing out that we obtain it in a society where expectations on the ‘honesty’ of incumbent policymakers have reached a very high standard, high enough to support a partial pooling equilibrium for all realizations of \( \theta \). Thus, it is certainly not necessary to have very bad expectations on politicians in order to want to enforce ‘flat’ rules. Indeed, in a sense the issue of the transparency of the rules is important when governments are expected to be good, rather than the other way round. It is only when the reputation of the average politician is high, in fact, that a badly minded policymaker can use the complexity of the contingent rules to ‘pool’ and exploit citizens without being discovered.

5. Related literature

The thrust of our argument can be better appreciated by comparing it with some related literature. Firstly, we have to distinguish our use of the term ‘transparency’ with other uses being made in the economics literature. For instance, the macroeconomic literature often uses this notion when comparing the commitment potential of different monetary rules (e.g. Cukierman and Meltzer, 1986; Cukierman, 1995; Herrendorf, 1998). However, in these works, ‘transparency’ is basically used to refer to the precision with which the public can observe the actions taken by the policymakers. Pegging of the exchange rates, say, is thought to be more transparent than money supply rules because it can be better monitored by the private sector. As the above analysis should have made clear, our focus here is on a subtler meaning of the idea of transparency. Transparency is not a property of the rules of the game, but rather it is the result of the interaction between the rules of the game and the strategic behavior of the agents involved. Flatter rules are more transparent because, in equilibrium, they allow citizens to gather more information about their representatives by observing the same set of governmental actions. Since there are limits to what voters can observe, this may provide an important insight into the functioning of the political system.

Secondly, we must acknowledge our modelling debt with the work of Coate and
Morris (1995). They are interested in clarifying the debate between the Chicago and the Virginia schools of public choice over the issue of the ‘efficiency’ of politics. To this end, they compare two possible ways of transferring resources to an interest group: either directly, via an observable transfer, or indirectly, by implementing a risky public project. Governments can either be ‘good’ or ‘bad’, and citizens are less informed on the real benefits of the project than the governments are. Vindicating the Virginia approach, Coate and Morris show that in equilibrium bad governments may prefer to pool and avoid direct (Pareto efficient) transfers, as this would reveal their type and result in election defeat. This is very similar to one of the results of our paper, except that in our case the most efficient rule which allows for pooling behavior. This different result is due to the inclusion in our model of an agency problem, a crucial difference with the Coate and Morris’s paper. The agency problem allows us to highlight which is our main argument here: the potential trade-off between transparency and efficiency and the consequent normative problem of the choice of the rules.

A similar trade-off, between high-powered incentives and the threat of collusion, has been investigated in the literature on regulation (e.g. Laffont and Tirole, 1993; Tirole, 1991). In the basic model of this literature, the Principal (i.e. the Congress) must design a contract for an Agent (i.e. the regulated firm), and she has the possibility of asking for the help of a Supervisor (i.e. a regulatory agency) which is endowed with better information on the Agent’s behavior. The Principal takes into account that the Supervisor can be bribed by the Agent. Usually, in order to reduce the stakes on which corruption is based, the optimal ‘grand’ contract involve less powered incentive payments than would otherwise be the case. In some cases, it is even optimal for the Principal to discard the Supervisor’s information altogether. Reinterpreting the Supervisor as the government and the Principal as the citizen, the formal analogy with both the structure and the results of our model would appear to be substantial.

There is a crucial difference, though. As we focus on the political context, we take as a natural constraint the fact that the Principal (the citizen) cannot directly write a contract with the Supervisor (the government). To understand why this difference is crucial, imagine that we attempt to apply the Laffont–Tirole conclusions to our political context. This would lead us either to reducing the discretion of the policymaker, maybe by directly writing an optimal contract for the agency at the Constitutional level, or to providing the government with the right incentives not to collude. However, both suggestions are hardly feasible in the political context. Constitutions are incomplete contracts which can only very weakly constrain the behavior of ruling politicians (e.g. Dixit, 1996), and elections are a highly imperfect way of providing incentives to governments. Indeed, these specific constraints are exactly the reason why we believe the issue of the transparency of rules may be so important in the political context. Transparency allows an otherwise very poorly equipped Principal to have a better check on the behavior of her Agent. To put it differently, our point here is not to say that as
politicians may be ‘bad’ it is better to ‘tie their hands’ with flatter rules. The point is rather that since it is not really possible to tie politicians’ hands, or at least, not very tightly, the screening property of less contingent rules is valuable.

Our results may also be seen as contributing to the literature on delegation (e.g. Holmstrom, 1984; Armstrong, 1995). In these works, a Principal must delegate a choice to an Agent, and as in our model, the Principal is, for some reasons, unable to write a fully contingent contract. In a static model, the basic result is that the Principal should leave more discretion to the Agent the more likely is that two agents’ preferences are aligned. Reinterpreting our results in the context of these models, we notice that adding a dynamic component may offer a very different insight to the problem. In a dynamic framework, giving less discretion to the Agent (i.e. forcing him to use a flat rule) may allow the Principal to obtain separation of types in the second period. As we have shown, this gain in transparency is particularly important when the Principal assigns a high probability to the fact that the Agent’s preferences are aligned with his own, because this makes pooling behavior more likely.

One limitation of the present work is that we only focus on electoral behavior as the citizen’s means of rewarding or punishing the government. More generally, governments may lose consensus, or they may come under attack from opposing interest groups, or they may face stiffer opposition in Parliament, or may risk a more thorough examination by the judicial system. In all these cases, less contingent rules are likely to impose on policymakers higher political costs, as their ‘bad’ behavior would be more easily detected. In a recent paper, Roland et al. (1997) emphasize the role played by the design of a system of checks and balances in providing the citizen with a richer set of instruments to improve the accountability of elected bodies. They do not deal explicitly with the problem of adverse selection in the choice of candidates, which is our focus here. Extending our analysis to this richer institutional setting may be a promising area for future research.

6. Concluding remarks

Standard arguments used to explain the difference between the ‘simple’ rules observed in many contexts and the ‘complex’ mechanisms prescribed by the theory, are based on a consideration of implementation costs, or on the need to avoid an excessive sensibility to measurement errors. We offer a different explanation. Different rules may induce different types of equilibrium behavior, with different informational content. Simple rules, even when they lead to some loss of efficiency, may be preferable because they are more ‘transparent’: they induce equilibria in which more information gets revealed.

In this paper, we illustrate this argument with reference to electoral behavior in the political context. This is a field within which our argument is likely to be of
particular importance, because of the large gap in information between policymakers and citizens, on one hand, and because elections are at best a very imperfect instrument to disciplining politicians, on the other hand. We show that it may be optimal to constrain governments to use simple rules, even at the cost of some inefficiency, precisely because the informational content of the same observed actions is higher at equilibrium.

The trade-off between accountability and efficiency may not be limited to the citizen–government relationship, however. In essence, the model discussed in this paper is one in which a severely constrained Principal faces both an adverse selection and a moral hazard problem. Given the limited set of instruments at her disposal to deal with adverse selection problem (i.e., in this paper, only her electoral behavior) it may be optimal to further constrain the set of instruments available to handle the moral hazard problem. As such, the model may have applications which go beyond the analysis we have developed here.

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Appendix.

Proof of Lemma 4

(i) A necessary condition for the existence of a partial pooling equilibrium is that neither type prefers to separate and choose the short-term maximizing tax level, in the worst possible case in which this choice causes loss of office for sure:

\[ ((1 - \pi)g_1 + \pi g_2 - \hat{i}) + \delta G^H(\theta, \tilde{\theta}) W^H \geq W^H \]

\[ (\hat{i} - c^\ell) + \delta G^L(\theta, \tilde{\theta}) W^H \geq W^H \]

These two conditions define an interval of candidate values for \( \hat{i} \):
This interval is not empty if:

$$G^L(\theta, \tilde{\theta}) + G^H(\theta, \tilde{\theta}) \geq \frac{1 - \gamma}{\delta} \quad (A.1)$$

The proposed $\hat{t}$ must also satisfy the individual rationality conditions:

$$c^H \leq \hat{t} \leq \pi g_1 + (1 - \pi)g_2$$

The intersection of these two intervals is not empty if besides (A.1) the following condition is satisfied:

$$G^L(\theta, \tilde{\theta}) \geq \frac{1 - \gamma}{\delta} \quad (A.2)$$

Because of $A2$, the RHS of both (A.1) and (A.2) are smaller than one. If we define:

$$\theta_1 = \frac{\pi \theta}{\pi \theta + (1 - \pi)(1 - \theta)}$$

we see that $G^L(\theta_1, \tilde{\theta}) = G^H(\theta_1, \tilde{\theta}) = 1$, so that (A.1) and (A.2) are certainly satisfied for all $\theta \neq \theta_1$. Also, $\theta < 1$ implies $\theta_1 < 1$.

For values of $\theta$ higher than $\theta_1$, the necessary conditions for the existence of a partial pooling equilibrium are satisfied. To sustain these equilibria, it is enough to appropriately specify the citizen’s belief out of equilibrium, for example by setting $\mu(t, g, \theta) = 0$ for all $t \neq \hat{t}$.

(ii) With reasonable beliefs, the good type can always signal itself by playing $t = c^L$ in period 1 and be re-elected for sure in period 2. We must then make sure that this deviation is not profitable for the good type:

$$((1 - \pi) g_1 + \pi g_2 - \hat{t}) + \delta G^H(\theta, \tilde{\theta}) W^H \geq W^L + \delta W^H \quad (A.3)$$

Recalling that the agency’s participation constrain implies that $\hat{t} \geq c^H$ at the proposed equilibrium, this gives us the further condition:

$$G^H(\theta, \tilde{\theta}) \geq 1 - \frac{1 - \gamma}{\delta} \quad (A.4)$$

Condition (A.4) ensures that the proposed equilibria are not based on the unreasonable belief that the bad type could play a dominated strategy. By $A1$, the right-hand side of (A.4) is certainly smaller than or equal to 1; again, the condition is satisfied at $\theta_1 < 1$.

Using (A.3) and the participation constraints, the interval of admissible values of the tax is:
\[ c_H^u \leq \hat{\ell} \leq \text{MIN}[\pi g_1 + (1 - \pi)g_2 c_H^u + W^H(1 - \gamma)] \]

which is non-empty under our assumptions. □

Partial pooling equilibria exist even for lower values of \( \theta \). Indeed, one can easily calculate a \( \theta_0 \) such that \( G^H(\theta, \theta) = \pi \) and \( G^L(\theta, \theta) = (1 - \pi) \) for all \( \theta \) in the interval \([\theta_0, \theta_1]\), so that partial pooling equilibria exist provided that \( \delta(1 - \pi) \geq (1 - \gamma) \). However, to sustain these equilibria with reasonable beliefs, the complementary condition must also hold: \( \delta(1 - \pi) \leq (1 - \gamma) \). Thus, except for the particular configuration of parameters such that \( \delta(1 - \pi) = (1 - \gamma) \), partial pooling equilibria can be sustained by reasonable beliefs only if \( \theta \equiv \theta_1 \).

**Mixed strategy equilibria under the complex rule**

**Lemma 5.** Given \( A1 \) and \( A2 \), under the complex rule: (i) if \( \delta(1 - \pi) \leq (1 - \gamma) \) for all \( \theta \leq \theta_1 \), there exist partial pooling equilibria in which, in the first period, the good type chooses \((H, c_H^u)\), while the bad type randomizes between \((L, c_H^u)\) and \((H, (1 - \pi)g_1 + \pi g_2)\); (ii) if \( \delta(1 - \pi) \geq (1 - \gamma) \) for all \( \theta \geq \theta_1 \), there exist partial pooling equilibria in which, in the first period, the bad type chooses \((L, c_L^u)\), while the good type randomizes between \((H, c_H^u)\) and \((L, c_L^u)\).

**Proof of Lemma 5.** (i) Let \( \alpha \) be the probability with which the bad type plays \((L, c_H^u)\). To complete the description of the equilibrium we must define the citizen’s beliefs and strategy. These are defined as follows. After observing \((c_H^u, g_1)\) or \( t = c_L^u \), the citizen always elects the incumbent. After observing \((c_H^u, g_1)\) she elects the incumbent with probability \( \beta \). After observing any other level of tax, she never re-elects the incumbent.

To make the citizen indifferent between electing the incumbent or the opponent when observing \((c_H^u, g_1)\), \( \alpha \) must be such that \( \mu_\ell(c_H^u, \theta, \theta) = \bar{\theta} \), which gives

\[
\alpha = \frac{(1 - \pi)\theta(1 - \bar{\theta})}{\pi(1 - \theta)\bar{\theta}}
\]

which is smaller than one if \( \theta \leq \theta_1 \).

To make the bad type indifferent between \((L, c_H^u)\) and \((H, (1 - \pi)g_1 + \pi g_2)\), \( \beta \) must solve the equation \( c_H^u - c_L^u + \delta[(1 - \pi) + \pi\beta]W^H = W^L \), which gives

\[
\beta = \frac{1 - \chi - \delta(1 - \pi)}{\delta\pi}
\]

Our assumption that \( \delta(1 - \pi) \leq (1 - \gamma) \) ensures that \( \beta \geq 0 \).

It is now easy to see that, with these values for \( \alpha \) and \( \beta \), the proposed strategies and beliefs define an equilibrium.

(ii) Let \( \alpha^\prime \) be the probability with which the good type plays \((H, c_H^u)\). Let the citizen’s beliefs and strategy be as follows. After observing \((c_H^u, g_2)\) or \( t = c^u \), the
citizen always elects the incumbent. After observing \((c^H, g_1)\) she elects the incumbent with probability \(\beta'\). After observing any other level of tax, she never re-elects the incumbent.

To make the citizen indifferent between electing the incumbent or the opponent when observing \((c^H, g_1)\), \(\alpha'\) must be such that 
\[
\mu_1(c^H, \theta, \bar{\theta}) = \bar{\theta},
\]
which gives
\[
\alpha' = \frac{\pi(1 - \theta)\bar{\theta}}{(1 - \pi)(1 - \theta)}
\]
which is smaller than one if \(\theta \geq \theta_1\).

To make the good type indifferent between \((H, c^H)\) and \((L, c^L)\), \(\beta'\) must solve the equation 
\[
W^H + \delta(\pi + (1 - \pi)\beta'W^H) = W^L + \delta W^H,
\]
which gives
\[
\beta = 1 - \frac{1 - \gamma}{\delta(1 - \pi)}
\]
which is bigger than zero if \(\delta(1 - \pi) \geq (1 - \gamma)\).

For these values for \(\alpha'\) and \(\beta'\), the proposed strategies and beliefs define an equilibrium. \(\square\)

Notice in particular that, recalling Proposition 1, if \(\delta(1 - \pi) < (1 - \gamma)\), for all values of the prior \(\theta\) there is an equilibrium under the complex rule in which the bad type pools. In this case, even for values of \(\theta\) smaller than \(\theta_1\) the simple rule may dominate the complex one.

**Proof of Proposition 2.** (i) Notice first that, at a separating equilibrium it must be that \(t^b = \sum f_i^L g_i\). Indeed, the individual rationality constraint for the citizen imposes this upper bound, and any value of \(t^b\) lower than this will not be robust to a deviation of the bad type to \(t = \sum f_i^L g_i\).

We must also check that the bad type does not want to mimic the good type:
\[
W^L \geq (t^g - c^L) + \delta W^L.
\]

This condition, and the participation constraint of the agency, define an interval of possible values for \(t^g\):
\[
c^L \leq t^g \leq c^L + (1 - \delta)W^L.
\]

It is easy to check that, for all values of \(t^g\) in this interval, a separating equilibrium with first period choices \((t^b = \sum f_i^L g_i, t^g, a^L = a^L)\) can be sustained with beliefs \(\mu(t, g_i, \theta) = 0\) for all \(t \neq t^g\).

(ii) All of the separating equilibria in which \(t^g > c^L\) can be eliminated by using the fact that \(t = c^L\) is a dominated action for the bad type: even in the prospect of being re-elected for sure he would only obtain a payoff of \(\delta W^L\), which is less than the payoff \(W^L\) he would obtain by choosing his short-term maximizing action and
be removed from office. Thus reasonable beliefs should have $\mu(c^L,g,\theta) = 1$, and the good type has a profitable deviation whenever $t^g > c^L$. If $\theta \geq \theta$ and $\delta \geq 1/2$, there exist also pooling equilibria under the simple rule. None of these can be sustained by reasonable beliefs, though. Indeed, at a pooling equilibrium with $t^g = t^h = t$, we must have $t \geq c^L + (1 - \delta)W^L$ to avoid deviation of the bad type to its short-term maximizing action. The good type thus obtains a payoff $\pi g_1 + (1 - \pi)g_2 - t + \delta W^L < W^L(1 + \delta)$. But the right-hand side of this inequality is the payoff that the good type would obtain, under reasonable beliefs, by deviating to $t = c^L$. □

Proof of Proposition 3. When $\theta \leq \theta_1$, $H$ simplifies to

$$H(\theta, \theta, \delta, \gamma) = W^H[(1 - \theta)\delta \theta + \theta(1 + \delta))\gamma - \theta(1 + \delta)]$$

a decreasing function of $\theta$. If we define $\gamma^* = [\theta_1(1 + \delta)/(1 - \theta_1)\delta \theta + \theta_1(1 + \delta)]$, we have that $H(\theta_1, \theta_1, \delta, \gamma) > 0$ for all $\gamma > \gamma^*$. For any such $\gamma$, using the above expression for $H$, we can find a value $\theta_\gamma$ such that $H(\theta_\gamma, \theta, \delta, \gamma) > 0$ for all $\theta \in (\theta_1, \theta_\gamma)$. □

References


