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# Private Agenda and Re-election Incentives[*]

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**Abstract**

Consider a politician who has to take two sequential decisions during his term in office. For each decision, the politician faces a trade-off between taking what he believes to be the decision that generates a public benefit, thus increasing his chances of re-election, and taking the decision that increases his private gain but is likely to decrease his chances of re-election. In our results we find that if the politician is a good enough decision maker and he desires to be re-elected enough, he takes the action that generates a public benefit regardless of his private interests. Moreover, we find that the behavior such that the politician delays taking the action that generates a public benefit to the last period of his term in office before he is up for re-election is optimal if and only if he has either very high or very low decision making skills.

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# 1 Introduction

Politicians regularly face a trade-off between choosing what is best for their constituency and what is best for their own private benefit. On the one hand, choices that enhance the living standards of citizens improve the politician's chances of re-election. On the other hand, the politician may be tempted instead to take choices that target his own private benefit. As Barro (1973) puts it, sources of private gain for a politician could be "payments from recipients of government contracts . . . increased business with a politician's law firm, promises of future employment . . . provision of personal services . . . ".

In this paper we consider a politician in office who has to take two sequential decisions before the next elections. Before taking each decision, he has a prior on what the socially optimal alternative is (the public decision). On top of that, he has a private interest in choosing a particular option (the private decision), not necessarily the same as the public decision. After each decision, it is known whether the politician took the public decision or not. After both decisions are taken, the politician is re-elected if and only if he took the public decision at least once. We study how different factors affect the politician's incentives to choose what he believes to be the public decision. These factors are how much the politician enjoys the private decision, how good a decision maker he is (i.e. the quality of his prior) and how much he desires to be re-elected.

In our analysis we obtain two main results. First, if the politician is a good enough decision maker and he desires to be re-elected enough, he takes what he believes to be the public decision at least once regardless of how large his private interests are. The novelty of this result is that it holds even if for fixed decision making skills and desire for re-election the politician's private interests are made arbitrarily large. The reason for this is due to the fact that there are times when the public decision coincides with the private decision. Hence, if the politician can to some degree guarantee himself re-election because of being a good decision maker and if his desire to be re-elected is sufficiently high, it is optimal for him to simply wait for the times when the public decision coincides with the private one.

Second, the behavior such that the politician delays taking the decision that generates a public benefit to the last period of his term in office right before he is up for re-election is optimal if and only if he has either very high or very low decision making skills. In particular, a politician that is a good decision maker starts-off by taking the private decision to then take what he believes to be the public decision when elections approach. The politician can behave in such a way in this case as he is somewhat certain that he will take the public decision in the second period, securing re-election. A bad decision maker cannot be sure of what the public decision is. Thus, he believes that re-election is unlikely regardless of how he behaves.

Hence, although the politician wants to be re-elected, he also wants to make sure he enjoys the benefit from taking the private decision. Therefore, he starts off by ensuring himself a certain payoff by taking the private decision and then tries to improve his chances of re-election by taking what he believes to be the public decision. A politician who is neither a good decision maker nor bad one needs to be more cautious and start off by choosing what he believes to be the public decision in order the improve his chances of re-election. Only if the politician has the public backing because he took the public decision, he will then choose according to his private interests. The novelty of this result is that we find a rational explanation for the behavior such that the politician follows his private agenda at the beginning of his term in office and then tries to be re-elected by taking the public decision, without assuming any kind of a memory effect on voters nor time inconsistencies by the politician.

The economic literature analyzing political processes has its roots in Downs (1957). The politician's trade-off between private and public interests is usually referred to as the political agency model, pioneered by Barro (1973) and Ferejohn (1986). In this literature, the relationship between the citizens and the politician is the same as that of a principal and an agent in the principal agent problem; citizens hire the politician to take certain decisions, the politician can shirk by taking the choices that increase his personal gain and citizens try to avoid this by not re-electing.

In this paper, we consider the political agency model as just described but, as opposed to previous literature, we allow for several decisions to be taken per term. This permits us to characterize and understand the specific decision rules that the politician may employ. In particular, we are interested in understanding when the politician takes public decisions as opposed to private ones, and why these decisions are sometimes taken at the beginning of the politician's term in office and other times they are taken at the end of his term before elections (recall the Kansas farmer's quote "what have you done for me lately", found, for instance, in Acemoglu and Robinson (2012) or Ferejohn (1986), see also Sarafidis (2007) and Smart and Sturm (2007), Ferraz and Finan (2005), Pettersson-Lidbom (2006) or Besley and Burgess (2002) for empirical references).[1]

As opposed to Ferejohn (1986), we focus our attention on the current politician in power and on how he solves the trade-off between public and private interests. Moreover, our focus is not on who wins each election and on what are the political views of the winner (as in Van Weelden (2013)), but rather on how the winner takes decisions depending on his own

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[1]Most of this empirical literature assumed that politician has a maximum number of terms. Hence, the standard prediction of the political agency model is that the politician shirks when he is in his last term in office. In our model, there is no term limit and shirking occurs because there are multiple decisions per term. Moreover, in our paper the politician chooses not only whether to shirk or not but also when.

characteristics. On top of that, unlike some of the previous political agency models, we do not need to consider different settings depending on whether or not the politician's characteristics are common knowledge or private knowledge (Bernhardt et al. (2009) or Bernhardt et al. (2011)), as citizens only care about the quality of the politician's decisions, not on what motivated him to take each decision.

Previous literature has also looked at the role of commitment in elections. With commitment, the politician chooses the decisions that he will take while in office at the beginning of his term. This has been shown to suffer from time inconsistency problems (Alesina (1988)) and, on top of that, it leaves open questions about the politician's reputation and how the citizens can punish candidates with unfulfilled promises (Aragonès et al (2007)). Instead, in our model, citizens evaluate the performance of the politician according to the decisions he took while in office. Thus, there is no role for commitment as only actual events instead of promises matter for re-election.[2]

The rest of the paper is organized as follows. In section 2 we introduce the model. We present our main results in section 3. Finally, section 4 concludes. All mathematical proofs are presented in the appendix.

# 2 The Model

There are 2 time periods per term, where each time period represents a decision of the politician.[3] At each time $t \in \{1, 2\}$, the state of nature can take two values, $s_t \in \{0, 1\}$, both equally likely. The state of nature represents what is the socially optimal decision at a certain point in time (the public decision). At each $t$ and before knowing the realization of $s_t$, the politician has to take a decision, $d_t \in \{0, 1\}$. Prior to taking each decision, however, the politician receives a signal $\theta_t \in \{0, 1\}$ about the state of nature. The signal $\theta_t$ is interpreted as what the politician believes to be the public decision. The signal $\theta_t$ has quality $q \in \left[\frac{1}{2}, 1\right]$ for all $t$ where $q$ represents how good a decision maker the politician is.[4] In particular, for all $t$

$$\Pr\left(s_t = 0 | \theta_t = 0\right) = \Pr\left(s_t = 1 | \theta_t = 1\right) = q.$$

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[2]For more on the role of commitment and time inconsistencies in a sequential policy making model see Bueno de Mesquita and Landa (2014).

[3]The case where there is only one time period (i.e. the politician takes only one decision per term) is considered in the seminal paper of Ferejohn (1986) and more recently in Van Weelden (2013). The working paper version of the present paper (Rivas (2014)) deals with the cases where there is only one time period (i.e. one decision) per term and when there are more than two.

[4]Note that given that we deal with a binary policy/binary state space model both the quality of information and the politician's decision making skills are equivalent concepts yet this is not true in general.

At the end of each time period $t$ the realization of $s_t$ is known. If for a given $t$ we have that $d_t = s_t$, we say that at time $t$ the politician took the public decision. Let $r_t \in \{0, \ldots, t\}$ be the number of times the politician took the public decision up to time $t$ included, that is, $r_t = \#\{n \in \{1, \ldots, t\} \; / \; d_n = s_n\}$.

At the end of period 2 voters decide whether or not to re-elect the politician. If the politician is re-elected then the game restarts, if not, the game ends. We assume that citizens re-elect the politician if and only if he took the public decision at least 1 time. That is, the politician is kept in power if and only if $r_2 \geq 1$. Note that the role of the electorate in our model is a passive one.[5] Moreover, we deliberately assume that voters have perfect memory within each term, i.e. they remember equally well the first period as well as the second one when the politician is up for re-election. If voters had better memory of more recent events then there will be an obvious reason why we observe politicians to be more selfish at the beginning of their terms in office and less so at the end. One of the purposes of this paper is to show that memory considerations are not needed for such behavior and that, therefore, there are more intricacies to the incentives faced by the politician that need to be explored.

The game we just described is illustrated in figure 1.

Figure 1: The Game



We assume that the politician enjoys being popular among the electorate. We represent this in the model by assuming that if the politician takes the public decision, then his utility increases by $\frac{1}{2}$ units.[6] On top of popularity, the politician has its own private agenda. In particular, the politician receives extra utility $\frac{\alpha}{2} \geq 0$ whenever he takes decision 1 (the private decision).[7] Finally, we assume that the politician discounts the utility of future elections at

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[5]The working paper version of the this paper (Rivas (2014)) extends this assumption by allowing voters to be strategic players that have the number of times the politician needs to take the public decision in order for him to be re-elected as their choice variable.

[6]Alternatively, it could be assumed that the politician receives some one-off benefit from taking the public decision.

[7]Even though we assume the private decision to be action 1, the private decision could change period by

a rate $\beta \in (0, 1)$.

The fact that both the utility from popularity and the utility from following his private agenda are divided by 2 is done to make calculations easier but it has no effect on the results. The discount factor $\beta$ is applied not to future periods but to future elections; this is to have $\beta$ as a measure of how much the politician wants to be re-elected. Note that the politician does not derive utility from holding office per se as his only sources of utility are popularity and private agenda. However, since he can only receive these when he is in power, both popularity and private agenda are a motivation for re-election.

Define $\frac{1}{2}u(s_t, d_t)$ as the utility the politician receives in period $t$ given $s_t$ and $d_t$. Following the description above we have that

$$
u(s_t, d_t) = \begin{cases} 1 & \text{if } d_t = s_t = 0, \\ 1 + \alpha & \text{if } d_t = s_t = 1, \\ \alpha & \text{if } d_t \neq s_t = 0, \\ 0 & \text{if } d_t \neq s_t = 1. \end{cases}
$$

Let $u_E(\theta_t, d_t)$ be the expected value of $u(s_t, d_t)$ at time $t$ after $\theta_t$ is known. Thus, we can write

$$
u_E(\theta_t, d_t) = \begin{cases} q & \text{if } d_t = \theta_t = 0, \\ q + \alpha & \text{if } d_t = \theta_t = 1, \\ 1 - q + \alpha & \text{if } d_t \neq \theta_t = 0, \\ 1 - q & \text{if } d_t \neq \theta_t = 1. \end{cases}
$$

Define $d_t : \{0, \dots, t-1\} \times \{0, 1\} \rightarrow \{0, 1\}$ as the plan of the politician such that his decision at time $t$ is given by $d_t(r_{t-1}, \theta_t)$ for all $t$. In an abuse of notation we also refer to $d_t$ as the realization of $d_t(r_{t-1}, \theta_t)$. Let $u_E(d_t)$ be the expected value of $u_E(\theta_t, d_t)$ before the realization of $\theta_t$ is known when the politician follows plan $d_t$. Finally, define $U_E$ as the maximum expected discounted utility the politician receives from playing the game (i.e. the continuation value), we have that $U_E$ is given by

$$
U_E = \max_{\{d_t\}_{t=1}^{t=2}} \left\{ \frac{1}{2} \sum_{t=1}^{2} u_E(d_t) + \Pr(r_2 \geq 1) \beta U_E \right\}.
$$

Note that both the one-period expected payoff $u_E$ and the continuation value $U_E$ include the possible payoffs from popularity and private agenda $\alpha$. Thus, even if the politician does not play the selfish action in the current term in office, he may still enjoy the selfish payoff in the future if he is re-elected.

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period. This would make no difference to our results but would complicate the exposition.

Given that the plan $d_t$ for all $t$ is contingent on all the possible values of $\theta_t$ and $r_{t-1}$, it is irrelevant whether the politician chooses the plan $d_t$ at time $t$ after knowing $\theta_t$ or at the beginning of the game before knowing $\theta_1$. Thus, for simplicity we assume that the politician chooses $\{d_t\}_{t=1}^{t=T}$ at the beginning of the game.[8]

Note that at any $t$, if $\theta_t = 1$ then choosing $d_t = 1$ maximizes the continuation value of the politician: if $d_t = 1$ then the politician's one-period expected utility is $q + \alpha$ while if $d_t = 0$ then the politician's one-period expected utility is $1 - q$, which is smaller than $q + \alpha$ for any $\alpha \geq 0$ as $q \in \left[\frac{1}{2}, 1\right]$. Moreover, the chances that the politician is re-elected are higher by taking the decision $d_t = 1$ than by taking the decision $d_t = 0$ whenever $\theta_t = 1$ as $q \in \left[\frac{1}{2}, 1\right]$. Thus, if the politician receives signal 1 his optimal plan, in the sense that it maximizes his present and future expected utility, is to take the decision 1. Therefore, from now on we only consider plans of the politician such that $d_t(r_{t-1}, 1) = 1$ for all $t$ and all $r_{t-1}$.

If at a given $t$ we have that $\theta_t = 0$, whether or not the politician chooses $d_t(r_{t-1}, 0) = 0$ or $d_t(r_{t-1}, 0) = 1$ depends on the parameters of the model and the value of $r_{t-1}$. The target our analysis is to identify this dependence. We refer to the plan $d_t(r_{t-1}, 0) = 0$ as the honest plan, as the politician chooses what he believes to be the public decision even though it goes against his private benefit. If the politician chooses a plan with $d_t(r_{t-1}, 0) = 0$ we say that he is honest at time $t$ for given $r_t$. Otherwise, if $d_t(r_{t-1}, 0) = 1$, we say that he is not honest. To simplify exposition, if the politician is indifferent between being honest or not we assume he is honest.

## 3    Analysis

There are eight possible plans maximizing $U_E$, we label those as $HH$, $DD$, $HD$, $DH$, $HC_w$, $DC_w$, $HC_r$ and $DC_r$. In these acronyms, we use the following convention: $H$ stands for being honest, $D$ stands for not being honest (dishonest), $C$ stands for the behavior that conditions being honest in the second period on whether or not the public decision was taken in the first period. In particular, the acronym $C_w$ means that the politician is honest in the second period if and only if the public decision was not taken in the first period (the politician was "wrong"). The acronym $C_r$ means to be honest in the second period if and only if the public decision was taken in the first period (the politician was "right"). In detail:

 -  *HH*: $d_1(0,0) = 0$ and $d_2(r_1, 0) = 0$ for all $r_1$.

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[8]This does not mean that the politician commits to a certain sequence of plans $\{d_t\}_{t=1}^{t=2}$. The politician can choose any plan $d_t$ at time $t$ but, given that $d_t$ is contingent on all relevant information up to time $t$, this plan is no different than the one he would have chosen at the beginning of the game. Likewise, this assumption poses no time consistency problems.

- *DD*: $d_1(0,0) = 1$ and $d_2(r_1,0) = 1$ for all $r_1$.

- *HD*: $d_1(0,0) = 0$ and $d_2(r_1,0) = 1$ for all $r_1$.

- *DH*: $d_1(0,0) = 1$ and $d_2(r_1,0) = 0$ for all $r_1$.

- *HC$_w$*: $d_1(0,0) = 0$, $d_2(0,0) = 0$ and $d_2(1,0) = 1$.

- *DC$_w$*: $d_1(0,0) = 1$, $d_2(0,0) = 0$ and $d_2(1,0) = 1$.

- *HC$_r$*: $d_1(0,0) = 0$, $d_2(0,0) = 1$ and $d_2(1,0) = 0$.

- *DC$_r$*: $d_1(0,0) = 1$, $d_2(0,0) = 1$ and $d_2(1,0) = 0$.

We remind the reader that we only consider plans such that $d(r_t,1) = 1$ for all $r_t$ throughout our analysis as this plan dominates any other plan whenever the politician receives signal 1.

Out of the eight possible plans above only four of them are not dominated, this is our next result.

**Lemma 1.** *The plans $HD$, $DH$, $HC_r$ and $DC_r$ are dominated by $HH$, $DD$, $HC_w$ or $DC_w$.*

Intuitively, the plans $HD$ and $DH$ are never optimal as it is best for the politician to be fully honest, $HH$, to condition his honesty for the second period on how he fared in the first period, $HC_w$, $DC_w$, $HC_r$ and $DC_r$, or to never by honest, $DD$. The politician may find it optimal to condition his honesty for the second period on how he fared in the first period: if his one-period utility is greater by following his private interests than by taking what he believes to be the public decision, then if he takes the public decision at time $t = 1$ he has no incentives to continue being honest as he is going to be re-elected regardless of the outcome of his decision at time $t = 2$.

The plans $HC_r$ and $DC_r$ are never optimal as if the politician receives more one-period utility by being honest then he maximizes his utility by being honest at both $t = 1, 2$. Similarly, if the politician receives more one-period utility by not being honest then a plan where he is honest after taking the public decision at $t = 1$ is always dominated by a plan where he is not honest under the same circumstances.

Using lemma 1, we can obtain the following result:

**Theorem 1.** *The optimal plan is given by:*

- *$HH$ if and only if $\alpha \leq 2q - 1$,*

- $HC_w$ if and only if $\alpha > 2q - 1$ and either $\beta \geq \frac{3-2q}{q(11-8q)-2}$ or

$$\alpha \leq \frac{q(8 + \beta - q(4 + 2\beta)) - 3}{3 + 2\beta - q(2 + 11\beta - 8\beta q)}.$$

- $DD$ if and only if $\beta < \frac{4}{16q-5}$ and

$$\alpha > \frac{q(8 + 2\beta) - \beta - 4}{4 + 5\beta - 16\beta q}.$$

- $DC_w$ if and only if neither $HH$, $HC_w$ nor $DC_w$ are optimal.

In words, Theorem 1 states the following. If the politician's one-period utility is higher by being honest than by taking the private decision, the optimal plan is for him to be honest at both periods, $HH$. Otherwise, if either he is patient enough with respect to his decision making skills or if his private interests are not too high then he starts off by being honest in hopes of taking the public decision to ensure re-election. The politician then, if he takes the public decision at time $t = 1$, takes the private decision at time $t = 2$. On the contrary, if the politician does not take the public decision at time $t = 1$, he continues to be honest at time $t = 2$ (plan $HC_w$). In this situation, the politician wants to ensure re-election and, hence, if necessary he is honest at both periods. If the politician is not patient enough and his private interests are sufficiently high then the optimal plan involves him taking the private decision at both periods, $DD$.

Finally, if the politician is not patient enough and his private interests are moderate, he starts off by taking the private decision and, if he does not have the electorate's backing because the private decision did not coincide with the public one at $t = 1$, he is honest at time $t = 2$, i.e. the plan $DC_w$. This is the type of behavior that empirical literature on the political agency model has tried to identify (see for instance Smart and Sturm (2007), Ferraz and Finan (2005) or Pettersson-Lidbom (2006)). Note that in our model if the plan $DC_w$ is optimal it is not because of a memory effect nor because of time inconsistency issues.

A conclusion that can be drawn from Theorem 1 is the following:

**Result 1.** *If the politician is a good enough decision maker and he desires to be re-elected enough, the politician is honest for as long as he has not guaranteed himself re-election **regardless** of how large his private interests are.*

*In particular, if $q \geq \frac{5}{8}$ and $\beta \geq \frac{3-2q}{q(11-8q)-2}$ then for any $\alpha \geq 0$ the politician is honest for as long as he has not guaranteed himself re-election.*

Note that a necessary condition for $\beta \geq \frac{3-2q}{q(11-8q)-2}$ is $q \geq \frac{5}{8}$, as otherwise $\frac{3-2q}{q(11-8q)-2} > 1$ and, hence, it can never be the case that $\beta \geq \frac{3-2q}{q(11-8q)-2}$. This is why Theorem 1 does not

state explicitly the requirement $q \geq \frac{5}{8}$ anywhere. We include the condition $q \geq \frac{5}{8}$ above because it makes the interpretation of Result 1 easier. The formal proof of Result 1 builds on the result of Theorem 1 and is presented in the appendix.

To see the intuition behind Result 1, consider the extreme case where $q = 1$, assume that the politician has not chosen the public decision in the first period, and he observes $\theta_2 = 0$. If the politician follows his private agenda he obtains a payoff of $\frac{\alpha}{2}$ and the game ends for him (he is not re-elected). If instead the politician is honest, he obtains a payoff of $\frac{1}{2} + \beta U_E$: he takes the public decision with probability 1 which gives him a payoff of $\frac{1}{2}$ and on top of that he is re-elected, which also gives him the discounted value of playing the game again. Note now that the continuation payoff $U_E$ includes the possibility of following his private agenda two times in the next term in office. Thus, if he takes the honest decision and then follows his private agenda twice during his new term in office he obtains a payoff of at least $\frac{1}{2} + \beta(\frac{\alpha}{2} + \frac{\alpha}{2})$.[9] Therefore, if $\beta > \frac{1}{2}$ then being honest is strictly better than following his private agenda even if $\alpha$ is unbounded for fixed $q$ and $\beta$.

The reason for this result is that if the politician is a good enough decision maker (high $q$) and patient enough (desires re-election enough: high $\beta$) then by going for re-election he can enjoy the payoff $\alpha$ more times in discounted expected terms than if he instead follows his private agenda today in exchange for lower chances of re-election.

We plot the statement in Theorem 1 in figure 2 for four different values of $\beta$. The most notable finding can be seen when $\beta = 0.75$ and $\beta = 0.95$. The plan where the politician starts off by taking the private decision and then, if he does not have the electorate's backing, he is honest at time $t = 2$ (the plan $DC_w$) is optimal if either $q$ is low (but not low enough as to make the plan $DD$ optimal) or high enough. For moderate values of $q$ the optimal plan is given by $HC_w$. That is, whether the politician follows plan $DC_w$ or $HC_w$ depends non-monotonically on the value of $q$. The intuition for this fact is the following. A good decision maker can start off by taking the private decision to then be honest only when elections approach, as he is somewhat certain that he will take the public decision at time $t = 2$, guaranteeing himself re-election. A bad decision maker receives a signal that is not very trustworthy. Hence, the differences in the probability of being re-elected when he follows his signal and when he ignores it are not too acute. That is, although the politician may value re-election significantly he believes that re-election is unlikely regardless of how he decides. Thus, he can guarantee himself the private gain $\alpha$ by barely decreasing his chances of re-election if he follows the plan $DC_w$. If the politician chooses the plan $HC_w$ instead, there is a chance that he will be honest at both periods, possibly not enjoying $\alpha$ in neither, and

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[9]The politician would get more if $\theta = 1$ at either of the two new periods, which happens with probability $\frac{3}{4}$. In this case, the politician would get a higher payoff this term and, on top of that, he is re-elected again.

still having a low chance of being re-elected. Therefore, the politician starts off by taking the private decision and, if the private decision did not happen to coincide with the public one at $t = 1$, he then tries to improve his chances of re-election by being honest. Finally, a politician who is neither a good decision maker nor a bad one needs to be more cautious and start off by begin honest in order the improve his chances of re-election. Only if the politician has the public backing because he took the public decision at time $t = 1$, he then takes the private decision.

Figure 2: Theorem 1
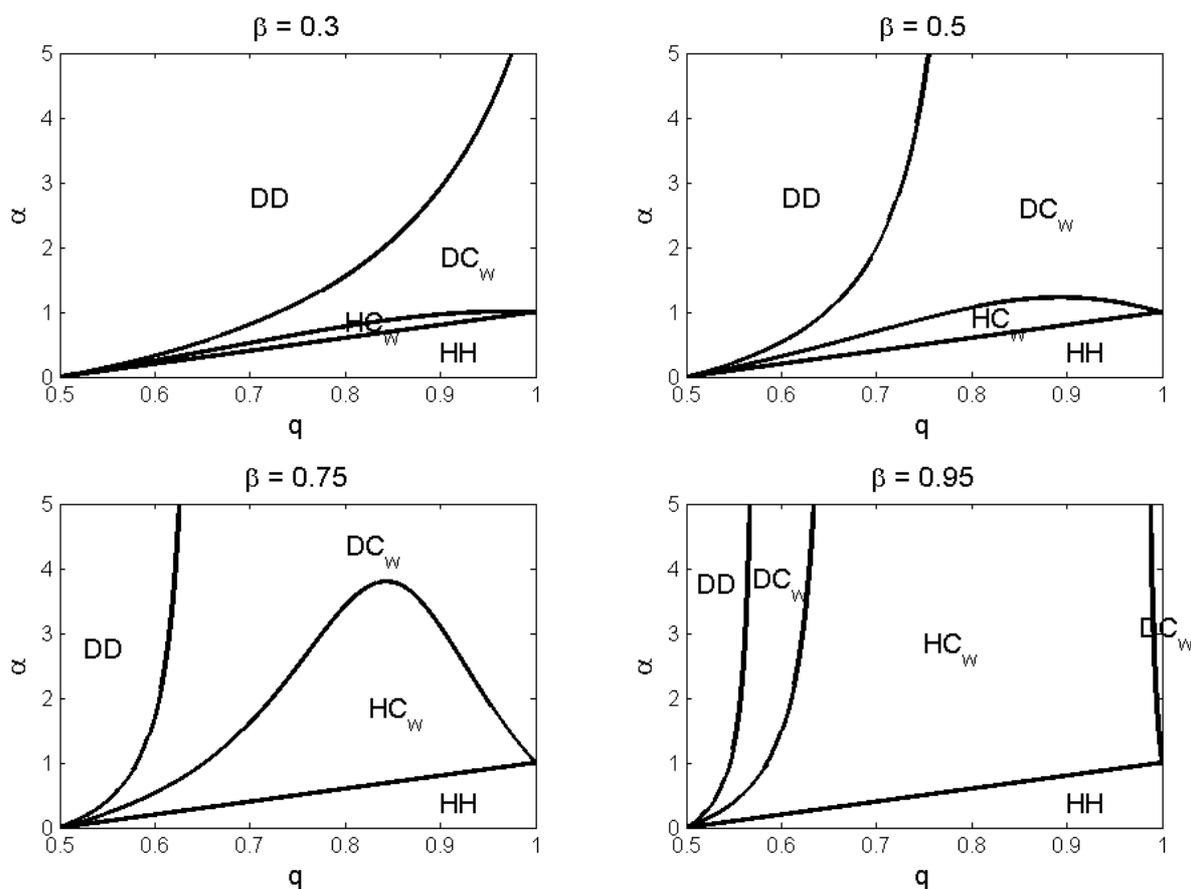


The conditions under which the plan $DC_w$ is optimal in Theorem 1 together with the observations in the preceding paragraph leads us to the following result:

**Result 2.** *If the politician takes the private decision, the **timing** at which he does so, i.e. whether he does so at the beginning of his term in office or at the end, can depend non-monotonically on how good a decision maker he is.*

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*More in general, the politicians' optimal plan can be non-monotonic in his decision making skills q.*

The formal proof of the result above builds on the result of Theorem 1 and is presented in the appendix. The result above highlights how the politician's decision making skills affect the timing of his choices. The behavior of the politician such that he follows his private interests first and then tries to guarantee himself re-election later is optimal because it ensures the politician's private gain while at the same time it also provides him with some possibilities of being re-elected.

# 4    Conclusions

In this paper we study a setting where a politician has to take two decisions during his term in office. For each decision, the politician faces a trade-off between taking what he believes to be the public decision, and taking the decision that increases his private gain but is likely to decrease his chances of re-election. In our results we characterize how factors like how good a decision maker the politician is, how strong his private interests are, and how much he wants to be re-elected, affect the politician's incentives to take the public decision.

In our results we find evidence for the behavior where a politician start his terms in office by taking the private decision and defer taking the socially motivated decision for the second period before he is up for re-election. Crucially, the fact that the politician chooses to follow his private agenda first and then tries to take the public decision in order to be re-elected has no relation with the memory of voters nor with time inconsistency issues; this behavior is optimal because it ensures the politician's private gain while at the same time it provides him with some confidence of being re-elected.

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## Appendix: Proofs

*Proof of lemma 1.* Let $U_E(S)$ be the value of $U_E$ when a certain plan

$$S \in \{HH, DD, HD, DH, HC_w, DC_w, HC_r, DC_r\}$$

is employed. If the politician employs plan $HH$ then it is true that

$$
U_E(HH) = \frac{1}{2}\left[\left(\underbrace{\frac{1}{2}}_{\Pr(s_1=0)}\underbrace{q}_{\Pr(\theta_1=0|s_1=0)} + \underbrace{\frac{1}{2}}_{\Pr(s_1=1)}\underbrace{(q+\alpha)}_{\Pr(\theta_1=1|s_1=1)}\right)\right.
$$

$$
\underbrace{\phantom{\frac{1}{2}}}_{t=1}
$$

$$
\left. + \left(\underbrace{\frac{1}{2}}_{\Pr(s_2=0)}\underbrace{q}_{\Pr(\theta_2=0|s_2=0)} + \underbrace{\frac{1}{2}}_{\Pr(s_2=1)}\underbrace{(q+\alpha)}_{\Pr(\theta_2=1|s_2=1)}\right)\right] +
$$

$$
\underbrace{\phantom{\frac{1}{2}}}_{t=2}
$$

$$
\beta\underbrace{q(2-q)}_{\Pr(r\geq1)}U_E(HH).
$$

Which implies

$$
U_E(HH) = \frac{q+\frac{\alpha}{2}}{1-q(2-q)\beta}.
$$

Proceeding in a similar fashion, we have that

$$
U_E(DD) = \frac{\alpha+\frac{1}{2}}{1-\frac{3}{4}\beta},
$$

$$
U_E(HD) = \frac{\frac{1}{2}\left(q+\frac{\alpha}{2}\right)+\frac{1}{2}\left(\alpha+\frac{1}{2}\right)}{1-\frac{1+q}{2}\beta},
$$

$$
U_E(DH) = \frac{\frac{1}{2}\left(q+\frac{\alpha}{2}\right)+\frac{1}{2}\left(\alpha+\frac{1}{2}\right)}{1-\frac{1+q}{2}\beta}.
$$

If the politician employs plan $HC_w$ then it is true that

$$U_E(HC_w) = \frac{1}{2}\left[\left(\underbrace{\frac{1}{2}}_{\Pr(s_1=0)}\underbrace{q}_{\Pr(\theta_1=0|s_1=0)} + \underbrace{\frac{1}{2}}_{\Pr(s_1=1)}\underbrace{(q+\alpha)}_{\Pr(\theta_1=1|s_1=1)}\right) + \right.$$

$$\left.\underbrace{q}_{\Pr(\theta_1=s_1)}\left(\underbrace{\frac{1}{2}}_{\Pr(s_2=0)}\underbrace{(1-q+\alpha)}_{\Pr(\theta_2=0|s_2=0)} + \underbrace{\frac{1}{2}}_{\Pr(s_1=1)}\underbrace{(q+\alpha)}_{\Pr(\theta_2=1|s_2=1)}\right) + \underbrace{(1-q)}_{\Pr(\theta_1\neq s_1)}\left(\frac{1}{2}\underbrace{q}_{\theta_1=0} + \frac{1}{2}\underbrace{(q+\alpha)}_{\theta_1=1}\right)\right] + $$

$$\beta\underbrace{q(2-q)}_{\Pr(r\geq 1)}U_E(HC_w).$$

Hence, we have the following:

$$U_E(HC_w) = \frac{\left(1-\frac{q}{2}\right)\left(q+\frac{\alpha}{2}\right) + \frac{q}{2}\left(\alpha+\frac{1}{2}\right)}{1-q(2-q)\beta}.$$

Thus, proceeding as above

$$U_E(DC_w) = \frac{\frac{1}{4}\left(q+\frac{\alpha}{2}\right) + \frac{3}{4}\left(\alpha+\frac{1}{2}\right)}{1-\frac{1+q}{2}\beta},$$

$$U_E(HC_r) = \frac{\left(\frac{1}{2}+\frac{q}{2}\right)\left(q+\frac{\alpha}{2}\right) + \left(\frac{1}{2}-\frac{q}{2}\right)\left(\alpha+\frac{1}{2}\right)}{1-\frac{1+q}{2}\beta},$$

$$U_E(DC_r) = \frac{\frac{1}{4}\left(q+\frac{\alpha}{2}\right) + \frac{3}{4}\left(\alpha+\frac{1}{2}\right)}{1-\frac{3}{4}\beta}.$$

Notice now that $q \in \left[\frac{1}{2}, 1\right]$ implies $q(2-q) \geq \frac{1+q}{2} \geq \frac{3}{4}$. Therefore, if $q + \frac{\alpha}{2} \geq \alpha + \frac{1}{2}$ then we have $U_E(HH) \geq U_E(HD) = U_E(DH)$, $U_E(HH) \geq U_E(HC_r)$ and $U_E(HH) \geq U_E(DC_r)$. Similarly, if $q + \frac{\alpha}{2} \leq \alpha + \frac{1}{2}$ then $U_E(HC_w) \geq U_E(HC_r)$ , $U_E(DC_w) \geq U_E(HD) = U_E(DH)$, and $U_E(DD) \geq U_E(DC_r)$. $\qquad\square$

*Proof of Theorem 1.* Given the result in lemma 1, it is true that

$$U_E = \max\{U_E(HH), U_E(DD), U_E(HC_w), U_E(DC_w)\}.$$

Recall that

$$U_E(HH) = \frac{q + \frac{\alpha}{2}}{1 - q(2 - q)\beta},$$

$$U_E(DD) = \frac{\alpha + \frac{1}{2}}{1 - \frac{3}{4}\beta},$$

$$U_E(HC_w) = \frac{\left(1 - \frac{q}{2}\right)\left(q + \frac{\alpha}{2}\right) + \frac{q}{2}\left(\alpha + \frac{1}{2}\right)}{1 - q(2 - q)\beta},$$

$$U_E(DC_w) = \frac{\frac{1}{4}\left(q + \frac{\alpha}{2}\right) + \frac{3}{4}\left(\alpha + \frac{1}{2}\right)}{1 - \frac{1+q}{2}\beta}.$$

We need to check the conditions on $q$, $\beta$ and $\alpha$ under which each of the four different plans above is optimal. We separate the proof in six parts:

**Part 1.** *Plan HH*

*Since $q(2 - q) \geq \frac{1+q}{2} \geq \frac{3}{4}$ then $q + \frac{\alpha}{2} \geq \alpha + \frac{1}{2}$ implies*

$$U_E(HH) \geq U_E(DD), U_E(HC_w), U_E(DC_w).$$

*Thus, if $q + \frac{\alpha}{2} \geq \alpha + \frac{1}{2}$ then the plan $HH$ is optimal. Moreover, if $q + \frac{\alpha}{2} \leq \alpha + \frac{1}{2}$ then it is easy to see that the plan $HC_w$ gives more payoff than the plan $HH$. Thus, the plan $HH$ is optimal if and only if $q + \frac{\alpha}{2} \geq \alpha + \frac{1}{2}$, which can be rewritten as $\alpha \leq 2q - 1$.*

**Part 2.** *Plans $HC_w$, $DC_w$ and $DD$*

*We proceed by showing first the conditions under which $U_E(HC_w) \geq U_E(DC_w)$, then we show the conditions under which $U_E(DD) > U_E(DC_w)$. Finally we prove that if $U_E(HC_w) \geq U_E(DC_w)$ then $U_E(HC_w) \geq U_E(DD)$ and that if $U_E(DD) > U_E(DC_w)$ then $U_E(DD) > U_E(HC_w)$.*

**Part 3.** *Conditions for $U_E(HC_w) \geq U_E(DC_w)$*

*We have that $U_E(HC_w) \geq U_E(DC_w)$ if and only if*

$$\frac{\left(1 - \frac{q}{2}\right)\left(q + \frac{\alpha}{2}\right) + \frac{q}{2}\left(\alpha + \frac{1}{2}\right)}{1 - q(2 - q)\beta} \geq \frac{\frac{1}{4}\left(q + \frac{\alpha}{2}\right) + \frac{3}{4}\left(\alpha + \frac{1}{2}\right)}{1 - \frac{1+q}{2}\beta}.$$

*Solving for $\alpha$, this can be rewritten as*

$$\alpha\left(3 + 2\beta - q(2 + 11\beta - 8\beta q)\right) \leq q(8 + \beta - q(4 + 2\beta)) - 3. \tag{1}$$

*Note now that the expression on the right hand-side is always positive: the minimum of $q(8 + \beta - q(4 + 2\beta)) - 3$ is achieved at $\beta = 0$ and $q = \frac{1}{2}$ and for those values $q(8 + \beta - q(4 + 2\beta)) - 3 = 0$.*

*Consider now that $3 + 2\beta - q(2 + 11\beta - 8\beta q) \leq 0$, then the condition in (1) is satisfied for any $\alpha$. We have that $3 + 2\beta - q(2 + 11\beta - 8\beta q) \leq 0$ if and only if $\beta \geq \frac{3-2q}{q(11-8q)-2}$. Hence, $U_E(HC_w) \geq U_E(DC_w)$ if $\beta \leq \frac{3-2q}{q(11-8q)-2}$.*

*Assume now that $3 + 2\beta - q(2 + 11\beta - 8\beta q) > 0$. In this case from equation (1) we obtain*

$$\alpha \leq \frac{q(8 + \beta - q(4 + 2\beta)) - 3}{3 + 2\beta - q(2 + 11\beta - 8\beta q)}.$$

*Hence, if and only if either the inequality above or $\beta \geq \frac{3-2q}{q(11-8q)-2}$ is satisfied, we have that $U_E(HC_w) \geq U_E(DC_w)$.*

**Part 4.** *Conditions for $U_E(DD) > U_E(DC_w)$*

*We have that $U_E(DD) > U_E(DC_w)$ if and only if*

$$\frac{\alpha + \frac{1}{2}}{1 - \frac{3}{4}\beta} > \frac{\frac{1}{4}\left(q + \frac{\alpha}{2}\right) + \frac{3}{4}\left(\alpha + \frac{1}{2}\right)}{1 - \frac{1+q}{2}\beta}.$$

*Solving for $\alpha$, this can be rewritten as*

$$\alpha\left(4 + 5\beta - 16\beta q\right) > q(8 + 2\beta) - \beta - 4. \tag{2}$$

*Note now that the expression on the right hand-side of (2) is always positive: $q(8 + 2\beta) - \beta - 4 = (4 + \beta)(2q - 1) \geq 0$. Thus, in order for equation (2) to be possible, it must be that its left hand side is positive: $4 + 5\beta - 16\beta q > 0$. This happens if and only if $\beta < \frac{4}{16q-5}$.*

*Thus, we have that $U_E(DD) > U_E(DC_w)$ if and only if $\beta < \frac{4}{16q-5}$ and, from equation (2),*

$$\alpha > \frac{q(8 + 2\beta) - \beta - 4}{4 + 5\beta - 16\beta q}.$$

**Part 5.** *$U_E(HC_w) \geq U_E(DC_w)$ implies $U_E(HC_w) \geq U_E(DD)$*

*Assume first that $U_E(HC_w) \geq U_E(DC_w)$ and $\beta \geq \frac{3-2q}{q(11-8q)-2}$. We have that $\beta \geq \frac{3-2q}{q(11-8q)-2}$ implies $\beta \geq \frac{4}{16q-5}$. This is because*

$$\frac{3 - 2q}{q(11 - 8q) - 2} \geq \frac{4}{16q - 5}$$

*if and only if $q \geq \frac{1}{2}$, which is true in our case.*

*Since $\beta \geq \frac{4}{16q-5}$ implies that $U_E(DD) \leq U_E(DC_w)$ (see part 4 of the proof), we have that $U_E(HC_w) \geq U_E(DC_w)$ and $\beta \geq \frac{3-2q}{q(11-8q)-2}$ implies $U_E(HC_w) \geq U_E(DD)$.*

*Assume now that $U_E(HC_w) \geq U_E(DC_w)$ but $\beta < \frac{3-2q}{q(11-8q)-2}$. In this case, we must have (see part 3 of the proof)*

$$\alpha \leq \frac{q(8 + \beta - q(4 + 2\beta)) - 3}{3 + 2\beta - q(2 + 11\beta - 8\beta q)}.$$

We now show that the inequality above together with $\beta < \frac{4}{16q-5}$ (necessary condition for $U_E(DD) > U_E(DC_w)$) implies

$$\alpha \ \leq \ \frac{q(8+2\beta) - \beta - 4}{4 + 5\beta - 16\beta q},$$

and, hence, $U_E(DD) \leq U_E(DC_w)$.

We have that

$$\frac{q(8 + \beta - q(4 + 2\beta)) - 3}{3 + 2\beta - q(2 + 11\beta - 8\beta q)} \ \leq \ \frac{q(8 + 2\beta) - \beta - 4}{4 + 5\beta - 16\beta q}$$

if and only if

$$(2q - 1)((2 + \beta)q - 3)(\beta(16q - 5) - 4) \ \geq \ 0.$$

Since $2q - 1 \geq 0$, $(2 + \beta)q - 3 \leq 0$ and $\beta(16q - 5) - 4 < 0$ given that $\beta < \frac{4}{16q-5}$, the inequality above is true. Hence, whenever $U_E(HC_w) \geq U_E(DC_w)$ we have $U_E(DD) \leq U_E(DC_w)$ as required. Therefore, plan $HC_w$ is optimal if and only if plan $HH$ is not optimal ($\alpha < 2q - 1$) and the conditions for $U_E(HC_w) \geq U_E(DC_w)$ are satisfied.

**Part 6.** $U_E(DD) > U_E(DC_w)$ implies $U_E(DD) > U_E(HC_w)$

If $U_E(DD) > U_E(DC_w)$ then it must be that $\beta < \frac{4}{16q-5}$ and

$$\alpha \ > \ \frac{q(8+2\beta) - \beta - 4}{4 + 5\beta - 16\beta q}.$$

However, as shown in part 5, this implies that

$$\alpha \ > \ \frac{q(8 + \beta - q(4 + 2\beta)) - 3}{3 + 2\beta - q(2 + 11\beta - 8\beta q)}.$$

Which in turn implies that $U_E(HC_w) < U_E(DC_w)$. Thus, $U_E(DD) > U_E(DC_w)$ implies $U_E(HC_w) < U_E(DC_w)$.

Note that the condition

$$\frac{q(8+2\beta) - \beta - 4}{4 + 5\beta - 16\beta q} \ > \ 2q - 1$$

can be rewritten as $\beta(-8q^2 + 6q - 1) < 0$, which is true for any $q \geq \frac{1}{2}$. Hence, whenever $U_E(DD) > U_E(DC_w)$ it is true that $\alpha > 2q - 1$ and, thus, plan $HH$ is not optimal.

Summing up, if $U_E(DD) > U_E(DC_w)$ then $U_E(HC_w) < U_E(DC_w)$ and plan $HH$ is not optimal. Therefore, plan $DD$ is optimal if and only if the conditions for $U_E(DD) > U_E(DC_w)$ are satisfied.

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$\square$

*Proof of Result 1.* The politician is honest for as long as he has not guaranteed himself re-election if he is honest in period 1 (before period 1 is resolved he has not had the chance to secure re-election yet) and if he is honest in period 2 at least in the situations where he did not take the public decision in period 1. Thus, we have to show that there are values of $q$ and $\beta$ for which for any value of $\alpha$ either the plan $HH$ or the plan $HC_w$ are optimal.

Assume first that $\alpha \leq 2q - 1$. By Theorem 1 the optimal plan is $HH$, which means that the politician is honest in both periods.

Assume now that $\alpha > 2q-1$. If $\beta \geq \frac{3-2q}{q(11-8q)-2}$ then by Theorem 1 the optimal plan is $HC_w$ which means that the politician is honest in the first period and honest again in the second period if he did not take the public decision in the first period. Note that $\beta \geq \frac{3-2q}{q(11-8q)-2}$ is only possible if $q \geq \frac{5}{8}$ as otherwise $\frac{3-2q}{q(11-8q)-2} > 1$. This completes the proof. $\square$

*Proof of Result 2.* Assume that $\beta < \frac{3-2q}{q(11-8q)-2}$. By Theorem 1 we have that in this case $HC_w$ is the optimal plan if and only if

$$\alpha \quad \leq \quad \frac{q(8+\beta-q(4+2\beta))-3}{3+2\beta-q(2+11\beta-8\beta q)}.$$

We now show that the right hand side of this expression is increasing in $q$ at $q = \frac{1}{2}$ and decreasing in $q$ at $q = 1$ for $\beta \geq \frac{1}{4}$. By continuity this means that the value of $\alpha$ for which $HC_w$ is the optimal plan is non-monotonic in $q$.

The sign of the derivative of

$$\bar{\alpha}(q,\beta) = \frac{q(8+\beta-q(4+2\beta))-3}{3+2\beta-q(2+11\beta-8\beta q)}$$

with respect to $q$ is equal to the sign of

$$(8+\beta-2q(4+2\beta))(3+2\beta-q(2+11\beta-8\beta q)) -$$
$$(q(8+\beta-q(4+2\beta))-3)(-(2+11\beta-16\beta q)).$$

The expression above evaluated at $q = 1$ equals $2(1-\beta)(1-4\beta)$ which is negative if $\beta > \frac{1}{4}$. The expression above evaluated at $q = \frac{1}{2}$ equals $(4-\beta)(2-\frac{3}{2}\beta)$, which is positive. Thus, since the expression $\bar{\alpha}(q,\beta)$ is continuous in $q$ then the region above its graph is non-convex for $\beta > \frac{1}{4}$, which proves that the value of $\alpha$ for which $HC_w$ is the optimal plan can be non-monotonic in $q$.[10]

Figure 2 shows that the assumptions imposed on the parameters of the model in this proof are non-empty and, thus, the monotonicity can indeed exist. $\square$

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[10]Note that $\beta < \frac{3-2q}{q(11-8q)-2}$ implies $3+2\beta-q(2+11\beta-8\beta q) > 0$ and, hence, the continuity in $\bar{\alpha}$.