Politicians as Experts, Electoral Control, and Fiscal Restraints

Uwe Dulleck† and Berthold U. Wigger‡

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Abstract

We propose an argument for fiscal restraints that is based on the premise that the services of politicians are credence goods. Politicians are experts who specialize in observing the true state of the economy. Budget maximizing politicians are better informed than the electorate about the level of public spending necessary to manage public affairs. Voters, who are able to observe the size of the budget but not the necessary level of spending, affect the government’s spending behavior via electoral control. A fiscal restraint limits the maximum spending a government can choose. We identify conditions under which such a fiscal restraint improves voter welfare and discuss the role of the political opposition as a second expert in situations in which the state of the economy requires a level of spending which exceeds the fiscal restraint.

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*Key words:* Electoral control, Fiscal restraints, Credence goods

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†Queensland University of Technology, The School of Economics and Finance, Gardens Point, Brisbane QLD 4001, Australia, uwe.dulleck@qut.edu.au

‡Karlsruhe Institute of Technology, Chair of Public Finance and Public Management, Kronenstraße 34, 76133 Karlsruhe, Germany, berthold.wigger@kit.edu.
1 Introduction

As recent debates in Europe and the United States have illustrated, policy proposals seeking to restrain government spending have proven to be controversial. Supporters of such restraints emphasize externalities imposed on future generations as well as on other countries, while opponents argue that such rules hinder the ability of governments to intervene in the economy in times when major interventions are needed.1 We provide an analysis of the welfare costs and benefits of such restraints, which is based on the assumption that politicians serve as experts in the sense that they are better informed than voters about the level of public spending necessary to manage public affairs.

Our treatment of politicians as experts mandated by voters to manage public affairs is novel in that we view politicians as serving a similar role as doctors, lawyers or other experts.2 If a person feels sick, he or she consults a doctor to identify the cause as well as potential therapies. In most cases the patient him- or herself is not able to verify either the diagnosis or the choice of the therapy. The doctor, owing to her education and experience, has the expertise to make these determinations. The relationship between voters and politicians can be viewed in a similar way. The politician specializes in understanding public affairs and, additionally, has governmental resources at her disposal to identify the need for necessary policy interventions. Similar to the example of the doctor, voters often lack the information and experience that would enable them to assess the decisions of politicians.3 To relate to recent policy debates, most voters are not able to determine the size and the

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1 These two positions feature prominently in the current debate on the austerity and rescue plan for the Greek government, which is jointly supervised by the European Commission, the European Central Bank and the International Monetary Fund. For a general discussion of the pros and cons of fiscal restraints see, e.g., Schick (2010). Section 2 of this paper provides a discussion of the literature on fiscal restraints that is relevant to our analysis.

2 Of course, the agency perspective on the political process as such is not new. See Besley (2006), who discusses political economy applications of moral hazard, adverse selection and career concerns. Also related to our approach is the literature on strategic information transmission such as Crawford and Sobel (1982), Gilligan and Krehbiel (1987, 1988) and Krishan and Morgan (2001).

3 Clearly, the analogy to a doctor is imperfect. What we want to emphasize is that the informational asymmetry and the incentives involved are similar.
scope of the macroeconomic policy intervention required to deal with the current economic crisis. While no one may have the perfect answer, politicians do have access to substantial analysis and data to make an informed decision. Similarly, in the case of foreign and defense policy, many voters are not able to determine the severity of external threats to the country and the necessary level of defense spending. Politicians, on the other hand, have access to highly classified intelligence information, which enables them to evaluate the level of threat to national security and to determine the amount of resources required to manage that threat level.

The theoretical literature on industrial economics has studied extensively the role of and the incentives for experts (see Darby and Karni, 1973, for the classic reference, Dulleck and Kerschbamer, 2006, for a survey of the theoretical literature and Dulleck et al., 2011, for experimental evidence). The goods and services provided by experts are referred to as "credence goods", since the customer must trust the expertise of the provider in choosing the appropriate course of action. To view the services of politicians as credence goods has not been considered in the literature. The present article attempts to fill this gap by assuming that politicians function as experts mandated by voters. We consider the implications of this approach for the analysis of fiscal policy and, in particular, the role of fiscal restraints.

The informational asymmetry between voters and politicians would be of no concern if the interests of both parties would be perfectly aligned. We do not make this assumption; rather, we assume that politicians are self-interested rational agents in line with the public choice tradition following Buchanan (1967). Specifically, we assume that politicians are interested in maximizing public spending (Niskanen, 1971). In our model, politicians systematically exploit their expertise in pursuing this goal.

The spending behavior of politicians can be disciplined by two mechanisms. On the one hand, voters can exert electoral control by voting a politician out of office if her expenditure appears to be too excessive. Voters thus provide incentives for politicians to act in their interest. This argument has been put forward by Barro (1973) and Ferejohn (1986). On the other hand, the spending behavior of politi-
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vicians can be constrained by fiscal restraints. The role of such restraints on fiscal policy has been emphasized in particular by Brennan and Buchanan (1980). Such a restraint reduces the maximum spending. However, it also implies that in some cases politicians are not able to manage public affairs adequately. Therefore, most existing fiscal restraints specify exemptions that allow politicians to exceed the fiscal limit under certain circumstances. Obviously, if only the politician in power—because of her expertise—is able to determine whether these circumstances apply, the fiscal restraint is essentially ineffective. In order to make the restraint effective, a second expert is needed who is able to verify whether the circumstances that allow for an exemption apply. Referring to our earlier analogy of the doctor-patient-relationship, the patient may mitigate the asymmetric information problem by seeking a second expert opinion. In the fiscal context, the political opposition may assume the role of a second opinion provider for voters. We specify a game where both the government and the opposition have access to information about public affairs and the required level of spending. We demonstrate that a fiscal restraint that requires support by the opposition if the government wants to exceed the fiscal restraint always improves voter welfare.

The remainder of the paper is organized as follows. Section 2 discusses the related literature and further elaborates on the key idea of this paper. Section 3 introduces the model. Section 4 characterizes the equilibrium public budget in a benchmark scenario with full information. Section 5 then establishes the equilibrium budget with expert politicians. Section 6 introduces a fiscal restraint on the public budget and identifies the conditions under which such a restraint improves voter welfare. Section 7 considers the role of the political opposition in applying a fiscal restraint. Section 8 concludes.

The German constitution, for example, specifies in Article 115 (2) a balanced budget rule and then states "... In cases of natural catastrophes or unusual emergency situations beyond governmental control and substantially harmful to the state’s financial capacity, these credit limits may be exceeded on the basis of a decision by a majority of the Bundestag’s Members." Similar amendments to the constitutions have been made in other European countries, e.g., Switzerland and Spain, or are currently on the political agenda in most member states of the European Union. Also, most US states have some form of a balanced budget or spending rule that allows for exemptions.
2 Related Literature

Fiscal restraints are a common theme in the public choice literature (Brennan and Buchanan, 1980, and Wilson, 1989). Most of this literature focuses on the problem of externalities of excessive public spending. These externalities may either be imposed on future generations (Buchanan and Tullock, 1962), on countries with close ties to the economy in question (von Hagen and Eichengreen, 1996), or they may arise because an incumbent government overspends strategically to limit the maneuverability of a future government (Persson and Svenson, 1989, Tabellini and Alesina, 1990).

Our model is based on the assumption of infinitely lived voters in a closed economy. We explicitly abstract from intergenerational as well as international externality issues. We address the function of fiscal restraints in a political accountability framework inspired by Barro (1973) and Ferejohn (1986). Barro (1973) has shown that if the preferences of the government and its electorate are not perfectly aligned then the electorate has to offer the incumbent some rent of holding office to militate against the government’s pursuit of its own goals. Where Barro assumes perfect information, Ferejohn (1986) adds asymmetric information. In Ferejohn’s model, the electorate cannot observe the activities of the government but is only able to assess the government’s performance. The electorate thus needs to motivate politicians with a reelection rule that provides incentives to act in the interest of the public.

Persson et al. (1997) elaborate on Ferejohn’s approach by analyzing how the separation of powers can help to elicit information on government activities and curtail the rent seeking behavior of politicians. Another paper on political accountability is Yared (2010). This author assumes that politicians are able to extract rents because of temporary economic shocks. These shocks generate changes in tax revenue and in the need for expenditure, thus allowing the government to exploit the tax base for rent appropriation. In this model, the voters’ reelection decision puts restrictions on taxes levied as well as on minimum levels of public spending. While
a benevolent government would impose constant tax rates to limit the excess burden of taxation, taxes with rent seeking politicians will be volatile, as citizens face a trade-off between the benefit of constant tax rates and the cost of potential rent appropriation by the government.

We differ from this literature by setting up the information problem as a credence good problem. Voters can observe the budget chosen by the government and they can observe its effect on their own well-being. However, voters cannot fully assess whether the extent of the budget was necessary to achieve this outcome. Only politicians can observe the true state of the world and this state determines the minimum necessary public budget. Within this framework we present a rationale for a fiscal restraint that functions as an instrument to limit the rents associated with the incumbent politician’s expertise.

The only article, to our knowledge, discussing fiscal restraints from an agency perspective on government is Besley and Smart (2007). These authors study the role of fiscal restraints in the presence of moral hazard and adverse selection where politicians can be either good, i.e., always work in the interest of the electorate, or bad, i.e., pursuing self-serving concerns. In their model a fiscal restraint is used to select the right politicians as well as to limit rents extracted by bad incumbents. The authors find that introducing a fiscal restraint can only be welfare enhancing if the incumbent politician is sufficiently likely to be of the good type. We differ from this model by assuming the information asymmetry to be based on the credence goods perspective. We relate the desirability of a fiscal restraint to the probability of bad states of the economy that can only be observed by expert politicians and, furthermore, identify a role for the political opposition as a second expert for voters.

3 The Model

Time is discrete and divided into legislative periods. In each legislative period $t$, public affairs require a budget of at least $\theta_t$ currency units. The variable $\theta_t$ is ran-
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domly drawn from the interval \([0, \bar{\theta}]\). We assume that \(\theta_t\) is identically distributed and serially uncorrelated over time, with continuous density \(f\) and cumulative distribution function \(F\).

If the public budget in period \(t\), denoted by \(b_t\), is smaller than \(\theta_t\), then public affairs cannot be managed adequately and this has a negative impact on the welfare of the electorate. In contrast, if the public budget at time \(t\) equals or exceeds \(\theta_t\), public affairs can be managed, although the exceeding amount \(b_t - \theta_t\) is slack in the sense that it does not contribute to the electorate’s welfare. We assume that the public budget is bounded from above, so that \(b_t \leq \bar{\theta}\) in each legislative period \(t\). This implies that the public budget can never exceed the largest amount possible that is required to manage public affairs. Note that we do not limit the budget otherwise, i.e., we assume that the state’s financial base—its tax base as well as its access to financial markets—is sufficient to meet all possible budgetary requirements. Moreover, we do not distinguish between tax and debt financed public funds. Since voters are assumed to face an infinite time horizon, they fully internalize future tax burdens associated with current deficits. As a consequence, voters are indifferent between tax and debt financed public funds and only care about the level of public spending.

The electorate consists of a unit-measure continuum of identical and infinitely lived voters. The representative voter’s intertemporal expected utility in period \(t\) is given by

\[
V_t = E \sum_{j=0}^{\infty} \delta^j v(b_{t+j}, \theta_{t+j}),
\]

where \(\delta\) represents a discount factor, \(E\) is the expectations operator, and \(v\) denotes the single-period utility of the representative voter, which depends on the size of the public budget and the realization of \(\theta\) in this period. The representative voter’s single-period preferences are defined as

\[
v(b_t, \theta_t) = \begin{cases} 
\phi - b_t, & \text{if } b_t \geq \theta_t, \\
-b_t, & \text{if } b_t < \theta_t.
\end{cases}
\]
Thus, if the public budget is sufficiently large to manage public affairs adequately, the representative voter enjoys a benefit amounting to $\phi > \bar{\theta}$ and, at the same time, forgoes private consumption in an amount equal to the public budget. The assumption $\phi > \bar{\theta}$ implies that it is always efficient to manage public affairs adequately. If, in contrast, the public budget is too small to manage public affairs, the representative voter receives no benefit from public finance and only forgoes private consumption in an amount equal to the public budget.\(^5\)

The incumbent politician is assumed to be a budget maximizer. Her intertemporal expected utility in period $t$ reads

$$U_t = E \sum_{j=0}^{\infty} \delta^j b_{t+j}. \quad (3)$$

We follow the citizen-candidate literature [see, e.g., Besley and Coate (1997, 1998)] by assuming that politicians and voters face a common discount factor. Nevertheless, our results hold even when discount factors differ, which then might reflect exogenous political risk faced by the incumbent.

Generally, a politician can be reelected infinitely often. However, only during incumbency does the politician directly derive utility from the size of the public budget. Once voted out of office, the politician’s preferences are similar to those of (other) voters. We assume that in the event that an incumbent is voted out of office, the incumbent is replaced by another politician and is never reappointed.\(^5\) Alternate politicians are always available who, once in office, pursue the same objective as their predecessors, that is, maximizing the public budget.

Voters employ a specific voting rule in order to control the budget maximizing behavior of the incumbent. At the beginning of each legislative period $t$ voters bind themselves to a voting rule that they will follow at the end of the legislative period.

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\(^5\)Our assumption of a discrete jump in voter utility if public spending is higher than the critical level is a simplification. Essential for our argument is that below the critical level as well as above this level the marginal benefit to voters is smaller than 1, i.e., the cost to voters is higher than the benefit of each currency unit spent. If the critical level of spending is reached, the state delivers all the essential services and hence at this point voters experience a discrete jump in utility.

\(^6\)Persson et al. (1997) employ a similar assumption. Ferejohn (1986) considers this case as well as the case that a politician may return.
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... period. This rule makes their voting behavior contingent on the information they gather within the legislative period. The incumbent is aware of the voting rule. Then, nature decides on the realization of $\theta_t$ and, hence, on the minimum size of the public budget necessary to manage public affairs. In the full information scenario, both voters and the incumbent observe $\theta_t$, whereas in the asymmetric information scenario $\theta_t$ is only revealed to the incumbent. Once the incumbent has learned the realization of $\theta_t$, she chooses the budget $b_t$. Finally, voters either reelect the incumbent or vote her out of office based on the voting rule, that they have committed to at the beginning of the legislative period. If the incumbent is voted out, she is replaced by a new incumbent who has the same budget maximizing attitude and is identical to the incumbent in all other respects.

We follow Ferejohn (1986) and Persson et al. (1997) in determining the voting equilibrium. The assumption of ex ante commitment to a voting rule is a sequential equilibrium, i.e., voters have no incentive to change the rule at the end of the legislative period, if they are indifferent between the incumbent and an opposing politician. Note that voters only commit to a voting rule within a single legislative period. That is, voters cannot commit to voting behavior in future legislative periods. Instead, when deciding on the voting rule, current voters take into account that voting behavior in future periods must be in the interest of the electorate at that time. Figure 1 illustrates the sequence of events within a single legislative period.

![Sequence of events within a legislative period](image)

**Figure 1: Sequence of events within a legislative period**

In the following, we first assume that both the incumbent and the voters observe the state of nature $\theta_t$ in each period $t$. This serves as a benchmark to distinguish between the rents the incumbent extracts from pure office holding and the rents that are associated with the private information of the incumbent. This benchmark
can also be seen as a scenario where an opposition politician exists who has access to the same level of information as the incumbent and is able to reveal this information credibly to the public. We then consider the more relevant case in which the incumbent can observe $\theta_t$ whereas voters cannot. We start with a scenario, in which the incumbent is the only expert. For the case of asymmetric information we consider situations with and without a fiscal restraint. We show that the welfare implication of a fiscal restraint that does not permit any exemption is mixed. We then introduce an opposition politician who has access to the same fiscal expertise as the incumbent. We specify a game in which invoking the exemption requires approval by the opposition politician and show that in this case a fiscal restraint can be welfare improving. The opposition politician’s behavior contains reliable information that enables voters to exert electoral control more effectively and thereby increases the welfare benefits from a fiscal restraint.

4 Full Information Equilibrium

If both the incumbent and the voters can observe $\theta_t$, voters can easily commit to vote out the incumbent if either $b_t > \theta_t$ or $b_t < \theta_t$, the latter implying $v(b_t, \theta_t) = -b_t$. In the former case, the incumbent has chosen a budget larger than necessary to manage public affairs and in the latter case a budget smaller than necessary. While the latter case can generally be ruled out by the incumbent’s inclination to choose a larger rather than a smaller budget, the former case needs to be considered just because of this inclination. In fact, a strict rule to vote the incumbent out of office if $b_t \neq \theta_t$ is generally not optimal since, if $\theta_t$ turns out to be small, the incumbent would prefer to choose $b_t = \bar{\theta}$ and being voted out of office at the end of the legislative period, rather than striving for another term in office by choosing $b_t = \theta_t$. In order to weaken the incumbent’s incentives to choose a maximum budget when she observes a small $\theta_t$, voters must allow the incumbent a certain minimum budget. Let the minimum budget in legislative period $t$ be denoted by $\hat{b}_f^t$, with superindex $f$ indicating the full information scenario. Then, the reelection
rule in legislative period \( t \) specifies that voters reelect the incumbent if she spends at most the budget \( \hat{b}_t^f \), when \( \theta_t \) turns out to be small, i.e., \( \theta_t \leq \hat{b}_t^f \). Furthermore, the reelection rule in legislative period \( t \) specifies that voters reelect the incumbent if \( b_t = \theta_t \) for the case that \( \theta_t > \hat{b}_t^f \). Given that voters aim to provide incentives for politicians to keep public spending as low as possible, the minimum budget \( \hat{b}_t^f \) is implicitly determined by

\[
\hat{b}_t^f + \sum_{j=1}^{\infty} \delta^j b_{t+j}^f F(\hat{b}_{t+j}^f) + \sum_{j=1}^{\infty} \delta^j \int_{\hat{b}_{t+j}^f}^{\theta} \theta_t dF(\theta_t) = \tilde{\theta},
\]

where \( b_{t+j}^f \) is the minimum budget voters define in legislative period \( t + j \). The left hand side of equation (4) measures the expected utility of the incumbent if she observes \( \theta_t \leq \hat{b}_t^f \) in period \( t \) and chooses \( b_t = \hat{b}_t^f \), so that she will be reelected at the end of period \( t \). The right hand side of equation (4) is the utility of the incumbent if she chooses the maximum budget in period \( t \) and is voted out of office at the end of period \( t \). Since \( \theta_t \) is serially uncorrelated and identically distributed over time, the minimum budget assumes the same amount in each period \( t \), so that (4) can be written as

\[
\hat{b}_t^f + \frac{\delta}{1 - \delta} \hat{b}_t^f F(\hat{b}_t^f) + \frac{\delta}{1 - \delta} \int_{\hat{b}_t^f}^{\theta} \theta dF(\theta) = \tilde{\theta}.
\]

We are now in a position to state the following result.7

**Proposition 1** Under full information, the equilibrium budget is given by

\[
b_t^f = \begin{cases} 
\hat{b}_t^f, & \text{if } \theta < \hat{b}_t^f, \\
\theta, & \text{if } \theta \geq \hat{b}_t^f.
\end{cases}
\]

For \( \delta < \frac{\tilde{\theta}}{\tilde{\theta} + E(\theta)} \) the minimum budget satisfies \( \hat{b}_t^f > 0 \) and is implicitly determined by condition (5), where \( E(\theta) \) is the expected value of \( \theta \) over its full support. For \( \delta \geq \frac{\tilde{\theta}}{\tilde{\theta} + E(\theta)} \) the minimum budget satisfies \( \hat{b}_t^f = 0 \). For \( \delta \) approaching to zero, the minimum budget \( \hat{b}_t^f \) approaches \( \tilde{\theta} \).

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7Proofs are relegated to the Appendix.
Figure 2 illustrates the results stated in Proposition 1. The left diagram plots the equilibrium budget \( b^f \) as a function of the state of nature \( \theta \). The right diagram illustrates how the minimum budget \( \hat{b}^f \) depends on the discount factor \( \delta \). Note that under full information the more patient the incumbent, the lower is the rent the electorate has to offer. This ramification was identified by Barro (1973).

![Diagram of equilibrium budget with full information](image)

**Figure 2: Equilibrium budget with full information**

### 5 Asymmetric Information Equilibrium

Under asymmetric information the incumbent observes \( \theta_t \) in legislative period \( t \), whereas voters do not. Voters observe the budget \( b_t \) and they observe whether or not public affairs are managed adequately because it is only then that they receive the benefit \( \phi \) from public finance. As a consequence, voters cannot make the voting rule contingent on \( \theta_t \). Rather, the voting rule can only be contingent on \( b_t \) and on whether or not voters receive the benefit \( \phi \).

Consider the following voting rule. If either the budget \( b_t \) exceeds a certain cut-off budget \( \hat{b}_t^a \), with superindex \( a \) indicating the asymmetric information scenario, or if the budget \( b_t \) is too small to manage public affairs adequately (that is, if vot-
ers do not receive the benefit $\phi$ from public finance), the incumbent is voted out of office at the end of period $t$. Otherwise, the incumbent is reelected for another legislative period. Then, if the cutoff budget is properly set, the incumbent will choose $b_t = \hat{b}^a_t$ if she observes $\theta_t \leq \hat{b}^a_t$ and $b_t = \bar{\theta}$ if she observes $\theta_t > \hat{b}^a_t$.

The representative voter in period $t$ chooses a cutoff budget that maximizes expected voter welfare, given the budgets in all subsequent periods,

$$V_t = \sum_{j=0}^{\infty} \delta^j (\phi - b_{t+j}) F(b_{t+j}) + \sum_{j=0}^{\infty} \delta^j (\phi - \bar{\theta}) [1 - F(b_{t+j})],$$

subject to the constraint that the incumbent does not find the cutoff budget $\hat{b}^a_t$ too small so that she chooses $b_t = \bar{\theta}$ for all $\theta_t$, that is, subject to the constraint

$$b_t + \sum_{j=1}^{\infty} \delta^j b_{t+j} F(b_{t+j}) \geq \bar{\theta}.$$

As voters minimize the budget, the cutoff budget is determined by

$$\hat{b}^a + \frac{\delta}{1 - \delta} \hat{b}^a F(\hat{b}^a) = \bar{\theta}$$

if the constraint is binding. If, in contrast, the constraint is not binding, the cutoff budget is determined by the following first order condition

$$-F(\hat{b}^a) - \hat{b}^a f(\hat{b}^a) + \bar{\theta} f(\hat{b}^a) = 0.$$ 

In both cases, the cutoff budget chosen by the voters will be the same in all periods so that the index $t$ has again been omitted. The next lemma specifies when $\hat{b}^a$ is determined by (6) or by (7), respectively.

**Lemma 1** There is some discount factor $\tilde{\delta} \in (0, 1)$ such that for $\delta < \tilde{\delta}$ the cutoff budget $\hat{b}^a$ is determined by the constraint (6) and for $\delta \geq \tilde{\delta}$ the cutoff budget $\hat{b}^a$ is determined by the first order condition (7).

In light of Lemma 1, the equilibrium budget under asymmetric information can be characterized as follows.
**Proposition 2** Under asymmetric information, the equilibrium budget is given by

\[
b^a = \begin{cases} 
\hat{b}^a, & \text{if } \theta \leq \hat{b}^a, \\
\bar{\theta} & \text{if } \theta > \hat{b}^a,
\end{cases}
\]

where \(\hat{b}^a\) is determined by the constraint (6) if \(\delta < \tilde{\delta}\) and by the first order condition (7) if \(\delta \geq \tilde{\delta}\).

Figure 3 illustrates the result stated in Proposition 2. The left diagram plots the equilibrium budget \(b^a\) as a function of the state of nature \(\theta\). The right diagram illustrates how the cutoff budget \(\hat{b}^a\) depends on the discount factor \(\delta\).

The next proposition provides a comparison between the full information and the asymmetric information equilibrium.

**Proposition 3** \(b^a > b^f\) for \(\theta \in [0, \bar{\theta}] \setminus \{\hat{b}^a, \tilde{\theta}\}\) and \(b^a = b^f\) for \(\theta \in \{\hat{b}^a, \tilde{\theta}\}\).

The rents resulting from the difference between the two reelection budgets \(b^a\) and \(b^f\) can be viewed as a measure of the information rent that accrues to the incumbent within a legislative period from her expertise.
6 Introducing a Fiscal Restraint on the Budget

Assume now that the public budget is subject to limitation by a fiscal restraint. We will refer to such a restraint as a budget cap. The fiscal restraint stipulates that in each legislative period $t$ the budget $b_t$ must not exceed a predefined cap on the budget, denoted as $\bar{b} \leq \bar{\theta}$. In the following we limit our attention to the case in which information is asymmetrically distributed between voters and the incumbent.\footnote{Under full information, a fiscal restraint should simply stipulate that the budget always be equal to what the state of nature implies.}

In the presence of a budget cap $\bar{b}$, the representative voter chooses a cutoff budget\footnote{We use the term cutoff budget or level, when talking about the reelection policy chosen by voters and we use the term budget cap when referring to the fiscal restraint.} that determines reelection of the incumbent at time $t$, which maximizes

$$V_t = \sum_{j=0}^{\infty} \delta^j (\phi - b_{t+j}) F(b_{t+j}) + \sum_{j=0}^{\infty} \delta^j (\phi - \tilde{b}) [F(\tilde{b}) - F(b_{t+j})] - \sum_{j=0}^{\infty} \delta^j \bar{b}[1 - F(\tilde{b})]$$

subject to

$$b_t + \sum_{j=1}^{\infty} \delta^j b_{t+j} F(b_{t+j}) \geq \bar{b}.$$ 

If the constraint is binding, the cutoff budget is determined by

$$\hat{b}^c + \frac{\delta}{1 - \delta} \hat{b}^c F(\hat{b}^c) = \bar{b},$$

where the index $t$ again has been omitted since the voters choose the same cutoff level $\hat{b}^c$ in each legislative period. The superindex $c$ indicates the presence of a fiscal restraint or budget cap. Equation (8) implicitly defines the reelection cutoff level of spending $\hat{b}^c$ as a function of the budget cap $\bar{b}$, where

$$\frac{d\hat{b}^c}{db} = \frac{1 - \delta}{1 - \delta + \delta [F(\hat{b}^c) + \hat{b}^c f(\hat{b}^c)]} > 0.$$

If the constraint is not binding, the cutoff level in the presence of a fiscal restraint is determined by the following first order condition

$$-F(\hat{b}^c) - \hat{b}^c f(\hat{b}^c) + \bar{b} f(\hat{b}^c) = 0,$$  

(9)
which again implies the cutoff budget as a function $\hat{b} = \hat{b}^c(\bar{b})$.

Maximum voter welfare in the presence of a budget cap reads

$$V = \frac{1}{1 - \delta} \left\{ (\phi - \hat{b}^c)F(\hat{b}^c) + (\phi - \bar{b})[F(\bar{b}) - F(\hat{b}^c)] - \bar{b}[1 - F(\bar{b})] \right\},$$

where $\hat{b}^c$ is either determined by the constraint (8) or by the first order condition (9). Differentiation of $V$ with respect to $\bar{b}$ yields

$$\frac{dV}{d\bar{b}} = \frac{1}{1 - \delta} \left\{ \phi f(\bar{b}) - 1 + F(\hat{b}^c) + [-F(\hat{b}^c) - \hat{b}^c f(\hat{b}^c) + \bar{b} f(\hat{b}^c)] \frac{d\hat{b}^c}{d\bar{b}} \right\},$$

where the term in square brackets vanishes if the cutoff budget $\hat{b}^c$ is determined by the first order condition (9). This leads us to the following result.

**Proposition 4**

i. Let $\delta < \tilde{\delta}$. Then, lowering the budget cap $\bar{b}$ starting from $\bar{b} = \bar{\theta}$ increases voter welfare if and only if

$$\phi f(\bar{\theta}) < 1 - F(\hat{b}^c) - [-F(\hat{b}^c) - \hat{b}^c f(\hat{b}^c) + \bar{b} f(\hat{b}^c)] \frac{d\hat{b}^c}{d\bar{b}}.$$

ii. Let $\delta \geq \tilde{\delta}$. Then, lowering the budget cap $\bar{b}$ starting from $\bar{b} = \theta$ increases voter welfare if and only if

$$\phi f(\bar{\theta}) < 1 - F(\hat{b}^c).$$

In general, if the expected marginal costs of a lower budget cap are smaller than the expected benefits, then lowering the budget cap increases voter welfare. At $\bar{b} = \bar{\theta}$ the expected marginal costs of a lower budget cap are given by $\phi f(\bar{\theta})$ per legislative period. Lowering the budget cap implies the possibility that $\theta$ may exceed the maximum budget that the incumbent is allowed to choose, in which case the public budget will not be sufficient to manage public affairs adequately. Then, voters forgo the benefit from public affairs amounting to $\phi$. The marginal likelihood that this happens is given by $f(\bar{\theta})$ when the budget cap is lowered by one currency unit starting from $\bar{b} = \bar{\theta}$. 
The expected marginal benefits of a lower budget cap per legislative period depend on whether the constraint on the cutoff budget \( \hat{b}^c \) is binding or not. This, in turn, depends on the condition on the discount factor \( \delta \) derived in Section 5. Consider first the case that \( \delta \geq \hat{\delta} \) so that the cutoff budget \( \hat{b}^c \) is determined by the unconstrained solution. If the incumbent observes a \( \theta \) that is larger than the cutoff budget \( \hat{b}^c \), she will choose the maximum budget \( \bar{b} \). The probability for this to happen is \( 1 - F(\hat{b}^c) \). Thus, reducing the budget cap by one currency unit results in an expected marginal benefit for voters in the form of a lower maximum budget amounting to \( 1 - F(\hat{b}^c) \).

If \( \delta > \hat{\delta} \), that is, if the cutoff level \( \hat{b}^c \) is determined by the constrained solution, then voters receive an additional marginal benefit of a lower budget cap. In the constrained solution, although voters actually prefer a lower cutoff budget, they are compelled to allow the incumbent a budget sufficiently large so that the incumbent does not choose the maximum budget in all states of nature. Since voters would actually prefer a lower cutoff budget, the term \( -F(\hat{b}^c) - \hat{b}^c f(\hat{b}^c) + \bar{b} f(\hat{b}^c) \) is negative. This is because the term measures the marginal increase in voter welfare per legislative period if the cutoff level is increased.\(^{10}\) If this term were positive, this would imply that \( \hat{b}^c \) could not be the constrained solution as voters would prefer a higher cutoff level and, at the same time, the incumbent’s incentives to choose the maximum budget in all states of nature could be weakened. A budget cap reduces the rents that the incumbent can extract from exploiting the opportunity to choose the maximum budget. Therefore, the budget cap enables voters to enforce a lower cutoff level which, in the constrained solution, increases voter welfare.

Whether or not the introduction of a budget cap increases expected voter welfare essentially hinges on the distribution of \( \theta \). If the density \( f \) is thick for large \( \theta \) (that is, if states of nature are likely to occur in which a large budget is necessary to manage public affairs), then the introduction of a budget cap cannot be expected to contribute to voter welfare. In contrast, if the density \( f \) is thin for large \( \theta \), the

\(^{10}\)The argument for \(-F(\hat{b}^c) - \hat{b}^c f(\hat{b}^c) + \bar{b} f(\hat{b}^c)\) to be negative in the constrained solution does not rely on the assumption that voter welfare is concave in \( b \) for all \( b \in [0, \bar{\theta}] \). It simply follows from the fact that, in the constrained solution, voters cannot choose a lower cutoff level.
case for a budget cap arises.

The desirability of a budget cap also hinges on the discount factor $\delta$. If the discount factor is small, the incumbent is more inclined to choose the maximum budget, irrespective of the state of nature, in order to immediately extract the rents from office. A budget cap reduces the maximum budget the incumbent can choose and, thus, weakens her incentives to deploy this strategy. Therefore, the introduction of a budget cap is more likely to be beneficial if the discount factor $\delta$ is small and the constraint on the cutoff budget is binding.\(^{11}\)

Generally, the budget cap that maximizes voter welfare is determined by the following first order condition

$$\phi f(\hat{b}) - 1 + F(\hat{b}^c) + [-F(\hat{b}^c) - \hat{b}^c f(\hat{b}^c) + \hat{b} f(\hat{b}^c)] \frac{d\hat{b}^c}{db} \leq 0, \quad \text{with } 0 = \text{if } \hat{b} < \hat{\theta},$$

(11)

which can be inferred from equation (10). The next result characterizes the properties of an optimal budget cap.

**Corollary 1** Let either the condition stated in Proposition 4.i hold for $\delta < \hat{\delta}$ or the condition stated in Proposition 4.ii hold for $\delta \geq \hat{\delta}$. Then, there exists some budget cap $\bar{b}^*$ with $\hat{b}^c < \bar{b}^* < \hat{\theta}$ that maximizes voter welfare.

The following two examples determine the cutoff budgets without a budget cap, $\hat{b}^a$, and with a budget cap, $\hat{b}^c$, where condition (11) has been employed to determine the optimal budget cap $\bar{b}^*$. The first example is the case in which the introduction of a cap is welfare diminishing. In the second example the introduction of a cap is welfare enhancing.

**Example 1** Let $\theta$ be uniformly distributed on $[0, 1]$. Then, $\hat{\delta} = \frac{2}{3}$. For $\delta < \frac{2}{3}$ the cutoff budget is determined by the constrained solution and amounts to $\hat{b}^a = $\(^{11}\)Note that $\hat{\delta}$, that is, the discount factor below which the constraint on the cutoff budget $\hat{b}^c$ binds, generally depends on the budget cap. This is readily verified as follows. For $\delta = \hat{\delta}$, equations (8) and (9) imply the same cutoff budget $\hat{b}^c$. Together, these two equations then determine the cutoff budget $\hat{b}^c$ and the discount factor $\delta$ as functions of the budget cap $\hat{b}$.
[\sqrt{1 + 2 \delta - 3 \delta^2 - (1 - \delta)}]/2\delta > \frac{1}{2}$. For $\delta \geq \frac{2}{3}$ the cutoff budget is determined by the unconstrained solution and amounts to $\hat{b}^a = \frac{1}{2}$. In either case the introduction of a budget cap $\bar{b} < \hat{\theta}$ reduces voter welfare.

**Example 2** Let $\theta$ be distributed on $[0, 1]$ according to the triangular distribution function $F(\theta) = 2\theta - \theta^2$. Then, $\bar{\delta} = 0.672$. The introduction of a budget cap is beneficial for the voters. Table 1 provides numerical solutions of the cutoff budgets with and without a budget cap, $\hat{b}^a$ and $\hat{b}^c$, and in the presence of an optimal budget cap $\bar{b}^*$. In all cases $\phi = 1.1$ has been assumed.

<table>
<thead>
<tr>
<th>$\delta$</th>
<th>$\hat{b}^a$</th>
<th>$\hat{b}^c$</th>
<th>$\bar{b}^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>0.478</td>
<td>0.410</td>
<td>0.812</td>
</tr>
<tr>
<td>0.9</td>
<td>0.423</td>
<td>0.405</td>
<td>0.947</td>
</tr>
</tbody>
</table>

Table 1: Cutoff budgets and budget caps with triangular distribution

### 7 The Role of the Political Opposition

The previous section has identified the conditions under which a fiscal restraint in the form of a binding budget cap will be beneficial for voters. The welfare costs of a fiscal restraint materialize in situations in which the fiscal restraint hinders the government to act appropriately. Therefore, it makes sense to consider an exemption to the rule. One could allow the government to choose a budget that exceeds the budget cap if $\theta$ turns out to be larger than the budget cap. Obviously, this cannot be at the discretion of the incumbent. If the incumbent can decide about when the fiscal restraint can be suspended, she can exploit her expertise to make the budget cap ineffective so that it does not restrain her budget maximizing behavior. However, in this section we demonstrate that a fiscal restraint can be fruitfully employed, if an exemption requires approval from a third party that we call the political opposition. In this case, a fiscal restraint disciplines the government’s spending behavior and,
at the same time, allows the government to manage situations that require a large budget adequately.

In the following we again consider a fiscal restraint that imposes a cap on the government budget. We now allow this rule to specify when an exemption may apply. We assume that such an exemption will always require the consent of the opposition, where the opposition consists of a politician who competes with the incumbent for office and who has the same access to information as the incumbent. While the electorate is still not able to observe $\theta$, the incumbent as well as the opposition politician are. The opposition politician hence serves as a second expert, albeit one who wants to get into power. We assume that there are no programmatic differences between the incumbent and the opposition politician. While our assumption that the government and the opposition have the same access to information about the state of the world may be simplistic, in many countries the opposition certainly has better information than the public, due to parliamentary rights and services as well as access to think tanks related to the opposition. Thus, with our assumption of access to the same information, we hope to gain some initial insights into the effect of fiscal rules specifying exemptions.

We revisit the question concerning the incentives that the electorate may provide the government in order to ensure that the government only applies for an exemption to exceed the budget cap when it is actually necessary, i.e., if $\theta > \bar{b}$. At the same time, we need to ensure that the opposition will only consent to a budget that exceeds the cap if this is necessary to ensure that public affairs are managed adequately. Thus, we study the following voting rule: As before, the representative voter chooses a voting rule at the beginning of the legislative period, that he applies at the end of the period. Both, the government and the opposition are aware of this rule. The voting rule now specifies that reelection of the incumbent is guaranteed if the budget does not exceed a reelection cutoff and the public affairs are managed adequately. If the government does not apply for an exemption and exceeds the budget cap, the incumbent will be voted out of office and the opposition politician takes over. If the government does apply for an exemption to exceed the budget
cap, the opposition politician then has to decide whether or not she agrees. If she
does not agree and the government sets a budget equal to the budget cap but fails
to manage public affairs adequately, then the incumbent stays in office. If pub-
lic affairs can be adequately managed with a budget smaller or equal to \( \bar{b} \), then
the opposition politician gets elected. If the opposition agrees and the government
sets a budget above \( \bar{b} \), with which the government is able to manage public affairs
adequately, two outcomes are possible: the incumbent will be reelected in period
\( t \) with probability \( p_t \) or the opposition politician gets into power with probability
\( 1 - p_t \).

This rule provides the incumbent with an incentive to seek the consent of the
opposition for an exemption that enables her to exceed the budget only if \( \theta > \hat{b} \).
The opposition, on the other hand, has an incentive to consent to an exemption if
and only if this is the case. This voting rule differs from the rule introduced in
Section 3, as it now specifies a probability \( p_t \) of reelection, given the following
conditions: the government proposes a budget that exceeds the cap, the opposition
consents to grant the exemption, and public affairs are managed adequately.

The representative voter at time \( t \) chooses a cutoff budget and a probability \( p_t \)
to maximize his utility

\[
V_t = \sum_{j=0}^{\infty} \delta^j (\phi - b_{t+j} + b_t) + \sum_{j=0}^{\infty} \delta^j (\phi - \hat{b}) [F(\bar{b}) - F(b_{t+j})]
\]

\[
+ \sum_{j=0}^{\infty} \delta^j (\phi - \hat{b}) [1 - F(\bar{b})]
\]

subject to the constraint

\[
b_t + \sum_{j=1}^{\infty} \delta^j b_{t+j} F(b_{t+j}) + \sum_{j=1}^{\infty} \delta^j p_{t+j-1} \tilde{\theta} [1 - F(\bar{b})] \geq \bar{b}.
\]

Obviously, the constraint becomes less binding if \( p_t \) is larger. Therefore, voters will
choose the highest possible probability \( p_t \) to reelect the incumbent if the incumbent

\[12\]Note that our model abstracts from any moral hazard problems. If the budget \( \bar{b} \) is sufficient
to manage public affairs adequately, then the government cannot spend the budget \( \bar{b} \) inefficiently
without this being observed by the electorate.
proposes the budget $b_t = \bar{\theta}$ and the opposition consents. Given that any positive probability provides a sufficient incentive to the opposition to consent if a larger budget is required, voters will choose a $p_t$ arbitrarily close to 1. For simplicity, we assume $p_t = 1$ for all $t$. Then, the cutoff budget is determined by

$$\hat{b}^o + \frac{\delta}{1 - \delta} \hat{b}^o F(\hat{b}^o) + \frac{\delta}{1 - \delta} \bar{\theta} [1 - F(\hat{b})] = \tilde{b},$$

if the constraint is binding, and by

$$-F(\hat{b}^o) - \hat{b}^o f(\hat{b}^o) + \tilde{b} f(\hat{b}^o) = 0$$

if not. Again, the time index $t$ has been omitted as voters are concerned with the same calculus in each legislative period $t$. The superindex $o$ indicates a cutoff level chosen by the voter in the presence of a budget cap that can be exceeded if consented to by the opposition. Conditions (12) and (13) both determine the cutoff budget $\hat{b}^o$ as a function of the budget cap $\tilde{b}$. If the cutoff budget is determined by (12), that is, if it is determined by the constraint on the cutoff, then implicit differentiation yields

$$\frac{d\hat{b}^o}{db} = \frac{1 + \delta f(\tilde{b})}{1 - \delta + \delta [F(\tilde{b}^c) + \hat{b}^c f(\tilde{b}^c)]} > 0.$$ 

The maximum voter welfare that can be achieved in the presence of a budget cap that can be exceed only with the consent of the opposition is given by

$$V = \frac{1}{1 - \delta} \left\{ (\phi - \hat{b}^o) F(\hat{b}^o) + (\phi - \bar{\theta}) [F(\tilde{b}) - F(\hat{b}^o)] + (\phi - \bar{\theta}) [1 - F(\tilde{b})] \right\},$$

where $\hat{b}^o$ is either determined by the constraint (12) or by the first order condition (13). Differentiation of $V$ with respect to $\tilde{b}$ yields

$$\frac{dV}{d\tilde{b}} = \frac{1}{1 - \delta} \left\{ -F(\tilde{b}) + F(\hat{b}^o) + (\theta - \tilde{b}) f(\tilde{b}) + [-F(\hat{b}^o) - \hat{b}^o f(\hat{b}^o) + \tilde{b} f(\hat{b}^o)] \frac{d\hat{b}^o}{d\tilde{b}} \right\},$$

where again the term in square brackets is negative if the cutoff budget $\hat{b}^o$ is determined by the constraint (12) and vanishes if the cutoff budget $\hat{b}^o$ is determined by the first order condition (13). From (14) the following inference can be drawn.
Proposition 5 The introduction of a budget cap $\bar{b}$ that can only be exceeded with the consent of the political opposition strictly increases voter welfare.

Proposition 5 implies that there exists an optimal budget cap $\bar{b}^*$ for all distributions of $\theta$ and all $\phi > \bar{\theta}$. The optimal budget cap satisfies $\hat{b}^o < \bar{b}^* < \bar{\theta}$. Figure 4 illustrates the equilibrium budget with a budget cap amounting to the optimal level $\bar{b}^*$.

Figure 4: Equilibrium budget with budget cap

In the equilibrium with the political opposition as a second expert, the public assumes one of three levels depending on the state of nature $\theta$: For $\theta \in [0, \hat{b}^o]$, the incumbent chooses the budget $b = \hat{b}^o$ and is reelected for another term in office; for $\theta \in (\hat{b}^o, \bar{b}^*)$, the incumbent chooses the budget $b = \bar{b}^*$ and is voted out of office; and, for $\theta \in (\bar{b}^*, \bar{\theta}]$, the incumbent chooses the budget $b = \bar{\theta}$ and is reelected for another term in office with probability $p$ arbitrarily close to 1. Clearly, the levels of $b = \hat{b}^o$ and $b = \bar{b}^*$ depend on the distribution of $\theta$ and on the discount factor $\delta$. The following example, which is a continuation of Example 1, determines the optimal cutoff budget and the budget cap for the case of a uniform distribution.

---

13The proof is similar to the proof of Corollary 1.
Example 3 Let $\theta$ be uniformly distributed on $[0, 1]$. In this case $\hat{\delta} = \frac{3}{7}$ if the budget cap is chosen optimally. For $\delta < \frac{3}{7}$ the cutoff budget $b = \hat{b}^o$ falls from $\frac{1}{2}$ to $\frac{1}{3}$ with increasing $\delta$ and the optimal budget cap $b = \bar{b}^*$ increases from $\frac{1}{2}$ to $\frac{2}{3}$. For $\delta \geq \frac{3}{7}$ the cutoff budget $b = \hat{b}^o$ becomes $\frac{1}{3}$ and the optimal budget cap $b = \bar{b}^*$ becomes $\frac{2}{3}$. Figure 5 illustrates this example.

Figure 5: Example 3

8 Conclusion

In this article we have identified the effect of a fiscal restraint on voter welfare, based on the assumption that politicians serve as experts who provide services to voters that are characterized as credence goods. Because of the information asymmetry inherent to credence goods, politicians are able to spend excessively. A fiscal restraint may mitigate the spending tendency of expert politicians. We have shown that a fiscal restraint, which does not allow for any exemptions, enhances voter welfare only if the probability that the state of nature requires a large public budget is relatively low. In contrast, a fiscal restraint which allows for exemptions that can only be granted by the political opposition, which functions as second
expert for voters, strictly enhances voter welfare.

In most countries fiscal restraints allow for some sort of exemption so long as there is support of the governing majority. However, our analysis suggests that allowance for exemptions should require the fulfillment of stricter criteria. This is because if the support of the governing majority is sufficient for an exemption, then the incumbent can exploit her expertise to render the fiscal restraint ineffective. To the extent that a fiscal restraint is intended to remedy excessive spending that is associated with the credence good character of public finance, the granting of an exemption should require the consent of a second expert. We attribute the role of second expert to the political opposition. In order for the political opposition to function effectively in its role of second expert, granting of an exemption should require a supermajority in the legislative body of government. Thus, our analysis points to a weakness of existing fiscal rules to restrain the tendency of excessive public spending.

Finally, we would like to mention that our model also implies a political business cycle. The literature on political business cycles points to increased public spending at the end of a legislative period (see Nordhaus, 1975, for an early theoretical approach and Litchig and Morrision, 2010, for recent empirical evidence). We share Rogoff’s (1990) view that such behavior is not due to the fact of myopia or limited rationality of the electorate. Rather, it follows from the agency problem a rational electorate faces when it tries to provide politicians with proper incentives. In our model, government spending is high, because the increased risk of losing power in a tight election implies that expert politicians opt for the immediate rent of a larger budget instead of an uncertain future in office. Aidt et al. (2011) show that tight margins in elections are in fact correlated with increased spending. In our view, highlighting the occurrence of a political business in a model in which public services are treated as a credence good is an opportunity for future research.
Appendix

Proof of Proposition 1

Implicit differentiation of equation (5) yields

\[
\frac{d\hat{b}^f}{d\delta} = -\frac{\hat{b}^f F(\hat{b}^f) + \int_{\hat{b}^f}^{\bar{\theta}} \theta dF(\theta)}{(1 - \delta)|1 - \delta + \delta F(\hat{b}^f)|} < 0.
\]

Furthermore, equation (5) implies that $\hat{b}^f \to \bar{\theta}$ if $\delta \to 0$. Finally, setting $\hat{b}^f = 0$ in equation (5), one gets after some manipulations

\[
\delta = \frac{\bar{\theta}}{\bar{\theta} + E(\bar{\theta})}.
\]

Since the minimum budget $\hat{b}^f$ cannot be negative, it follows that $\hat{b}^f = 0$ for all $\delta \geq \frac{\bar{\theta}}{\bar{\theta} + E(\bar{\theta})}$. Q.E.D.

Proof of Lemma 1

First observe that if $\hat{b}^a$ as determined by (7) is larger than $\hat{b}^a$ as determined by (6), the constraint on $\hat{b}$ does not bind. Second, observe that $\hat{b}^a$ as determined by (7) is independent of $\delta$, whereas $\hat{b}^a$ as determined by (6) depends on $\delta$ as follows

\[
\frac{d\hat{b}^a}{d\delta} = -\frac{\hat{b}^a F(\hat{b}^a)}{(1 - \delta) \left[1 - \delta + \delta F(\hat{b}^a) + \hat{b}^a f(\hat{b}^a)\right]} < 0.
\]

Third observe that $\hat{b}^a$ as determined by (7) implies $\hat{b}^a < \bar{\theta}$. Fourth and finally observe that $\hat{b}^a$ as determined by (6) implies that $\hat{b}^a \to \bar{\theta}$ if $\delta \to 0$ and $\hat{b}^a \to 0$ if $\delta \to 1$. Q.E.D.

Proof of Proposition 3

Since $\hat{b}^a$ is bounded from below by condition (6) and $\hat{b}^a$ as determined by condition (6) exceeds $\hat{b}^f$ as determined by condition (5), it follows that $\hat{b}^a > \hat{b}^f$. Thus, for $\theta < \hat{b}^f$ it follows that $b^a = \hat{b}^a > b^f = \hat{b}^f$. For $\theta \in [\hat{b}^f, \hat{b}^a)$ it follows that $b^a = \hat{b}^a > b^f = \theta$. For $\theta \in (\hat{b}^a, \bar{\theta})$ it follows that $b^a = \theta > b^f = \theta$. Only for $\theta \in \{\hat{b}^a, \bar{\theta}\}$ it follows that $b^a = \hat{b}^f$. 

**Proof of Corollary 1**

From Proposition 4 it is obvious that $\bar{b} < \bar{\theta}$. For $\delta < \tilde{\delta}$, the cutoff budget $\hat{b}^c$ is determined by the constraint (8) and $\hat{b}^c < \bar{b}^*$ directly follows from the fact that $F(\hat{b}^c) > 0$. For $\delta \geq \tilde{\delta}$ the cutoff budget $\hat{b}^c$ is determined by the first order condition (9). Assume, contrary to Corollary 1, that $\hat{b}^c \geq \bar{b}^*$. Then, it follows that

$$-F(\hat{b}^c) - (\hat{b}^c - \bar{b}^*) f(\hat{b}^c) < 0,$$

which is contradictory to condition (9). Q.E.D.

**Proof of Proposition 5**

Evaluate (14) at $\hat{b} = \hat{\theta}$ to find that

$$\frac{dV}{db}|_{b=\hat{\theta}} < 0$$

if

$$-F(\hat{\theta}) + F(\hat{b}^o) + [-F(\hat{b}^o) - \hat{b}^o f(\hat{b}^o) + \bar{b} f(\hat{b}^o)] \frac{d\hat{b}^o}{db} < 0.$$

The term in square brackets is negative if $\hat{b}^o$ is determined by the constraint (12) and vanishes if $\hat{b}^o$ is determined by the first order condition (13). Further, $F(\hat{\theta}) > F(\hat{b}^o)$ and $d\hat{b}^o/db > 0$ if $\hat{b}^o$ is determined by the constraint (12). Thus, it follows that $dV/db < 0$ for $\hat{b} = \hat{\theta}$. Q.E.D.
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