Mechanisms for the Control of Fiscal Deficits*

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Abstract

This paper shows that a simple two-stage voting mechanism may implement a constrained optimal state dependent decision about the size of the fiscal deficit. I consider a setup with strategic fiscal deficits à la Tabellini and Alesina (1990). Three groups of voters are informed about the productivity of current public spending. Voters differ in their preferences for public goods and swing voters' preferences may change over time. The current government decides on the current spending mix and it has an incentive to strategically overspend. Under certain conditions, a simple two-stage mechanism in which a deficit requires the approval by a supermajority in parliament implements a constrained optimal decision. When the current majority is small, political bargaining may further increase social welfare. However, when the current majority is large, a supermajority mechanism with bargaining leads to a biased spending mix and reduces welfare whereas the laissez faire mechanism may yield the first best. An appropriately adjusted majority threshold can deal with this problem.

Keywords: Fiscal policy rules, constitutional choice, mechanism design.

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1 Introduction

Designers of fiscal policy institutions have to deal with a fundamental trade-off. On the one hand, elected policymakers face limited or uncertain periods in office which can create

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a bias towards excessive spending. This bias needs to be corrected through an appropriate regulation of fiscal policy. On the other hand, fiscal flexibility is desirable because new information about economic circumstances and political preferences may require a flexible fiscal policy reaction. Any suitable institutional arrangement has to address both problems at the same time. This paper formally studies institutional arrangements that reduce strategic fiscal deficits while still permitting some fiscal flexibility.

Tying policymakers' choices through strict constitutional deficit ceilings is a direct way of addressing the problem of strategic overspending. In order to maintain some fiscal flexibility, constitutions often contain exemption clauses that permit exceptions under circumstances that make a fiscal policy response particularly desirable[1]. However, formulating exception clauses can be very difficult when relevant information about the need for discretionary fiscal policy responses is not contractible ex ante or not verifiable ex post. It would be prohibitively costly to fully specify at the constitutional stage, what kind of situation makes an elevated fiscal deficit (or a surplus) acceptable in the (partly distant) future and to specify the appropriate size of the deficit. Even if some relevant events can be specified in a constitution, it may be difficult to verify their realization ex-post. Any constitution that addresses the problems of fiscal sustainability and fiscal flexibility has to specify how the political system shall deal with non contractible and non verifiable information.

This paper addresses this constitutional choice problem from a mechanism design perspective. In my model, fiscal policy decisions should ideally depend on the realization of two random variables: The desired spending mix of the majority of citizens and the productivity of public spending at different points of time. Voters differ in their preferences for two public goods. Moreover, all voters and all policymakers are equally well informed about the relative desirability of current vs. future public spending. This is why, for any given spending mix, all voters would agree on the optimal time path for public spending. However, I assume that neither the spending mix nor the productivity of current public spending are contractible at the constitutional stage. In this environment, it is the role of political institutions to base decisions regarding the spending mix and the deficit on voters' preferences and on the realization of the productivity of current spending. By assumption, the constitution can only specify how decision rights are allocated to political parties. The political party that represents the majority of citizens should choose the (current majority's desired) spending mix. However, as in Tabellini and Alesina

[1] For an early empirical analysis of fiscal rules see von Hagen (1991) and for a discussion of the role of strict fiscal rules and exemption clauses in constitutions see Wyplosz (2005).

(1990) this government has an incentive to strategically overspend. In such a situation, a constrained optimal choice of the spending level requires that the government spends less than it would like to. I derive conditions under which a simple revelation mechanism can implement such a constrained optimal outcome.

I begin with the analysis of a simple revelation mechanism that asks both political parties for simultaneous announcement regarding the realized productivity parameter. The mechanism then implements the corresponding deficit. If the two announcements differ, a low default spending level is implemented. When the realized productivity of government spending is sufficiently large or sufficiently small, this mechanism implements a constrained optimal collective choice. Moreover, for any given strict budget rule one can find a default spending level such that the corresponding revelation mechanism yields a higher social welfare.

Any revelation mechanism requires a structured procedure with simultaneous announcements that are then transformed into outcomes. Such a procedure may be difficult to implement in practice. I show that a similar state dependent outcome can be implemented by a simple three-step supermajority mechanism. In the first step, the government asks the parliament to accept a specific deficit level that may exceeds a prespecified value. The approval of the deficit requires a supermajority in parliament whenever the deficit exceeds the prespecified value. In the second step, the parliament may accept or reject the proposal. If the proposal is rejected then the size of the budged may not exceed the prespecified size. In the third step the government decides on the spending mix, taking into account the parliament's decision. I show that, for any given budget rule one can find a supermajority mechanism that yields a higher social welfare.

In a two-party system, a supermajority mechanism grants the opposition party a veto right on any budget that exceeds a prespecified absolute or relative deficit level. In this sense it closely resembles the practice in the U.S. where the government can only increase government debt beyond a prespecified value if the House and the Senate both give their approval. Over the last 30 years the composition of the two chambers and the president's party affiliation only fit together in 8 years. This effectively turned the U.S. mechanism into a supermajority rule in most of these years.

The present paper shows that such a mechanism may in principle play a useful role. However, a supermajority mechanism has the drawback that it grants the opposition considerable political power exactly when a deficit would be particularly useful. It is likely that the opposition uses its right to veto an increase of the size of the budget in order to negotiate the spending level and the spending mix with the government. This in turn

may distort the spending mix. It depends on the features of the underlying distribution of individuals' preferences, whether a supermajority increases or reduces social welfare compared to a laissez faire constitution. In this context, the size of the current majority plays an important role. A society which is almost equally split into two political camps is likely to benefit from a supermajority mechanism with bargaining because the bargaining process may lead to a more moderate spending mix which increases social welfare. If, instead, the opposition is small, the distortion of the spending mix away from the majority's preferred outcome may reduce social welfare. A laissez faire constitution may also perform well when there is a high probability of a political change and when all members of the current majority's preferences are strongly correlated.

Accordingly, the constitution should ideally adjust the majority threshold to the underlying political situation. A too low majority threshold can lead to excessive spending and a too uneven spending mix. A too large threshold may lead to too little concentration of the spending mix. However, a properly chosen supermajority threshold can make sure that a government which is supported by a large enough majority in parliament does not need the approval of the current opposition.

An analysis of costs and benefits of fiscal policy rules has to be based on a politico-economic theory of elevated fiscal deficits. The formal analysis of budget procedures has been pioneered by Ferejohn and Krehbiel (1987). Important early strategic explanations of elevated deficits have been put forward by Alesina and Drazen (1989), Tabellini and Alesina (1990), and Lizzeri (1999)[2]. While Alesina and Drazen (1989) emphasize that political indivisibilities can lead to a war of attrition and delayed fiscal consolidation, Tabellini and Alesina (1990) explore how excessive deficits arise when incumbent parties strategically overspend when they risk to lose the upcoming election. Lizzeri (1999) explains deficits via competition of political parties that play a multi period game of Myersonian political competition. The present model of constitutional design is based on the explanation put forward in Tabellini and Alesina (1990). It is a modified version of their two period case and it extends their analysis by specifying the contractual environment in more detail.

A recent analysis of constitutional measures to overcome excessive deficits in Azzimonti, Battaglini and Coate (2015). Their model is based on the dynamic legislative bargaining model in Battaglini and Coate (2008). In this model randomly selected agenda setters propose tax rates, deficits, public good provision and non-distortionary pork-barrel spending. In equilibrium, pork barrel spending occurs when public goods are less produc-

[2] See also Persson and Svensson (1989).

tive. In an extension of the original paper, Azzimonti, Battaglini and Coate find that a balanced budget rule has short run costs and long run benefits that may outweigh these costs. Moreover, a supermajority rule for the deficit level does not alter the equilibrium policy outcome or equilibrium welfare. The present analysis relies on a different policy process - one with a two party system in which the key conflict is not about the allocation of pork barrel transfers but about the composition of public spending. A particular focus is on the role of renegotiation of the spending mix under a supermajority mechanism.

Several economists have proposed that exceptionally high fiscal deficits should only be permitted if they are backed by a supermajority in parliament[3]. The underlying idea is that there should be more widespread support for deficits when exceptional circumstances affect many individuals in the same way[4]. A first formalization of this argument can be found in Becker, Gersbach, and Grimm (2010). In their model, there is a single public good and voters differ in their preference for private and public consumption. The parliamentary decision procedure yields an outcome that is put up for a vote against the status quo. A flexible majority threshold for this vote which increases with the proposed fiscal deficit may reduce the equilibrium deficit[5]. The same holds for an inflexible upper bound on the deficit. The advantage of a flexible majority rule is that it permits that the equilibrium deficit increases when all voters' present income declines. The present paper is also based on the idea that the political system should filter out the situations in which fiscal deficits do not receive widespread support. It uses a different formal framework that permits to analyze additional issues. Modelling a two-dimensional information aggregation problem permits to analyze the effect of fiscal policy institutions on the level and composition of public spending. The paper provides a welfare analysis of different alternative mechanisms. Moreover, the present paper studies the role of parliamentary negotiations that may arise when the opposition is granted a veto right regarding the deficit level.

Another model that analyzes how fiscal policy institutions should deal with new information about the desirability of deficits is Kiel (2003, chapter 3). She studies a fiscal policy mechanism design problem with cross border externalities. Several countries have idiosyncratic stochastic spending needs. A mechanism maps the vector of spending needs into a vector of fiscal deficits. Her paper studies a static case and it does not derive

[3] German Council of Economic Advisors (2007) and Council of Economic advisors to the German Ministry of the Economy (2008).

[4] German Council of Economic Advisors (2007, p.101).

[5] The concept of a flexible majority rule has been introduced in Gersbach and Erlenmeyer (1999).

endogenously why the deficit bias arises.

The present paper is also related to several papers that study the trade-off between policy credibility and flexibility, including Rogoff (1985), Aghion and Bolton (2003) and Dal Bo (2006). Rogoff (1985) studies the optimal choice of the characteristics of a monetary policymaker. Dal Bo (2006) shows that committees deciding under a super-majority rule can replicate the choice of a conservative policymaker, the advantage being that the committee can pick the appropriate majority threshold for each issue. Aghion and Bolton (2003) study a trade-off between policy credibility and flexibility on the constitutional stage. A constitution that imposes a larger majority threshold reduces the chance to efficiently reforms, but it also reduced the risk of excessive redistribution. The present paper focuses on public spending decisions of fiscal policymakers who are selected by the population in an election and on budgetary bargaining between political parties.

2 The model

2.1 Consumers

Consider a country with a population consisting of three homogenous groups of individuals. There are two divisible public goods, x and y and two legislative periods, 1 and 2.[6] In both periods, the government has a given revenue of 1/2. In the first period, the government spends s_1 an it needs to raise debt at an interest rate of zero if $s_1 > 1/2$. The zero interest rate also applies to deposits. Debt has to be fully repaid in the second period which is why spending in that period has to satisfy $s_2 \leq 1 - s_1$. In both periods, both public goods have the same price 1. The members of one group, called x voters, always wish to consume more of good x than of good y. The members of another group (y voters) always wants to consume more of good y than of good x. Both groups represent a share of $1/2 - \varepsilon$ of society with $\varepsilon > 0$. The third group (with a population share of 2ε) are swing voters who, in period 1 wish to consume more of good x than of good y. With a given probability p, this may change in period $t = 2$. All voters know, which of the

[6] An alternative interpretation of the model is that good x represents transfers to the poor and good y tax cuts for the rich.

three groups they belong to.[7] [8]

Preferences of x-voters, y-voters and swing voters are represented by the following von Neumann Morgenstern utility functions.

$$u^x(x_1, y_1, x_2, y_2) = \theta \cdot u(x_1, y_1) + u(x_2, y_2), \tag{1}$$

$$u^y(x_1, y_1, x_2, y_2) = \theta \cdot v(x_1, y_1) + v(x_2, y_2), \tag{2}$$

$$u^z(x_1, y_1, x_2, y_2) = \theta \cdot u(x_1, y_1) + \delta u(x_2, y_2) + (1-\delta) v(x_2, y_2), \tag{3}$$

where the indices refer to periods 1 and 2 and where $\delta = 1$ if swing voters' preferences continue to be more in favor of consuming good x and $\delta = 0$ otherwise. The parameter θ measures the relative efficiency (or desirability) of public spending in period 1. It is drawn from a given distribution $\phi(\theta)$ on $[a, b] \subset R^+ \setminus \{0\}$ which is known by the designer at the constitutional stage (i.e. before period 1). All voters become informed about the realization of θ in period 1. I assume that x- and y-voters' preferences are different and symmetric in the following sense:

$$v(x, y) = u(y, x) \text{ and } v(x, y) \neq u(x, y). \tag{4}$$

The utility function $u(x, y)$ is strictly concave. Moreover, I assume that utility values are determined by the period t spending level s_t and the spending share $\chi_t := x_t / (x_t + y_t)$ as follows:

$$u(s_t \chi_t, s_t(1-\chi_t)) = f(s_t) \cdot u(\chi_t, (1-\chi_t)), \tag{5}$$

with $f' > 0$, $f'' < 0$, and $f'(0) = \infty$. At a relative price of 1, x (y) voters want to consume a share $\chi^* > 1/2$ of good x (y) in each period. I define

$$\bar{u} \ : \ = u(\chi^*, 1-\chi^*), \tag{6}$$

$$\underline{u} \ : \ = u(1-\chi^*, \chi^*). \tag{7}$$

[7] The present model is close to the two period one in Tabellini and Alesina (1990) but not exacly the same. The main differences are that voters fall into three distinct classes and that political parties represent two of these classes. This significantly simplifies the analysis of voting decisions and incentive compatibility constraints. The same holds for the simpler specification of voter utility.

[8] In Section 5, I consider an alternative setup with only two groups in which it may occur that in the second period some of the x-voters turn into y-voters.

2.2 Parties and voting

There are two political parties (X and Y) that represent the two groups of society with stable preferences. Both parties compete for office in each of the two legislative periods 1 and 2. Their objective is to maximize the utility of their respective constituency, the x- and the y-voters. Parties cannot commit to any specific platform when they compete. In particular, they cannot commit to a platform for period 2 in period 1. An election merely determines both parties' vote shares in parliament and so allocates the right to choose policies. Swing voters have no specific political representation.

Voters vote sincerely for their preferred party. In period 1, swing voters vote for party X because, as will become clear below, party X picks the same spending level as party Y but it chooses the swing voters' preferred spending mix in that period. If the swing voters change their preferences then this implies a change in government in period 2. Throughout the paper, the political parties are treated as the informed agents. Alternative assumptions regarding the structure of the party system, the motivation of party representatives and the commitment power of parties will be discussed in section 5.

2.3 Predetermined spending

In practice, states often engage in long run contractual commitments in order to overcome credibility problems.[9] This is why I assume that, at the beginning of period 1, some spending decisions related to this period can only be altered at a prohibitively high cost. I denote by $\check{s} < 1/2$ the level of predetermined spending in period 1 and by $\check{\chi}$ the share of predetermined spending that is earmarked for good x. Thus, in period 1 an amount of at least $\check{\chi} \cdot \check{s}$ has to be spend on good X and at least $(1 - \check{\chi})\,\check{s}$ has to be spend on good Y. The level of predetermined spending imposes a lower bound on any spending limit that a constitution can impose. To simplify the analysis, I assume that there is no such constraint in period 2.

2.4 The constitutional stage

The objective of this paper is to find appropriate constitutional arrangements that deal with a two-dimensional information aggregation problem. The problem is to find institu-

[9] One important area where long term contracts are used is the employment of public servants. Long term contracts may be useful when an employee has to make a relationship specific investment that only pays off for him if his employment lasts long enough. Another area where similar credibility problems may arise are procurement relationships.

tions that assign a feasible time path for public spending on the goods x and y to any joint realization of the majority's preferences regarding the spending mix (in both periods) and the productivity parameter θ.

In an unrestricted setup and with perfectly correlated types θ, one can easily implement a social choice that maximizes expected social welfare. Just consider a direct revelation mechanism that asks both political parties to submit an announcement about the realization of θ. If the two parties' announcements differ, the mechanism only provides a prespecified mix of public goods. Otherwise, the mechanism provides the welfare maximizing mix of public goods which lies between what x-voters and y-voters want. This mix would have to take both parties' electoral support into account. Clearly, such a mechanism is incentive compatible if the prespecified mix of public goods is sufficiently unattractive for both parties. However, there are practical difficulties with such an approach. One problem is that it is difficult to fully specify in a constitution how the desired mix of public spending varies with the size of both groups. The list of public goods and the list of states of the world would have to be quite long. Moreover, the set of available public goods and the preferences regarding these goods may evolve over time. This is why I assume that the spending mix is not contractible at the constitutional stage.[10]

In what follows, I assume that the constitutional rules can allocate the right to choose the budget and that one can also impose constraints on public spending. Any such constraint has to respect the predetermined spending requirements for period 1. In particular, it is possible to leave the decision about the spending mix to the current government or to the opposition or to permit bargaining between both parties once the information θ has realized.

2.5 Desired spending levels

It is useful to first define state dependent optimal spending levels from the perspective of the two political parties as well as the state dependent welfare maximizing spending level. The following definition refers to a situation where in both periods the majority party unilaterally fixes the spending mix, i.e. party X forms the government in period 1, whereas, in period 2 party X (Y) forms the government with probability $1-p$ (p).

Definition 1 *Consider the case where, in each period, the majority party has the right to choose the spending mix. Define $s^P(\theta)$ $(P \epsilon \{X, Y\})$ as the desired state dependent period*

[10] Another problem is that a particularly unattractive budget would not be renegotiation proof because both parties would prefer a set of alternatives. This problem will be addressed in section 5.

1 spending level of Party P and $s^W(\theta)$ as the state dependent welfare maximizing period 1 spending level, i.e.

$$s^X(\theta) = \arg\max_s \theta \cdot f(s) \cdot \bar{u} + f(1-s) \cdot ((1-p)\bar{u} + p\underline{u}), \tag{8}$$

$$s^Y(\theta) = \arg\max_s \theta \cdot f(s) \cdot \underline{u} + f(1-s) \cdot (p\bar{u} + (1-p)\underline{u}), \tag{9}$$

and

$$\begin{aligned} s^W(\theta) &= \arg\max_s (\theta \cdot f(s) + f(1-s)) \cdot \left(\left(\frac{1}{2}+\varepsilon\right)\bar{u} + \left(\frac{1}{2}-\varepsilon\right)\underline{u}\right) \\ &= \arg\max_s \theta \cdot f(s) + f(1-s). \end{aligned} \tag{10}$$

The shape of these three functions is characterized in lemma 1.

Lemma 1 *(i) For all $\theta \geq 0$ we have $s^{X\prime}(\theta), s^{W\prime}(\theta), s^{Y\prime}(\theta) > 0$.*

(ii) For all $\theta \geq 0$ we have $s^{X\prime\prime}(\theta), s^{W\prime\prime}(\theta), s^{Y\prime\prime}(\theta) < 0$.

(iii) For all $\theta > 0$ we have $s^X(\theta) > s^W(\theta) > s^Y(\theta)$.

Proof See Appendix.

In the case where $\theta = 1$ a balanced budget ($\bar{s} = 1/2$) maximizes social welfare because it equates marginal welfare across periods. The form of the functions $s^X(\theta)$, $s^Y(\theta)$, and $s^W(\theta)$ is depicted in Figure 1.

In order to facilitate the analysis that follows, I assume that the minimum spending level $\check{s}$ and $\check{\chi}$ are such that - for the lowest possible realization of θ, a, party X can still implement its preferred spending mix, i.e.

$$\check{\chi} \cdot \check{s} \leq \chi^* \cdot s^X(a) \ \wedge \ (1-\check{\chi}) \cdot \check{s} \leq (1-\chi^*) \cdot s^X(a) \Leftrightarrow \check{s} \leq \min\left\{\frac{1-\chi^*}{1-\check{\chi}}, \frac{\chi^*}{\check{\chi}}\right\} \cdot s^X(a). \tag{11}$$

I also assume that the welfare maximizing policy sometimes includes a fiscal deficit and sometimes a surplus. Hence, the support of the distribution of types $\phi(\theta)$ on $[a, b]$ is such that

$$0 < s^{W^{-1}}(\check{s}) < a < 1 < b.$$

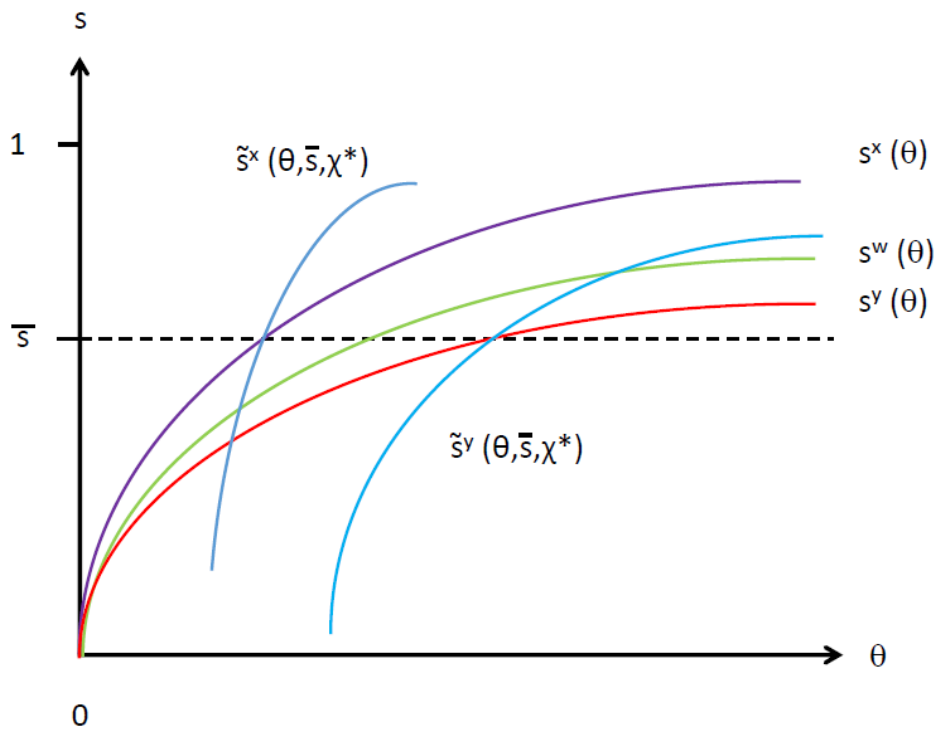

Figure 1: Desired spending levels of both parties ($s^X(\theta)$, $sY(\theta)$), welfare maximizing spending level ($s^W(\theta)$) and the curves $\tilde{s}^X(\theta,\bar{s},\chi^*)$ and $\tilde{s}^Y(\theta,\bar{s},\chi^*)$ from Definition 2.

3 Mechanisms

3.1 Laissez faire and budget rules

Before I turn to more sophisticated mechanisms, I first briefly discuss two practically relevant benchmark arrangements.

Under a laissez faire constitution, an election is held in each period. In each period the elected government may choose both the spending mix and the spending level subject to the first period's minimum spending constraint. In this case, the $t = 2$ government spends its desired share χ^* or $1 - \chi^*$ of the remaining budget $1 - s$ on good x. Taking this into account, the $t = 1$ government's payoff is concave in period 1 spending s with a unique maximum at $s^X(\theta)$.

For all $\varepsilon > 0$ and for all possible realizations of θ, the laissez faire outcome does not maximize social welfare because the preferences of the current y-voters and the preferences of swing voters are not taken into account by party X. There is too much spending on good x relative to good y in period 1 and there also is too much overall spending in period

1. The principal reasons for the welfare losses differ for different parameter constellations. When the group of swing voters is very large, most voters know that their preferred spending mix will be implemented in both periods. In this case, the excessive deficit is the main source of welfare losses. The deficit arises because party X strategically overspends in the interest of a small group of voters with stable preferences. Instead, when the group of swing voters is small and when the political majority is very stable, there is almost no overspending because party X expects that it will continue to form the government in period 2. However, there is excessive spending on good x compared to the welfare maximizing spending mix.

A constitution that relies on a strict spending rule fixes a maximum expenditure for period 1, $\bar{s} \geq \check{s}$. In both periods, the spending mix is the same under such a rule as in the laissez faire case. Obviously, the optimal strict spending rule performs better than a laissez faire constitution when there is no need for fiscal policy discretion. The laissez faire constitution instead performs better when fiscal discretion is important.[11]

3.2 Revelation mechanisms

A direct revelation mechanism simultaneously asks both political parties for announcements regarding the realization of the information parameter θ. The period 1 spending level s is then directly made a function of the two announcements. In theory such a mechanism can in principle force the government to implement some spending level for sure, i.e. can force the government to spend more money on public goods than it actually wants to. However, since governmental savings can hardly be excluded in practice, it is more appropriate to assume that the mechanism can only specify a maximum spending level $\bar{s} \geq \check{s}$.

As a first step, it is useful to characterize a period 1 spending level that makes party $P \in \{X, Y\}$ indifferent to a default spending level $\bar{s}$ in combination with a default spending mix $\bar{\chi}$ when party X has the right to manage public spending in period 1 and the elected

[11] To see why, consider the simple binary case where θ is drawn from the set $\{1, \bar{\theta}\}$ (where $\bar{\theta} > 1$) according to some given distribution. When $\bar{\theta} = 1$ and $\bar{s} = 1/2$, swing voters know that their desired spending mix will be implemented in both periods. This is why they do not want to run a fiscal deficit. The joint welfare of the (equal sized) groups of x- and y-voters is maximized if the budget is balanced, taking into account that the current government chooses spending. The laissez faire constitution leads to a strictly lower welfare level than the balanced budget rule. It follows from the continuity of all expected payoffs in $\bar{\theta}$ that this also holds in an environment of $\bar{\theta} = 1$. All voters' desired spending level for period 1 converges to 1 as $\bar{\theta}$ goes to infinity. The welfare difference is increasing and unbounded which is why the laissez faire constitution is better for large enough values of $\bar{\theta}$.

party selects the spending mix in period 2. This spending level will play an important role in the opposition's incentive compatibility constraint.

Definition 2 *Consider a given default period* 1 *spending level* $\bar{s}$ *and a default spending mix* $(\chi^*, 1-\chi^*)$. *For all* $\theta > \left(s^Y\right)^{-1}(\bar{s})$ *define* $\tilde{s}^Y(\theta, \bar{s}, \chi^*)$ *as the maximum solution to*

$$\begin{aligned} & \theta f\left(\tilde{s}^Y(\theta, \bar{s}, \chi^*)\right) \underline{u} + f\left(1 - \tilde{s}^Y(\theta, \bar{s}, \chi^*)\right)((1-p)\underline{u} + p\bar{u}) \\ = \; & \theta f(\bar{s}) \underline{u} + f(1-\bar{s})((1-p)\underline{u} + p\bar{u}), \end{aligned} \tag{12}$$

and for all $\theta < \left(s^X\right)^{-1}(\bar{s})$ *define* $\tilde{s}^X(\theta, \bar{s}, \chi^*)$ *as the minimum solution to*

$$\begin{aligned} & \theta f\left(\tilde{s}^X(\theta, \bar{s}, \chi^*)\right) \bar{u} + f\left(1 - \tilde{s}^X(\theta, \bar{s}, \chi^*)\right)((1-p)\bar{u} + p\underline{u}) \\ = \; & \theta f(\bar{s}) \bar{u} + f(1-\bar{s})((1-p)\bar{u} + p\underline{u}). \end{aligned} \tag{13}$$

Note that when $\theta > \left(s^Y\right)^{-1}(\bar{s})$ equation (12) has two solutions, one being $\tilde{s}^Y(\theta, \bar{s}, \chi^*) = \bar{s}$. Generally, the value $\tilde{s}^Y(\theta, \bar{s}, \chi^*)$ is larger than $\bar{s}$ and it specifies the upper bound of an acceptable deficit from the perspective of the opposition party Y once it faces the alternative spending level. When when $\theta = \left(s^Y\right)^{-1}(\bar{s})$ the unique solution is $\bar{s}$. The following lemma lists further properties of these two functions (see figure 1 for two curves $\tilde{s}^X_\theta(\theta, \bar{s}, \chi^*)$ and $\tilde{s}^Y_\theta(\theta, \bar{s}, \chi^*)$ satisfying properties (i)-(iv)).

Lemma 2 *(i) For* $\tilde{s}^Y > \bar{s}$ *we have* $\tilde{s}^Y_\theta(\theta, \bar{s}, \chi^*) > 0$.

(ii) For $\tilde{s}^X < \bar{s}$ *we have* $\tilde{s}^X_\theta(\theta, \bar{s}, \chi^*) > 0$.

(iii) For all $\bar{s} \in (0, 1/2)$ *there is a value* $\theta > \left(s^Y\right)^{-1}(\bar{s})$ *such that* $\tilde{s}^Y(\theta, \bar{s}, \bar{\chi}) = s^W(\theta)$.

(iv) For all $\bar{s} \in (0, 1/2)$ *there is a value* $\theta < \left(s^X\right)^{-1}(\bar{s})$ *such that* $\tilde{s}^X(\theta, \bar{s}, \bar{\chi}) = s^W(\theta)$.

Proof See Appendix.

The revelation principle implies that any normal form mechanism can be replaced by a mechanism of the following sort.

Definition 3 ***(Revelation mechanism)*** *A revelation mechanism asks both political parties for announcements* $\hat{\theta}_X$ *and* $\hat{\theta}_Y$ *and enforces a maximum spending level*

$$s^{\max}\left(\hat{\theta}_X, \hat{\theta}_Y\right) = \begin{cases} f\left(\hat{\theta}_X\right) & \text{if } \hat{\theta}_X = \hat{\theta}_Y \\ \bar{s} & \text{otherwise} \end{cases}. \tag{14}$$

where $\bar{s} \in \{\check{s}, 1/2\}$ *is a default spending level. The party that wins the majority in period 1(2) decides on the spending mix in period 1(2).*

The default period 1 spending $\bar{s}$ would have to be specified in the constitution, e.g. through a requirement to always balance the budget. The following lemma describes the best possible outcome that can be achieved by such a mechanism for any given default spending level $\bar{s}$.

Lemma 3 *The following social choice of the spending level is truthfully implementable through a Bayesian Nash equilibrium:*

$$g(\theta, \bar{s}) := \begin{cases} s^X(\theta) & \text{if } s^X(\theta) \leq \bar{s} \\ \bar{s} & \text{if } \tilde{s}^Y(\theta, \bar{s}, \chi^*) < \bar{s} < s^X(\theta) \\ \min\left\{s^W(\theta), \tilde{s}^Y(\theta, \bar{s}, \chi^*)\right\} & \text{if } \tilde{s}^Y(\theta, \bar{s}, \chi^*) \geq \bar{s} \end{cases}. \tag{15}$$

Proof See Appendix.

Figure 2 shows how the spending functions $g(\theta, \bar{s})$ approximates the welfare maximizing function $s^W(\theta)$. Note that by assumption the minimum spending constraints are not binding for any $\theta \in [a, b]$. The grey curve characterizes the equilibrium outcome if $\theta \in [a, b]$. Different default spending levels $\bar{s}$ lead to the implementation of different approximations of this function. From Figure 2 it is obvious that, for any given default spending level $\bar{s}$, the spending function $g(\theta, \bar{s})$ weakly socially dominates the spending function implemented by a strict rule with the spending level $\bar{s}$. The reason is that the implemented spending level always lies weakly closer to the welfare maximal one. Hence, if the support of $\phi(\theta)$ is large enough, any given strict rule is strictly dominated by a revelation mechanism. From Figure 2 it is also obvious that there always is a spending level $\bar{s}$ such that the laissez faire constitution is dominated by a revelation mechanism. To verify this, consider the case where $\bar{s} = s^W(b)$. In this case the state dependent spending level with a revelation mechanism is identical to the laissez faire one if $s^X(\theta) \leq \bar{s}$, and it equals $\bar{s}$ otherwise. This yields higher welfare than the laissez faire solution. Further welfare improvements can be realized if one marginally reduces $\bar{s}$ because welfare is marginally increased for all realizations of θ in $\left[s^{X^{-1}}(\bar{s}), b\right)$. These results are summarized in the following proposition.

Proposition 1 *(i) For any given default spending level, the socially optimal spending function $g(\theta, \bar{s})$ that can be implemented with a revelation mechanism socially dominates the spending functions implemented by a strict rule with the spending level $\bar{s}$. (ii) There always is a spending level $\bar{s}$ such that the laissez faire constitution is dominated by a revelation mechanism.*

Obviously, the above type of mechanism has many other equilibria because both parties can coordinate on other social choice functions $f(\theta)$ when they make their announcements.

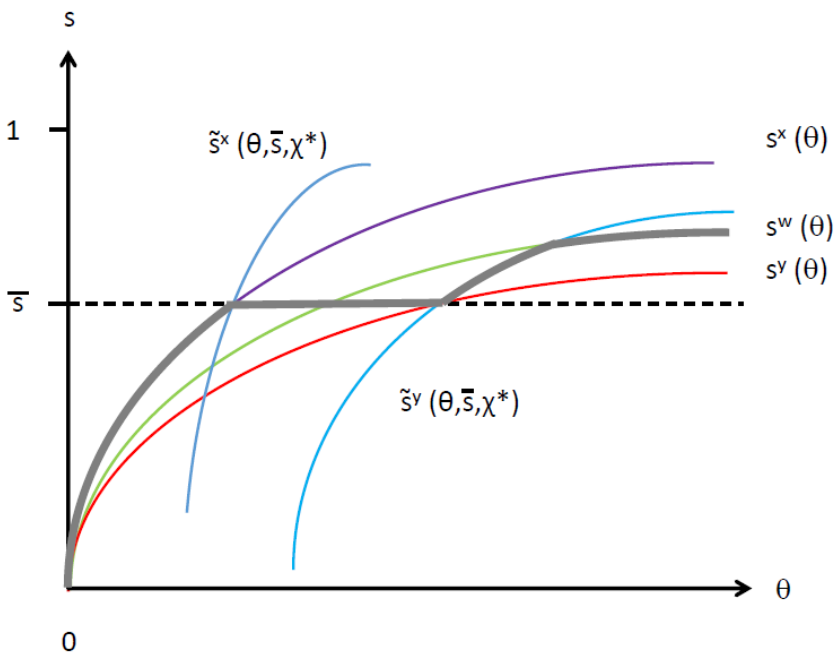

Figure 2: The implemented spending level $g(\theta, \bar{s})$ under a revelation mechanism. The relevant range for θ is given by its support $[a, b]$.

In the tradition of the mechanism design literature I assume that the planner - in this case the constitutional assembly - can select its preferred social choice function. The function $g(\theta, \bar{s})$ is optimal for any given $\bar{s}$.

Generally, the constrained optimal choice of $\bar{s}$ is not trivial. It depends on predetermined spending $\check{s}$ and on the the underlying distribution of types $\phi(\theta)$. To see why it is not always optimal to pick the lowest feasible value $\check{s}$ for $\bar{s}$, it suffices to consider the limit case of a binary distribution on $\{\theta', \theta''\}$. When $\{\theta', \theta''\}$ is such that $\tilde{s}^Y\left(\theta'', s^{W^{-1}}(\theta'), \bar{\chi}\right) \geq s^W(\theta'')$, a revelation mechanisms that fixes $\bar{s} = s^W(\theta')$ can implement the first best. Consider instead the case where predetermined spending $\check{s}$ is only slightly smaller than $s^W(\theta'')$. Picking an $\bar{s}$ slightly below $s^W(\theta')$ implies that the social choice in case of the low realization of θ does not maximize social welfare because party Y prefers the disagreement result to the welfare maximal value of s.

3.3 A simple three-stage mechanism

Under a direct revelation mechanism both parties have to simultaneously and independently announce a θ value or, equivalently, the corresponding spending level. It may be difficult to organize such a procedure in practice because members and leaders of politi-

cal parties tend to communicate a lot outside any structured mechanism. It is therefore worthwhile to analyze alternative mechanisms that produce similar results. The following supermajority mechanism approximates the results from the previous revelation mechanisms. Moreover, it solves the equilibrium multiplicity problem of the Normal form revelation mechanism.

Definition 4 ***(Supermajority mechanism)*** *In period* 1*, after observing* θ*, the government proposes a spending level* s*, where* s *may not exceed* $s^W\left(\bar{\theta}\right)$*. The opposition can accept or reject this proposal. If the proposal is rejected, the government can not spend more than a default spending level* $\bar{s} \geq \check{s}$*. If the proposal is accepted then the government may raise debt accordingly. The government chooses the spending mix.*

This supermajority mechanism implements the same social choice function as revelation mechanism 1 if θ can not become too large.

Lemma 4 *The following social choice of the spending level in period* 1 *is implementable as a subgame perfect Nash equilibrium of the supermajority mechanism with default spending level* $\bar{s}$*.*

$$h\left(\theta,\bar{s}\right) := \begin{cases} \min\left\{\bar{s}, s^X\left(\theta\right)\right\} & \tilde{s}^Y\left(\theta,\bar{s},\chi^*\right) \leq \bar{s} \\ \max\left\{\bar{s}, \tilde{s}^Y\left(\theta,\bar{s},\chi^*\right)\right\}. & \textit{otherwise} \end{cases}. \tag{16}$$

Proof See Appendix.

The outcome of the supermajority mechanism is weakly monotonous in the realization of the information parameter θ. The supermajority mechanism delivers a result which, for low enough θ values, replicates the social choice depicted in Figure 2. For higher values the outcome differs (see Figure 3). Hence, the outcome of this sequential mechanism yields a lower expected social welfare than the one of the simultaneous move game if the support of the distribution of θ is large enough. Obviously, social welfare under the supermajority mechanism exceeds welfare under a strict budget rule because, for all θ, the implemented social choice is preferred to $\bar{s}$ by both types of voters. From Figure 3 it is also obvious that there always is a spending level $\bar{s}$ such that the laissez faire constitution is dominated by a revelation mechanism. This can be achieved if one fixes $\bar{s} = s^W\left(b\right)$. The same argument as in the case of the revelation mechanism can be used to show that further welfare improvements can be realized if one marginally reduces $\bar{s}$. To summarize:

Proposition 2 *(i) For any given default spending level, the spending function* $h\left(\theta,\bar{s}\right)$ *that can be implemented with a supermajority mechanism socially dominates the spending functions implemented by a strict rule with the spending level* $\bar{s}$*. (ii) There always is a*

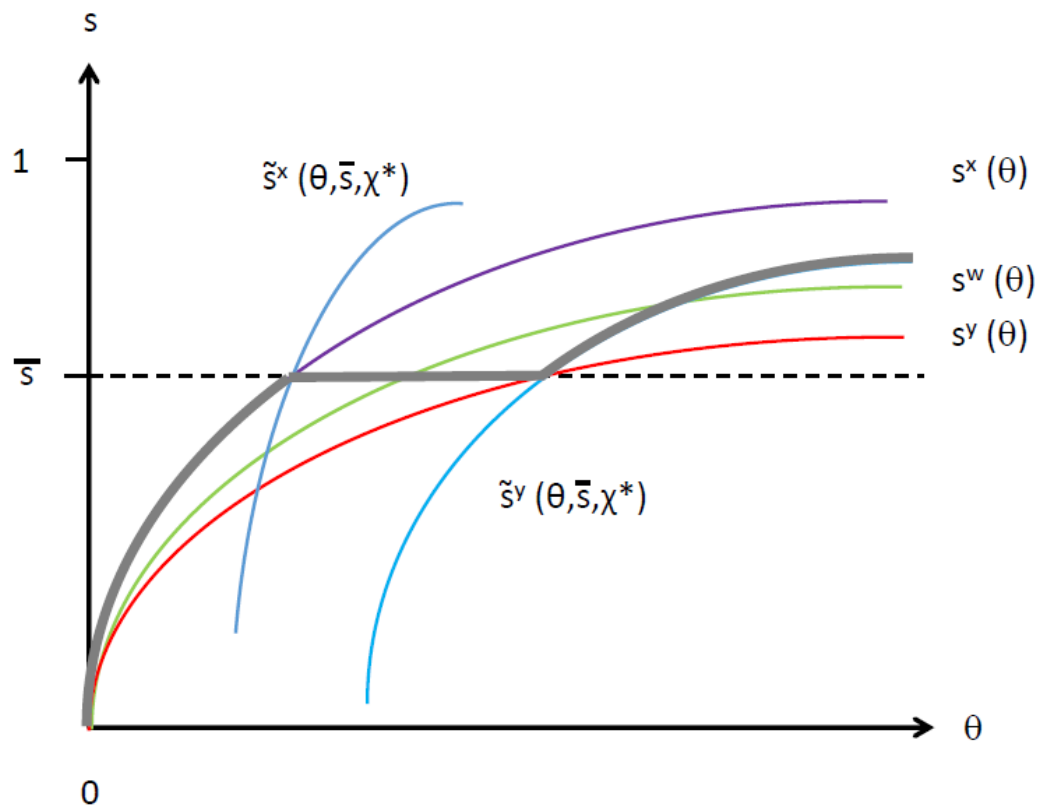

Figure 3: The implemented spending level $h(\theta, \bar{s})$ under a supermajority mechanism.

spending level $\bar{s}$ such that the laissez faire constitution is dominated by a supermajority mechanism.

4 Bargaining about spending level and spending mix

4.1 Welfare enhancing bargaining

The supermajority mechanism that we have studied so far enables the opposition party to veto any "non-standard" deficit requested by the government. This makes the opposition more powerful than it would be in a purely majoritarian system. In practice one would expect that the opposition party makes use of its veto power. It may so be able to jointly negotiate the period 1 spending level and spending mix with party X. I now assume that the spending mix can be the issue of such a negotiation among the two political parties and that the outcome of this bargaining process is given by the Nash bargaining solution. In line with the intertemporal non-contractability of public spending, I assume that bargaining only concerns period 1 spending and debt. The first order conditions for

the Nash bargaining solution can be found in the appendix of the paper.

I begin the analysis considering a given commonly known realization of the productivity parameter θ. The following two lemmata establish useful invariance and monotonicity properties of the bargaining outcome.

Lemma 5 *(i) The laissez-faire policy outcome is independent of the size of the group of swing voters. (ii) The bargaining outcome is independent of the size of the group of swing voters.*

Proof (i) Under a laissez faire constitution, party X selects its preferred spending mix in the first period. In the second period the majority picks its preferred spending mix. The spending level of the first period is determined by party X not taking into account that swing voters and y-voters prefer a lower spending level. (ii) Bargaining takes place between party X and party Y. The size of the group of swing voters is irrelevant for both groups' payoffs. This is why the Nash bargaining solution (see the appendix for details) is independent of the size of the group of swing voters. *Q.E.D.*

Lemma 6 *(i) Social welfare under a laissez-faire constitution is linear and strictly increasing in the size of the group of swing voters. (ii) Social welfare under a supermajority rule with bargaining is linear in the size of the group of swing voters.*

Proof (i) We know from lemma 5 that the laissez-faire outcome is independent of the size of the group of swing voters. Social welfare is a weighted average of the three groups' utilities. It is given by $2\left((1+\varepsilon)\,\bar{u}+(1-\varepsilon)\,\underline{u}\right)$. This establishes linearity in ε. When the size of the group of swing voters increases, the unequal spending mix that obtains in both periods is optimal for a larger part of the population. (ii) Decisions do not depend on the size of the three groups. Social welfare is a weighted average of the three groups' utilities where the weights are ε, $1-2\varepsilon$, and ε. *Q.E.D.*

Based on the two previous results, we can now study the optimal choice among the supermajority mechanism with bargaining and a laissez faire constitution. When the group of swing voters is small, bargaining leads to a more equal mix of public goods which increases welfare. This may be different when the group of swing voters is large and when the current majority is rather stable. In this case, the distortion of the spending mix generated by bargaining may reduce social welfare.

Lemma 7 *(i) Let $\varepsilon^* \in (0,1)$. Consider any given productivity θ and any given probability $p \in [0,1]$. Either the welfare ranking of the supermajority mechanism with bargaining and the laissez faire constitution does not depend on ε, or there is a unique value $\varepsilon^* \in (0,1)$*

below (above) which a supermajority rule with bargaining yields a strictly higher (lower) welfare level than a laissez faire constitution. (ii) For any given default spending level $\bar{s} < 1$*, there are values* θ *and* $p \in [0,1]$ *for which such a unique cutoff value* $\varepsilon^* \in (0,1)$ *exists.*

Proof Part (i) follows directly from lemma 2.

(ii) Consider the case where $p = 0$. Under a laissez faire constitution, the spending level chosen by party X in period 1 is the welfare maximizing one. In both periods, the spending share of good x is χ^*. I will now show that, when $\varepsilon = 0$ and when θ is large enough, a supermajority rule with bargaining yields a higher welfare level than a laissez faire constitution. Let u^P $\left(u_0^P\right)$ be the (disagreement) utility of the constituency of party P. Moreover, define $U^P := \lim_{\theta\to\infty} \frac{u^P}{\theta}$, and $U_0^P := \lim_{\theta\to\infty} \frac{u_0^P}{\theta}$. It follows that $U_0^X = f(\bar{s})\,\bar{u}$ and $U_0^Y = f(\bar{s})\underline{u}$. The laissez faire constitution yields normalized utilities $\left(U^X, U^Y\right) = (f(1)\,\bar{u}, f(1)\,\underline{u})$ for parties X and Y. The bargaining outcome must be associated with a lower spending share of good X than χ^* because χ^* maximizes the utility of party X which yields an infinite slope of the utility possibility frontier at $\left(U^X, U^Y\right) = (f(1)\,\bar{u}, f(1)\,\underline{u})$. Hence, the bargaining outcome yields a higher social welfare than laissez faire.

When ε goes to 1, welfare under the laissez faire constitution and the maximum welfare converge because χ^* becomes the desired spending share of good X for all voters. Instead, the outcome under a supermajority rule with bargaining does not depend on ε and it does not maximize social welfare. Hence, when θ is large enough, a supermajority rule with bargaining yields a strictly higher (lower) welfare level than a laissez faire constitution for $\varepsilon = 0$ (1). This and the linearity results from lemma 2 yields the result. *Q.E.D.*

4.2 Constitutional choice

Based on the previous results, we can now turn to the analysis of the constitutional choice. I focus on the comparison of a laissez fare constitution and a supermajority rule with bargaining and I assume that at the constitutional stage not only the value of θ but also the probability of a change of the majority party p and the size of the group of swing voters ε is stochastic.[12] In a first step, the following lemma considers a given joint and independent distribution of p and θ, $\gamma(p,\theta)$. For any such distribution the choice of the constitution depends on the realization of the size of the group of swing voters.

[12] This does not rule out that, at the constitutional stage, there may be some information available about the stability of voters' political preferences.

Lemma 8 *Consider any given joint and independent distribution of p and θ, $\gamma(p,\theta)$. There is a cutoff value $\varepsilon^* \in [0,1]$ below (above) which a supermajority rule with bargaining yields a weakly higher (lower) welfare level than a laissez faire constitution.*

Proof We have already established that the difference of welfare under supermajority rule with bargaining and a laissez faire constitution is a linear function of ε which is non-negative for $\varepsilon = 0$. Call this function $D(\varepsilon, p, \theta) = \delta(p,\theta) \cdot \varepsilon + \alpha(p,\theta)$. The expected welfare difference of the two mechanisms is

$$\tilde{D}(\varepsilon) \quad : \quad = \frac{\int_0^1 \int_0^1 D(\varepsilon, p, \theta) \cdot \gamma(p,\theta) \cdot dp \cdot d\theta}{\int_0^1 \int_0^1 \gamma(p,\theta) \cdot dp \cdot d\theta} \tag{17}$$

$$= \frac{\int_0^1 \int_0^1 \delta(p,\theta) \cdot \gamma(p,\theta) \cdot dp \cdot d\theta}{\int_0^1 \int_0^1 \gamma(p,\theta) \cdot dp \cdot d\theta} \cdot \varepsilon + \frac{\int_0^1 \int_0^1 \alpha(p,\theta) \cdot \gamma(p,\theta) \cdot dp \cdot d\theta}{\int_0^1 \int_0^1 \gamma(p,\theta) \cdot dp \cdot d\theta}. \tag{18}$$

This function is linear in ε and non-negative for $\varepsilon = 0$. The proposition follows. *Q.E.D.*

To summarize, the option to negotiate the spending mix and the spending level may increase social welfare. However, when there are many swing voters, a small opposition party may be able to substantially change the political outcome which reduces social welfare compared to the laissez faire constitution. Therefore, for any given joint distribution of p and θ, one would need to know the size of the group of potential swing voters in order to choose one of the two mechanisms. Tailoring mechanisms in this sense would be difficult in practice because the political environment may change over time[13]. However, in the context of the present model, a properly chosen supermajority threshold can make sure that a large enough current majority does not need the approval of the current opposition. To see why, consider again the joint and independent distribution of ε, p and θ. From lemma 4 we know that there is a threshold $2\varepsilon^*$ for the size of the group of swing voters below (above) which a supermajority mechanism with bargaining is better than (not as good as) a laissez faire constitution. An automatic adjustment to a stochastic size of the group of swing voters can be achieved by a supermajority threshold that is required for a deficit of size $1 + \varepsilon^*$. If the current majority exceeds this threshold, then party X

[13] See Engelmann and Grüner (2013) for a discussion of the interim choice of mechanisms.

does not require the support of a supermajority for a deficit. Therefore the mechanism turns effectively into a laissez faire mechanism. To summarize:

Proposition 3 *Consider any joint and independent distribution of ε, p and θ. A supermajority mechanism with bargaining that uses an appropriate majority threshold lead to an optimal choice (conditional on the realization of ε) between a supermajority mechanism with bargaining and a laissez faire constitution.*

5 Robustness and extensions

So far, I have assumed that swing voters have no direct political representation, in the sense that there is no party that shares swing voters' interest in good x and in a moderate expenditure policy. On the one hand this may seem to be a reasonable assumption because voters with unstable preferences may find it more difficult to establish a party with a recognizable party identity. However, on the other hand, swing voters have a clear interest in a more moderate deficit than "full" supporters of the current majority and they have voting rights. In this section, I discuss how the policy outcome is affected if swing voters have more political influence than in the baseline model.

5.1 All x-voters are potential swing voters

A straightforward way to model a political representation of swing voters is to assume that all x-voters are potential swing voters. More specifically, assume that with probability p a fraction of the group of x-voters of size 2ε turns into y-voters. In case of such a preferences switch, the corresponding voters are drawn randomly from the set of x-voters. Hence, each individual x-voter's preferences shift with probability $2\varepsilon p/(1+\varepsilon)$. Moreover, x-voters know that if their own preference shifts, they become part of a new majority of y-voters. If some x-voters' preferences shift then x-voters whose preferences do not shift become a minority in period 2.

In this setting, party X represents the interest of a homogenous group of voters. It is easy to verify that when $p < 1$ and when $2\varepsilon < 1$, for all realizations of θ the deficit under a laissez faire constitution exceeds the one in a constrained welfare maximum.

It is also straightforward to verify that the supermajority mechanism performs similarly to the case in which swing voters can be distinguished from x-voters. What changes is that party X suggest a lower deficit than before because it now represents potential swing voters. This mechanism still outperforms a strict rule with the same benchmark spending level.

Concerning the negotiation of the spending level and the spending mix, one obtains a stronger result regarding the role of large preference shifts. When $2\varepsilon = 1$, x-voters know that their desired spending mix will always be implemented. This is why the probability p leaves the desired spending level of x-voters unaffected. They always pick the welfare maximizing spending level. Therefore, a laissez faire constitution always realizes the first best when $2\varepsilon = 1$. A supermajority mechanism with bargaining may still yields a higher social welfare than a laissez faire mechanism when ε is small.

5.2 Two parties with credible platforms

Another way of modelling a stronger political influence of swing voters is to assume that two competing parties can commit to political platforms. This makes parties compete for the swing voters and so it makes this group politically more influential.

Consider the case where two parties can commit to a spending level for period 1 but not to the spending mix. Assume that indifferent voters choose party X. Party X can only attract a majority if it makes swing voters strictly better off than party Y. Party X's best reply to a given spending level offered by party Y is to make swing voters indifferent or - if this yields a majority of votes - to pick its preferred deficit. Party Y can only attract a majority if it makes swing voters strictly better off than party X. If this makes party Y worse off than party X's offer, then party Y should pick a platform that makes it lose the election.

Party X has an advantage. If, in period 1, both parties propose the same spending level, swing voters and x-voters are both attracted by party X. Obviously, in equilibrium party Y cannot win the election. There are equilibria in which party Y loses the election. The constraint on these equilibria is that party X chooses a spending level so that party Y cannot make swing voters better off without making itself worse off. In some of these equilibria party X overspends relative to the welfare maximum. The deficit is undesired from the perspective of the swing voters whose desired deficit level maximizes social welfare. A supermajority mechanism can improve the outcome.[14]

[14] It is more complicated to study the case in which both spending level and spending mix are part of a policy platform. In this case the three goups of voters all have distinct ideal points (χ_1, s). In this case there often is no Nash equilibrium in political platforms.

5.3 Three parties

Consider next an electoral system with proportional representation in which swing voters are represented by a third political party. The preferred policy of this party is to choose the majority's desired spending mix but not to run a deficit when $\theta = 1$. The median voter in parliament along both policy dimensions would be a member of this party. Accordingly, such a system should display low deficits even if there is no supermajority mechanism in place.

5.4 The political economy of supermajority rules

Our analysis shows that there are situations in which the introduction of supermajority mechanisms increases welfare compared to a laissez faire situation or a strict fiscal rule. Such supermajority mechanisms (or rules that work similarly most of the time) exist in some countries but they are not widespread. In the present model, the acceptance of supermajority mechanism by the political actors depends on the institutional status quo. If the status quo constitution is a laissez faire one, an elected government opposes the introduction of a supermajority mechanism and the current opposition favors it. The outcome is generally suboptimal. However, there is no scope for a deal between both parties because - in the present setup with only two periods - the opposition has nothing to offer. This may be different when there are many periods because in this case, future election results are not perfectly known.

A reform is feasible if one considers a laissez faire constitution before the period 1 election result is known. In this case both political parties are in favor of a supermajority mechanism and the outcome of constitutional bargaining is constrained optimal.

It is well known that the participation in a mechanism depends can be facilitated by properly choosing the status (see e.g. Cramton, Gibbons, and Klemperer, 1987). The introduction of a supermajority mechanism may be facilitated if the status quo is a constitution with a strict rule and if θ is large. In this case, even if the election results of the first period are known, there may be scope for constitutional negotiations between both parties when the productivity of public spending is high.

6 Conclusion

This paper addresses the trade off between fiscal discipline and fiscal flexibility. It studies this trade-off in a setup with non-contractible and partly private information about voters'

desired spending mixes and their desired spending levels. The paper has two main findings. The first main finding is that, under certain conditions, a simple revelation mechanism yields a constrained welfare maximizing state dependent budget decision. The result of the revelation mechanism can be approximated by a simple supermajority mechanism. However, the supermajority mechanism sometimes gives the opposition a veto right that it may use to influence the spending mix. The second main finding concerns the conditions under which a supermajority mechanism outperforms a laissez faire constitution when bargaining cannot be ruled out. If the opposition is small in size, the introduction of a supermajority mechanism may actually lower expected social welfare. When the two political camps have similar size, supermajority mechanisms may instead perform very well. A properly chosen supermajority threshold can make sure that a large enough current majority does not need the approval of the current opposition.

The supermajority mechanism studied in this paper is an alternative to fiscal policy arrangements which are currently introduced in some of the countries of the Eurozone. Some of these new arrangements give the government the right to announce the existence of special economic circumstances. Exemption clauses are e.g. included in the new institutional arrangements in France and Italy. The results generated by such constitutional rules have often been rather disappointing in the past. Between 1969 and 2009, Article 115 of the German constitution ruled out that the federal government's annual fiscal deficit exceeds the annual amount of public investment. However, under exceptional economic circumstances the rule was not supposed to be binding and the government could unilaterally decide that an exception is acceptable. Moreover, the concept of investment in Article 115 has been quite vague. In 1989 the German constitutional court argued that the rule is useless because government debt continued to increase significantly while the rule was in place.

Several extensions of the present basic framework can be considered in further research. This paper studies a dynamic fiscal mechanism design problem with two periods and two public goods. It is important to understand how robust the present results are in a setup with more periods. When there are more periods, the size of the debt level might play a role as a state variable. The Eurozone states agreed to put more emphasis on the current debt level (the 1/20th rule). A particular focus of further research should be on how constraints on fiscal policy should be adjusted to the participating countries' debt levels. In a dynamic context one should also consider that predetermined government expenses as a state variable can be chosen strategically.

Another topic for further research is the role and the emergence of the party structure. It would be worthwhile to endogenize this structure in a setup where individual preferences

cannot be categorized into a finite number of groups. Such an analysis could also consider cases where there are more than two public goods. Moreover, the analysis could be extended for different preferences regarding the source and size of public revenues.

The present paper has focused on one prominent strategic deficit explanation for excessive deficits. It is worthwhile to also study the performance of different mechanisms if political polarization and indivisibilities lead to elevated deficits (see Alesina and Drazen, 1989, and Grüner, 2013). Moreover, in a model with multiple public goods and more voter diversity, one could attempt to further investigate the optimal size of the required majority for a deficit of a given size.[15] It would also be important to find out how exactly one should quantitatively adjust the size of the majority to the size of the deficit that has been requested.

The focus of this paper is on purely national solutions for the problem of strategic deficits. When part of the relevant information is internationally observable, one might consider a solution where international decision makers are also involved in the decision procedure. In this context, it would be desirable to further study the case in which excessive debt generates externalities across countries (see Kiel, 2004 for a first analysis). Such an extension should address the efficiency, individual rationality and renegotiation proofness of hybrid (national and international) mechanisms for the control of fiscal deficits.

[15] See Becker, Gersbach, and Grimm (2010) for an analysis of a flexible majority rule in the case where the government provides a single public good.

7 Appendix

7.1 Proof of lemma 1

(i) and (ii) Consider first the function $s^W(\theta)$. The optimality of s requires that $\theta = \frac{f'(1-s)}{f'(s)}$. Therefore the inverse of $s^W(\theta)$ satisfies $\frac{d\theta}{ds} = \frac{-f'(s)f''(1-s)-f'(1-s)f''(s)}{f'(s)^2} > 0$, and $\frac{d^2\theta^*}{ds^2} = \frac{(f'(s)f''(1-s)+f'(1-s)f''(s))2(f'(s))f''(s)}{f'(s)^4} > 0$ which establishes the strict monotonicity and strict concavity of $s^W(\theta)$. The same type of argument can be made for the other two functions. Part (iii) follows directly from the three FOCs

$$\begin{aligned}\theta &= \frac{f'(1-s)}{f'(s)} \cdot \frac{((1-p)\,\bar{u} + p\underline{u})}{\bar{u}},\\ \theta &= \frac{f'(1-s)}{f'(s)} \cdot \frac{(p\bar{u} + (1-p)\,\underline{u})}{\underline{u}},\end{aligned}$$

and

$$\theta = \frac{f'(1-s)}{f'(s)},$$

and from

$$\frac{(p\bar{u} + (1-p)\,\underline{u})}{\underline{u}} > 1 > \frac{((1-p)\,\bar{u} + p\underline{u})}{\bar{u}}.$$

7.2 Proof of lemma 2

(i) Rewrite (12) as

$$\theta = \frac{\left(f(1-\bar{s}) - f\left(1-\tilde{s}^Y\right)\right)}{\left(f\left(\tilde{s}^Y\right) - f(\bar{s})\right)} \frac{((1-p)\,\underline{u} + p\bar{u})}{\underline{u}}.$$

and take the derivative

$$\begin{aligned}\frac{d\theta}{d\tilde{s}^Y} &= \frac{\left(f\left(\tilde{s}^Y\right) - f(\bar{s})\right) f'\left(1-\tilde{s}^Y\right) - \left(f\left(1-\tilde{s}^Y\right) - f(1-\bar{s})\right) f'\left(\tilde{s}^Y\right)}{\left(f\left(\tilde{s}^Y\right) - f(\bar{s})\right)^2}\\ &\quad \cdot \frac{((1-p)\,\underline{u} + p\bar{u})}{\underline{u}}\end{aligned}$$

We have

$$\begin{aligned}\frac{d\theta}{d\tilde{s}^Y} &> 0 \Leftrightarrow\\ \left(f\left(\tilde{s}^Y\right) - f(\bar{s})\right) f'\left(1-\tilde{s}^Y\right) &> \left(f(1-\bar{s}) - f\left(1-\tilde{s}^Y\right)\right) f'\left(\tilde{s}^Y\right). \qquad (19)\end{aligned}$$

The concavity of $f(s)$ implies that for $\tilde{s}^Y > \bar{s}$ and $\tilde{s}^Y > 1/2$

$$
\begin{aligned}
f'\left(1-\tilde{s}^{Y}\right) &> \frac{f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{Y}\right)}{\left(1-\bar{s}\right)-\left(1-\tilde{s}^{Y}\right)} > \frac{f\left(\tilde{s}^{Y}\right)-f\left(\bar{s}\right)}{\tilde{s}^{Y}-\bar{s}} > f'\left(\tilde{s}^{Y}\right) \\
f'\left(1-\tilde{s}^{Y}\right) &> \frac{f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{Y}\right)}{\tilde{s}^{Y}-\bar{s}} > \frac{f\left(\tilde{s}^{Y}\right)-f\left(\bar{s}\right)}{\tilde{s}^{Y}-\bar{s}} > f'\left(\tilde{s}^{Y}\right) \\
&\Leftrightarrow f'\left(1-\tilde{s}^{Y}\right)\left(\tilde{s}^{Y}-\bar{s}\right) > f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{Y}\right) \\
&> f\left(\tilde{s}^{Y}\right)-f\left(\bar{s}\right) > f'\left(\tilde{s}^{Y}\right)\left(\tilde{s}^{Y}-\bar{s}\right).
\end{aligned}
$$

This in turn implies (19). For $\tilde{s}^{Y} > \bar{s}$ and $\tilde{s}^{Y} < 1/2$ the concavity of $f(s)$ implies that

$$
\begin{aligned}
\frac{f\left(\tilde{s}^{Y}\right)-f\left(\bar{s}\right)}{\tilde{s}^{Y}-\bar{s}} &> f'\left(\tilde{s}^{Y}\right) > f'\left(1-\tilde{s}^{Y}\right) > \frac{f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{Y}\right)}{\left(1-\bar{s}\right)-\left(1-\tilde{s}^{Y}\right)} \\
&\Leftrightarrow f\left(\tilde{s}^{Y}\right)-f\left(\bar{s}\right) > f'\left(\tilde{s}^{Y}\right)\left(\tilde{s}^{Y}-\bar{s}\right) \\
&> f'\left(1-\tilde{s}^{Y}\right)\left(\tilde{s}^{Y}-\bar{s}\right) > f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{Y}\right).
\end{aligned}
$$

This also implies (19).

(ii) Rewrite (13) as

$$
\theta = \frac{\left(f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{X}\right)\right)}{\left(f\left(\tilde{s}^{X}\right)-f\left(\bar{s}\right)\right)}\frac{\left(\left(1-p\right)\bar{u}+p\underline{u}\right)}{\bar{u}}
$$

The derivative $\frac{d\theta}{d\tilde{s}^{X}}$ is positive iff

$$
\left(f\left(\tilde{s}^{X}\right)-f\left(\bar{s}\right)\right)f'\left(1-\tilde{s}^{X}\right) < \left(f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{X}\right)\right)f'\left(\tilde{s}^{X}\right). \tag{20}
$$

The concavity of $f(s)$ implies that for $\tilde{s}^{X} < \bar{s}$ and $\tilde{s}^{X} < 1/2$

$$
\frac{f\left(\tilde{s}^{X}\right)-f\left(\bar{s}\right)}{\tilde{s}^{X}-\bar{s}} > f'\left(\tilde{s}^{X}\right) > f'\left(1-\tilde{s}^{X}\right) > \frac{f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{X}\right)}{\left(1-\bar{s}\right)-\left(1-\tilde{s}^{X}\right)}.
$$

This in turn implies (20). For $\tilde{s}^{X} < \bar{s}$ and $\tilde{s}^{X} > 1/2$ the concavity of $f(s)$ implies that

$$
f'\left(1-\tilde{s}^{X}\right) > \frac{f\left(1-\bar{s}\right)-f\left(1-\tilde{s}^{X}\right)}{\left(1-\bar{s}\right)-\left(1-\tilde{s}^{X}\right)} > \frac{f\left(\tilde{s}^{X}\right)-f\left(\bar{s}\right)}{\tilde{s}^{X}-\bar{s}} > f'\left(\tilde{s}^{X}\right).
$$

This also implies (20).

(iii) Consider given values $\bar{s}, \bar{\chi}$. I proceed by inverting the functions $s^{W}(\theta)$ and $\tilde{s}^{Y}(\theta, \bar{s}, \bar{\chi})$. The inverse of $s^{W}(\theta)$ is given by $\theta = f'(1-s^{W})/f'(s^{W})$ and the inverse of $\tilde{s}^{Y}(\theta, \bar{s}, \bar{\chi})$ by $\theta = \frac{(f(1-\bar{s})-f(1-s))}{(f(s)-f(\bar{s}))}\frac{((1-p)\underline{u}+p\bar{u})}{\underline{u}}$. For a given value $s = s^{W} = \tilde{s}^{Y}$, these inverse functions assume identical values if

$$
\frac{f'(1-s)}{f'(s)} = \frac{f\left(1-\bar{s}\right)-f\left(1-s\right)}{f\left(s\right)-f\left(\bar{s}\right)}\frac{\left(\left(1-p\right)\underline{u}+p\bar{u}\right)}{\underline{u}}
$$

The left hand side in strictly monotonously increasing, unbounded for $s \to 1$, and positive for $s = \bar{s} > 0$.

The RHS can be rewritten as

$$\begin{aligned} & \frac{f(1-\bar{s}) - f(1-s)}{s-\bar{s}} \frac{s-\bar{s}}{f(s)-f(\bar{s})} \frac{((1-p)\,\underline{u} + p\bar{u})}{\underline{u}} \\ = & \frac{f(1-\bar{s}) - f(1-s)}{1-\bar{s}-(1-s)} \frac{s-\bar{s}}{f(s)-f(\bar{s})} \frac{((1-p)\,\underline{u} + p\bar{u})}{\underline{u}} \end{aligned}$$

with limit

$$\frac{f'(1-\bar{s})}{f'(\bar{s})} \frac{((1-p)\,\underline{u} + p\bar{u})}{\underline{u}}$$

for $s \to \bar{s}$. Hence, at $s = \bar{s} \in (0, 1/2)$ the RHS exceeds the LHS. Moreover, since the RHS is bounded, there must exist at least one intersection point in $(\bar{s}, 1)$ where $s^W(\theta) = \tilde{s}^Y(\theta, \bar{s}, \bar{\chi})$.

(iv) Proceeding like in (iii) yields the result. *Q.E.D.*

7.3 Proof of lemma 3

Consider the following direct revelation mechanism asking for announcements $\hat{\theta}_X$ and $\hat{\theta}_Y$:

$$s\left(\hat{\theta}_X, \hat{\theta}_Y\right) = \begin{cases} \min\left\{s^W\left(\hat{\theta}_X\right), \tilde{s}^Y\left(\hat{\theta}_X, \bar{s}, \chi^*\right)\right\} & \text{if } \hat{\theta}_X = \hat{\theta}_Y \geq \tilde{s}^{Y^{-1}}(\bar{s}, \bar{s}, \chi^*) \\ \bar{s} & \textit{otherwise} \end{cases} . \quad (21)$$

Consider first the incentive compatibility constraint of the opposition and assume that the government announces θ thruthfully. It follows from definition 1 that the opposition is indifferent beween truthtelling and any false announcement. It follows from Definition 1 that the goverment optimally replies with truthtelling as well. Hence, we do have a Bayesian Nash equilibrium. *Q.E.D.*

7.4 Proof of lemma 4

It is optimal for party Y to accept everything that is at least as good as $\tilde{s}^Y(\theta, \bar{s}, \chi^*)$. *Q.E.D.*

7.5 The Nash bargaining solution

Consider a given realization of θ and a given value p. Define $\tilde{u}(p) := p\underline{u} + (1-p)\,\bar{u}$. Hence, $f(1-s)\,\tilde{u}(p)$ is the expected overall utility of x voters in the second period when

the transition probability is p and the first period spending level is s. Denote by u^P $\left(u_0^P\right)$ the (disagreement) utility of the constituency of party P. The Nash product is:

$$\begin{aligned} N(s,\chi_1) &= \left(u_X - u_0^X\right)\cdot\left(u_Y - u_0^Y\right) \\ &= \left(\theta f(s)\, u(\chi_1) + f(1-s)\,\tilde{u}(p) - u_0^X\right) \\ &\quad \cdot\left(\theta f(s)\, u(1-\chi_1) + f(1-s)\,\tilde{u}(1-p) - u_0^Y\right) \\ &= \theta^2 f(s)^2\, u(\chi_1)\cdot u(1-\chi_1) \\ &\quad +\theta f(s)\, f(1-s)\left(\tilde{u}(1-p)\, u(\chi_1) + \tilde{u}(p)\, u(1-\chi_1)\right) \\ &\quad +f(1-s)^2\left(\left(\tilde{u}(p)\right)\tilde{u}(1-p)\right) \\ &\quad -u_0^X\cdot\left(\theta f(s)\, u(1-\chi_1) + f(1-s)\,\tilde{u}(1-p) - u_0^Y\right) \\ &\quad -u_0^Y\cdot\left(\theta f(s)\, u(\chi_1) + f(1-s)\,\tilde{u}(p) - u_0^X\right). \end{aligned} \tag{22}$$

The first-order conditions are

$$\begin{aligned} N'_{\chi_1} &= \theta^2 f(s)^2\left(-u(\chi_1)\cdot u'(1-\chi_1) + u'(\chi_1)\cdot u(1-\chi_1)\right) \\ &\quad +\theta f(s)\, f(1-s)\left(\tilde{u}(1-p)\, u'(\chi_1) - \tilde{u}(p)\, u'(1-\chi_1)\right) \\ &\quad +u_0^X\cdot\theta f(s)\, u'(1-\chi_1) \\ &\quad -u_0^Y\cdot\theta f(s)\, u'(\chi_1) = 0. \end{aligned} \tag{23}$$

and

$$\begin{aligned} N'_s &= \theta^2 2 f(s)\, f'(s)\, u(\chi_1)\cdot u(1-\chi_1) \\ &\quad +\theta\left(-f(s)\, f'(1-s) + f'(s)\, f(1-s)\right)\left(\tilde{u}(1-p)\, u(\chi_1) + \tilde{u}(p)\, u(1-\chi_1)\right) \\ &\quad -2f(1-s)\, f'(1-s)\left(\left(\tilde{u}(p)\right)\tilde{u}(1-p)\right) \\ &\quad -u_0^X\cdot\left(\theta f'(s)\, u(1-\chi_1) - f'(1-s)\,\tilde{u}(1-p)\right) \\ &\quad -u_0^Y\cdot\left(\theta f'(s)\, u(\chi_1) - f'(1-s)\,\tilde{u}(p)\right) = 0. \end{aligned} \tag{24}$$

Both expressions do not include the size of the group of swing voters, ε (lemma 5 (ii)).

7.6 The welfare maximum

Consider first the welfare maximizing size of the first period budget and spending mix when the ruling party in period 2 determines the spending mix in that period. Welfare is given by

$$
\begin{aligned}
W(s,\chi_1) &= \left(\frac{1}{2}-\varepsilon\right)\left(u^X+u^Y\right)+2\varepsilon u^S \qquad (25)\\
&= \left(\frac{1}{2}-\varepsilon\right)\cdot \\
&\quad (\theta f(s)\,u(\chi_1)+f(1-s)\,\tilde{u}(p) \\
&\quad +\theta f(s)\,u(1-\chi_1)+f(1-s)\,\tilde{u}(1-p)) \\
&\quad +2\varepsilon\left(\theta f(s)\,u(\chi_1)+f(1-s)\,u(\chi_2)\right),
\end{aligned}
$$

where χ_2 denotes the second period spending share of good X. The first-order conditions are

$$
\begin{aligned}
W_s' &= \left(\frac{1}{2}-\varepsilon\right)\left(\theta f'(s)\left(u(\chi_1)+u(1-\chi_1)\right)-f'(1-s)\left(\tilde{u}(p)+\tilde{u}(1-p)\right)\right) \qquad (26)\\
&\quad +2\varepsilon\left(\theta f'(s)\,u(\chi_1)-f'(1-s)\,u(\chi_2)\right).
\end{aligned}
$$

and

$$
W_{\chi_1}=\left(\frac{1}{2}-\varepsilon\right)\left(\theta f(s)\,u'(\chi_1)-\theta f(s)\,u'(1-\chi_1)\right)+2\varepsilon\left(\theta f(s)\right)u'(\chi_1). \qquad (27)
$$

The optimal spending level is characterized by

$$
\frac{f'(s)}{f'(1-s)}=\frac{1}{\theta}\frac{\left(\frac{1}{2}-\varepsilon\right)\left(\tilde{u}(p)+\tilde{u}(1-p)\right)+2\varepsilon u(\chi)}{\left(\frac{1}{2}-\varepsilon\right)\left(u(\chi)+u(1-\chi)\right)+2\varepsilon u(\chi)}, \qquad (28)
$$

and the optimal spending mix by

$$
\frac{u'(\chi)}{u'(1-\chi)}=\frac{\frac{1}{2}-\varepsilon}{\frac{1}{2}+\varepsilon}. \qquad (29)
$$

Hence, for $\varepsilon=0$ the budget should be balanced (lemma 2).

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