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**The Trade-off between Monetary and Fiscal Solidity:  
International Lenders and Political Instability**

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# The Trade-off between Monetary and Fiscal Solidity: International Lenders and Political Instability

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May 2004

## Abstract

This paper analysis the intertemporal public finance decision under political instability. The government's choice between inflationary finance and foreign debt is constrained by an interest rate, which is affected both by market conditions and debt conditionality. The main result is that there is typically a trade-off between seigniorage taxation and foreign debt. There are two implications. First, monetary and fiscal solidity can typically not be achieved at the same time. Second, myopic behaviour produced by political instability leads to a reduction of seigniorage, not to an increase as argued, for instance, by Cukierman, Edwards and Tabellini (AER, 1992).

**JEL classification:** E63, F34, O23

**Keywords:** debt conditionality, myopic behaviour, political economy, seigniorage, government deficit, public finance.

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This paper extends previous work on political instability and is largely motivated by suggestions from my colleagues Frank Barry and Peter Neary.

All remaining errors are mine. – Comments most welcome.

# 1 Introduction

Public finance decisions in many developing and transition countries are often plagued by three political economy problems which reinforce one another. First, foreign and domestic bondholders may have lost confidence in any form of debt issue and are no longer willing to hold government debt. Second, loans on international credit markets are curtailed or expensive because of bad macroeconomic performance. In addition, international financial institutions like the International Monetary Fund (IMF) apply conditions to their credits (debt conditionality). Third, given that existing tax collection problems cannot be overcome in the short run, it is appealing for any government to use seigniorage for financing government expenses.

On top of these obstacles, public finance decisions are typically also affected by purely political considerations. In particular, political instability is known to produce myopic behaviour by the government in power. There are three literatures. In the first two, a government attempts to raise its chances for re-election by obtaining support through short term measures. This is the argument of the traditional political business cycle literature (e.g. Nordhaus, 1975) as well as the modern (*endogenous*) political instability literature where the instability originates in electoral uncertainty (e.g. Tabellini and Alesina, 1990).

In the third literature a government faces an exogenous chance of losing power. Examples range from the threat of a coup d'état or revolution to some other unforeseen event like a terrorist attack as in Spain in March 2004. Under such political instability, the incumbent government highly discounts the future in favour of short term gains (as, for instance, in Cukierman, Edwards and Tabellini, 1992).<sup>1</sup> More cynically, one could say that the government tries to secure the spoils at least for the foreseeable future. This third literature (of *exogenous* political instability) is particularly relevant for unstable and more or less

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<sup>1</sup> In Cukierman, Edwards and Tabellini (1992) the government prefers the immediate benefit from seigniorage to the longer term effects of structural change. In Devereux and Wen (1998) the result is more public spending at the expense of economic growth. Svensson's (1998) model produces a low level of property rights investment, which hampers private investment in the future.

authoritarian developing countries as well as for countries in transition.

The *exogenous* political instability literature typically incorporates an exogenous degree of polarisation (or social heterogeneity), i.e. it accounts for conflicting interests in society. There are two types of government as in the *endogenous* political instability literature, but here their objectives are basically identical. They only differ in that the two types of policymakers (symmetrically) provide different amounts of two public goods (or support two group interests to different degrees). In fact, the chance of another government with opposite objectives taking over in the next period is what produces the political instability and hence myopic behaviour.

This paper analysis the intertemporal public finance decision under exogenous political instability and exogenous polarisation. The government finance decision is constrained by the aforementioned absence of domestic debt and the inability to change tax base or tax rate. Public goods are financed by three sources of government revenue: a given proportional tax, seigniorage and foreign debt. The amount of available debt is determined by an interest rate, which is affected both by market conditions and debt conditionality. In this setup, the optimal choice of the government exhibits a trade-off between inflationary finance and foreign debt.

This paper is different to and improves the existing literature in several respects. First, it provides a more comprehensive view of alternative sources of government revenue. Cukierman, Edwards and Tabellini (1992) model seigniorage and taxation, Devereux and Wen (1998) capture domestic debt and taxation, and in Svensson's (1998) model, there is only taxation. In contrast, this paper captures three alternative sources of government revenue. In particular, the model in this paper includes foreign debt because foreign debt is a crucial source of revenue in developing and transition countries with inherent (exogenous) political instability. It can be shown that myopia produced by political instability results in the optimal government choice of more foreign debt, but less seigniorage, because there is a trade-off between seigniorage and foreign debt. This paper, therefore, contradicts Cukierman, Ed-

wards and Tabellini's (1992) finding that political instability leads to more seigniorage.

Furthermore, this paper complements two earlier papers by Bohn (2000 and 2002) which both incorporate foreign debt. In Bohn (2000), Cukierman, Edwards and Tabellini's (1992) finding of high levels of seigniorage under political instability is confirmed. International financial institutions give credits in response to previous period monetary solidity,<sup>2</sup> i.e. low levels of seigniorage. This is a form of ex ante debt conditionality. The government tries to comply in order to benefit from foreign debt in the future. However, increased myopia due to more political instability means more heavily discounted future benefits. Hence the government prefers high levels of seigniorage now while accepting less credits being made available by international financial institutions in the future. The situation is different in Bohn (2002). There, foreign credits depend on contemporaneous debt conditionality. Myopia produced by political instability reduces the perceived burden of debt repayment and the government wants to borrow as much as possible. This can be exploited by the government by reducing seigniorage. Therefore, the findings in Bohn (2002) contradict those in Bohn (2000) and Cukierman, Edwards and Tabellini (1992).

In (Bohn, 2002), debt is modelled to be quantity-constrained to capture debt conditionality. The country in question is supposed to have lost its credit-worthiness with commercial lenders. In that context, it makes sense to assume a fixed interest rate, at which, say, the IMF, lends a certain amount of funds depending on some performance criteria. In this paper, a broader view is taken. We assume that the country in question has full access to international credit markets. There is no debt ceiling; instead, debt is price-constrained: the more the country wants to borrow, the higher the interest rate. In addition, international financial institutions still exert some influence. If they withdraw (part of) their credits because the country fails to fulfill certain debt conditionality criteria, the interest rate rises, but the country is still able to borrow from commercial lenders.

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<sup>2</sup> The expressions "monetary solidity" and "fiscal solidity" are used instead of "monetary and fiscal stability" to avoid confusion with the term "political stability".

In this paper, the main result is that the findings in Bohn (2002) are confirmed in a more general setting. There is typically a trade-off between seigniorage taxation and foreign debt. Monetary and fiscal solidity can typically not be achieved at the same time. Myopic behaviour produced by political instability leads to a reduction of seigniorage, not to an increase as argued, for instance, by Cukierman, Edwards and Tabellini (1992).

The remainder of the paper is organised as follows. Sections 2 to 5 present the intertemporal framework of the theoretical model. Sections 6 to 9 summarize and simplify the government maximization problem. Sections 10 to 12 discuss the impact of political instability and debt conditionality. Section 13 concludes.

## 2 Model: Government Preferences and Political Instability

The model captures the intertemporal decision problem of the government, in particular the optimal choice between revenue from debt and inflation tax. It consists of two periods: period 1 (current period) and period 2 (final period). There are two sectors in the economy: (i) the government and (ii) the private sector. The model is specified in real terms.

Government preferences over periods 1 and 2 are given by the following total utility (or welfare) function:

$$W = V_1(C_1) + H_1(G_1, F_1) + E\{\rho(V_2(C_2) + H_2(G_2, F_2))\}. \quad (1)$$

The  $V(\bullet)$  functions are concave and twice continuously differentiable utility functions of the government in private sector consumption  $C$  (henceforth private consumption utility). The  $H(\bullet)$  functions are utility functions in the government provision of public goods  $G$  and  $F$  (henceforth public goods utility).  $E$  is the expectation operator and  $\rho < 1$  is the government discount factor. Total government utility is additively separable in two senses: first, with respect to periods; and second, with respect to utility derived either from private consumption or from public goods provision.

Assuming two types of governments (i.e. policymakers) political instability comprises two features: (i) the probability of government change and (ii) political polarization. After the first period the incumbent government may loose office to the other set of policymakers with a fixed probability  $\pi$ ; it stays in power with probability  $(1 - \pi)$ .<sup>3</sup> It is assumed that there are two ethnic or social groups. Each one benefits more from one of the two public goods. Each of the two types of government provides both types of public goods, but to differing degrees. Political polarization then depends on the differences of policymakers' preferences with respect to their public good provision. The public goods utility function  $H$  is specified for one type of government (for the other type,  $\alpha$  must be replaced by  $(1 - \alpha)$ ):

$$H(G, F) = \frac{1}{\alpha(1 - \alpha)} \min\{\alpha G, (1 - \alpha)F\}. \quad (2)$$

For simplicity, their disagreement in public goods provision is parameterized symmetrically by  $\alpha$  which is exogenous. The denominator in equation (2) is a normalization such that

$$H(G, F) = F + G =: X, \quad (3)$$

where  $X$  is the total public goods provision and the marginal public goods utility  $H'(X)$  equals unity (cf. section 7 and appendix A). Without limiting the general validity of the analysis, it is assumed that  $1 \leq \alpha \leq \frac{1}{2}$ . When  $\alpha$  equals half, the two types of government have identical preferences; the more distant  $\alpha$  is from half, the more they disagree on how much to spend on each of the two public goods. If preferences of both policymaker types are very dissimilar, political polarization is large. Political polarization measured by  $\alpha$

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<sup>3</sup> In a multi-period setting, this random change of government at fixed intervals would be referred to as Markov switching (or Markov chain). If several time periods were considered and their lengths were fixed, for instance, at six months, some governments would only be in power for half a year, fewer would last for a year, and fewer yet for any longer period of time. This is a simple way of describing government change, but it matches the situation in many developing or transitional countries. In Russia, for instance, there were 5 changes of government in 1998 and 1999 despite the fact that no Duma or presidential elections were held. President Yeltsin alternately replaced representatives of the nomenclature (Chernomyrdin, Primakov, Putin) with so-called reformist Prime Ministers (Kirienko, Stepashin) in arbitrary and irregular intervals.



contributes to political instability because it accounts for the extend of preference changes given a change in government. For  $\alpha$  equals half, the instability effect of a government change is eliminated.

### 3 Model: Budget Constraints

The government budget constraints for both model periods (1 and 2) are:

$$G_1 + F_1 \leq \tau \bar{Y} + S_1 + D. \tag{4}$$

$$G_2 + F_2 + (1 + r)D \leq \tau \bar{Y} + S_2.$$

Real government expenditure consists of consumptive spending only (except for debt repayment in period 2).  $F_1$ ,  $G_1$ ,  $F_2$  and  $G_2$  are the amounts chosen by the government to spent on the two types of public goods in both periods. There are three sources of government revenue (right hand side). The focus is on the alternative choice of debt versus inflation taxation. Seigniorage is a government instrument both in period 1,  $S_1$ , as well as in period 2,  $S_2$ . At the same time, the government can choose to borrow on international credit markets in period 1, but has to repay its debt  $D$ , which is done in the final period (so that the model is closed). If the government discount factor  $\rho$  in equation (1) equalled the international discount factor,  $\frac{1}{1+r}$ , the government would always want to increase debt under political instability because there is a chance that another government would have to repay the debt. However,  $r$  is endogenous (as discussed further down) and the government is, therefore, price constrained in its choice of  $D$ . Following the parsimonious model notion, ordinary taxation is modelled at a rudimentary level only. It is calculated from exogenous tax rate  $\tau$  and exogenous tax base  $\bar{Y}$ .<sup>4</sup>

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<sup>4</sup> This implies two simplifying assumptions: (i) this is a no growth economy; and (ii) the tax rate cannot be changed. It also implies that taxes are non-distortionary.

The private sector budget constraints for both periods are simply:

$$C_1 \leq (1 - \tau)\bar{Y} - S_1 - \gamma(S_1). \quad (5)$$

$$C_2 \leq (1 - \tau)\bar{Y} - S_2 - \gamma(S_2).$$

Each period real private consumption depends on real income net of non-distortionary taxes minus inflation taxation and its deadweight loss  $\gamma$ . The function  $\gamma$  is assumed to be rising and convex in seigniorage ( $\gamma' > 0$ ,  $\gamma'' > 0$ ). Intuitively, this is a reasonable (though not compelling) assumption because the marginal increase in seigniorage at a higher level of seigniorage is typically associated with a more substantial rise in inflation compared to the rise of inflation at a lower level of seigniorage (Cagan, 1956).<sup>5</sup> For simplicity, it is assumed that  $\gamma$  is the same in both periods, but this has no bearing on the results.

The model could be interpreted in per capita terms, but the private sector is passive in the sense that it cannot take optimizing decisions on labor, savings or investment. Thus, there is no income growth and the two private sector budget constraints are not directly linked intertemporally. With regard to the private sector budget constraint the model is similar to the model in Cukierman, Edwards, and Tabellini (1992).

## 4 Model: Debt and Debt Conditionality

In a previous paper (Bohn, 2002), debt was modelled to be quantity-constrained. The idea was to investigate the effect of debt conditionality controlled by international financial insti-

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<sup>5</sup> Direct welfare costs include the shoe leather, the Olivera-Tanzi and redistribution effects. It suffices that the overall effect of inflation on welfare costs are linear, it may even be slightly concave. In developing and transition economies the effect of inflation on welfare costs is, however, more likely to be convex because high levels of inflation typically also erode the trust of the private sector in using the national currency for transactions. Thereby, the levels of barter trade and currency substitution in the economy are raised. Thus welfare losses are caused by seigniorage directly as well as through its effect on barter and currency substitution. Barter has been a problem in many developing and transition countries, in particular in Russia, and currency substitution was a wide-spread problem, for instance, in Eastern European as well as Latin American countries.

tutions like the IMF. The country in question is supposed to have lost its credit-worthiness with commercial lenders. In that context, it makes sense to assume a fixed interest rate, at which, say, the IMF, lends a certain amount of funds, which depends on some performance criteria (debt conditionality).

Here, a broader view is taken. We assume that the country in question has full access to international credit markets. There is no debt ceiling; instead, debt is price-constrained: the more the country wants to borrow, the higher the interest rate. In addition, international financial institutions still exert some influence. If they withdraw (part of) their credits because the country fails to fulfill certain debt conditionality criteria, the interest rate rises, but the country is still able to borrow from commercial lenders.

The willingness of international financial institutions like the IMF or the World Bank to lend depends on criteria referred to as debt conditionality. The aim is not only to avoid default and ensure repayment; instead debt conditionality is typically motivated by more general considerations such as economic and political stability or long run growth. In this paper, two performance criteria (Ray, 1998) as employed by the IMF (Guitián, 1995) are used: (i) deficit to GDP ratio (deficit reduction criterion); and (ii) money supply growth ( $\hat{M}$ , monetary solidity criterion). As GDP equals exogenous income here, the GDP ratio criterion (i) reduces to deficit (equal to debt  $D$  in this model). As for the monetary solidity criterion (ii) we derive the following relationship between  $S$  and  $\hat{M}$  from the quantity equation ( $M * V = Y * P$ ,  $V$  being velocity) together with the definition of real seigniorage ( $S \equiv \frac{\dot{M}}{P} = \frac{\dot{M}}{M} \frac{M}{P}$ ) and the exogeneity of  $Y$  in the first period:  $S = \hat{M} \frac{\bar{Y}}{V}$ . Instead of basing the criterion on the money supply growth rate, it can also be based on seigniorage  $S$  (while acknowledging that fluctuations in  $V$  can affect  $S$ ).

## 5 Model: Endogenous Interest Rate

While incorporating both commercial and institutional lenders, the interest rate equation remains fairly general:

$$r = \zeta(D, \phi(D, S_1, \delta, \sigma)) = \psi(D, S_1, \delta, \sigma). \quad (6)$$

The  $\zeta$  function distinguishes between the positive impact of an increase of the quantity of debt on the interest rate and the equally positive effect of debt conditionality function  $\phi$ , where  $\delta$  and  $\sigma$  represent IMF conditionalities with respect to deficit (which corresponds to debt  $D$  in this 2-period model) and inflation (which is measured by seigniorage in period 1,  $S_1$ ). Most of the following assumptions on equation (6) are straightforward:

- (i)  $\psi_k > 0$ , where  $k = D, S_1, \delta, \sigma$  (7)
- (ii)  $\psi_{DD} > 0$ ,
- (iii)  $\psi_{S_1 S_1} \geq 0$  or  $\frac{(1 - \gamma')^2 V'' - \gamma'' V'}{\rho \beta} \leq \psi_{S_1 S_1} < 0$ ,
- (iv)  $\psi_{D S_1} = \psi_{S_1 D} \geq 0$ ,
- (v)  $\psi_{D \delta} > 0$  and  $\psi_{S_1 \sigma} > 0$ ,
- (vi)  $\psi_{D \sigma} = 0$  and  $\psi_{S_1 \delta} = 0$ ,

Raising debt  $D$ , seigniorage  $S_1$  or debt conditionalities  $\gamma$  and  $\delta$  leads to an increase in the interest rate - as described by (i). Assumption (ii) reflects the dominant direct effect of  $D$  on the interest rate: at high levels of  $D$ , the interest rate explodes. Unsustainable levels of debt lead to prohibitive interest rates. Assumption (iii) refers to the second derivative with respect to  $S_1$ . It may be negative, but must be above some threshold (where  $\beta$  refers to political instability and polarisation as discussed in section 7) to ensure that our government

decision problem is a well-defined maximisation problem. One could have also made an argument for a direct effect of  $S_1$  in  $\zeta$  along the lines of assumption (ii). Assumption (iv) says that the cross-derivatives should, obviously, be non-negative. Assumptions (v) and (vi) reflect the idea of a conditionality, which means that the marginal effect of  $D(S_1)$  on the interest rate is increased by a rise in its respective conditionality factor  $\delta(\sigma)$ , but there are no cross-effects.

Even though the interest rate rises with reduced monetary ( $S_1 > 0$ ) and fiscal ( $D > 0$ ) solidity, strategic default or debt renegotiations are not envisaged. There are three reasons for not incorporating either of them in the model: (i), from conceptual point of view, the focus of the paper is on the choice between debt and seigniorage under political instability, not on the strategic game between the government and the international community (which is also interesting, but another paper); (ii), from a methodological point of view, it is difficult to capture both political instability and default in one and the same model (analytical results of a 2-period model would certainly not be possible); and (iii), empirically, default is much less relevant than commonly thought. According to International Development Association and International Monetary Fund (IDA and IMF, 2001) the incidence of recent debt rescheduling was only 12 percent in the group of some 60 countries which do not belong to the HIPC group (so-called heavily indebted poor countries).

## **6 Solution: Time-Inconsistency and Decomposition of the Government Maximization Problem**

The government maximization problem and its solution are not straightforward for two reasons: (i) there is a time-inconsistency problem; and (ii) there are too many instruments. The time-inconsistency problem arises because the uncertainty about which government is in power is resolved before the government decides about seigniorage  $S_2$  and public goods  $F_2, G_2$  in the second period. Hence the government would have to reoptimise, if this

were not taken into account. Therefore, the solution involves backward induction and the government optimisation in the first period is constrained by the optimal decision taken by any government in period 2. The maximisation problem for alternative policymakers is discussed in section 8.

Nonetheless, it is instructive to study first the maximisation problem in the first period as if there were no time-inconsistency problem: the government maximises total utility function (1) subject to constraints (4) and (5). The government has two types of instruments at its disposal: (i) its revenue choice between seigniorage and debt ( $S_1, S_2, D$ ); and (ii) its decision on public spending on each of the two public goods in both periods ( $F_1, G_1, F_2, G_2$ ). Increasing this period's revenue and spending it on public goods in period 1 raises contemporaneous public goods utility  $H$ . If the increase in revenue is due to an increase in period 1 seigniorage, government utility derived from private sector consumption is reduced at the same time. If it is paid for by more credits, the additional debt has to be repaid in period 2, which reduces funds available for public goods in period 2 and hence decreases utility derived from them.

The government decision problem is made tractable because of three assumptions: (i), government spending  $F$  and  $G$  is expenditure on public goods and does, therefore, not appear in the private sector budget constraints (5); (ii), government objective function (1) is additively separable; (iii), the functional format of the polarization assumption embedded in equation (2) guarantees  $H(G, F) = F + G$  (equation 3). Due to assumptions (i) and (ii) the government optimization problem can be decomposed into two problems: first, the optimal distribution of the total public goods spending between  $F$  and  $G$  (**distribution problem**); and second, the fundamental revenue and expenditure problem of the government (**fundamental problem**).

The (optimal) distribution problem for public goods spending is not really interesting and it is only required for being able to solve the fundamental revenue and expenditure problem of the government. Due to assumption (iii) the fundamental problem of the government

is independent of the actual government in power and the public sector budget constraints (4) can be inserted into total utility function (1) (see next section). Nonetheless, the fact that there are two potential governments does have crucial implications for any government decision on the total amount of public goods spending as well as on the source of revenue. In fact, the model is constructed that way to allow for the analysis of political instability as such (as, for instance, in Devereux and Wen, 1998, or Svensson, 1998) as opposed to analyzing the effect of different types of government with different objectives (as, for instance, in Aghion and Bolton, 1990, or Tabellini and Alesina, 1990).

We proceed as follows. In the next section (section 7), the solution for the optimal public goods distribution problem is used to simplify total government utility and, thereby, make the government maximization problem tractable. Then the second period maximisation problem is formally solved (section 8) to be able to discuss the fundamental problem of government revenue and expenditure (section 9). Finally, we analyse the effect of marginal changes of exogenous parameters on the optimal government choice on seigniorage and debt (perturbation results) in sections 10-12.

## 7 Solution: Simplifying Total Public Goods Utility

Assumption (iii), which refers to the functional format of public goods utility function  $H$ , has three specific implications. First, the optimal distribution of the total partial interest spending between  $F$  and  $G$  is crosswise symmetrical for both types, say  $i$  and  $k$ , of governments (when in power). Second, public goods utility  $H$  derived from type  $i$ 's choice of  $F$  and  $G$  (when in power) is equal to public goods utility derived from type  $k$ 's choice (when in power):

$$H^i(G^i, F^i) = G^i + F^i = X^i = X = X^k = G^k + F^k = H^k(G^k, F^k). \quad (8)$$

In either case, the marginal public goods utility is unity. Third, the (real) total value of public goods spending  $H$  is normalized - for each government - by the sum of its arguments ( $F + G$ ), when chosen optimally by any incumbent government. For  $i$  and  $k$  representing different governments and  $\alpha > \frac{1}{2}$  being assumed (without loss of generality), note, however, that government  $k$ 's optimal choice for  $F$  and  $G$  is, of course, suboptimal for government  $i$ :  $X^i = H^i(G^i, F^i) > H^i(G^k, F^k) = \frac{1-\alpha}{\alpha} X^i$ .

On this basis, the government's total utility function (1) can be simplified. For each period separately, utility derived from private consumption and from public goods spending is considered for the government in power in period 1 only. In the following, superscripts are only used for the other government (marked by  $k$ ). In period 1, this government's optimal choice for  $F$  and  $G$  results in  $H(G_1, F_1) = X_1$ . Thus first period public goods utility is

$$V(C_1) + H(G_1, F_1) = V(C_1) + X_1 \quad (9)$$

If this government is still in power in period 2 (with probability  $(1 - \pi)$ ), it will choose  $F$  and  $G$  such that  $H(G_2, F_2) = X_2$ . If, however, this government loses power in period 2 (with probability  $\pi$ ), it has to put up with the public goods spending chosen by the other government, i.e.  $H(G_2^k, F_2^k) = \frac{1-\alpha}{\alpha} X_2$ . Hence its second period total expected public goods utility is:

$$\begin{aligned} E \{ \rho ( V(C_2) + H(G_2, F_2) ) \} & \quad (10) \\ &= \rho \left( (1 - \pi) (V(C_2) + X_2) + \pi (V(C_2) + \frac{1 - \alpha}{\alpha} X_2) \right) \\ &= \rho ( V(C_2) + \beta(\alpha, \pi) X_2 ) \end{aligned}$$

Thus public goods utility in period 2 depends on three exogenous parameters: discount factor  $\rho$ , political polarization  $\alpha$  and the probability of losing power  $\pi$ . The latter two parameters are subsumed under quasi-exogenous parameter  $\beta$ , which is to represent political



instability:  $0 \leq \beta(\alpha, \pi) = (1 - \pi) + \pi \frac{1-\alpha}{\alpha} \leq 1$ . Note that political instability augments the effect of the discount factor: it lowers the valuation for the second period, i.e. it increases government myopia. Obviously,  $\beta = 1$  if both governments have identical preferences ( $\alpha = \frac{1}{2}$ ) or if the government stays in power with certainty ( $\pi = 0$ ). For  $\alpha = 1$  and  $\pi = 1$ ,  $\beta = 0$ . In other words,  $\beta$  decreases with more political diversity (polarization  $\alpha \uparrow$ ) and/or more political uncertainty (probability of government change  $\pi \uparrow$ ).

## 8 Solution: Second Period Maximisation

Due to the time-inconsistency problem the second period maximisation problem must be solved first in order to obtain the overall solution:

$$\begin{aligned} \max_{S_2, F_2, G_2} \quad & V(C_2) + H^j(F_2^j, G_2^j) & j = i, k & \quad (11) \\ \text{s.t.} \quad & G_2 + F_2 + (1 + r)D \leq \tau \bar{Y} + S_2 \\ & C_2 \leq (1 - \tau)\bar{Y} - S_2 - \gamma(S_2). \end{aligned}$$

As the uncertainty of who chooses  $F_2$  and  $G_2$  is resolved, the expectation operator on public sector utility  $H$  vanishes. From equation (8) we know that both governments choose different levels of  $F_2$  and  $G_2$ , but both governments' choices result in the same level of public goods utility. Hence constraint (i) can be substituted in irrespective of the government in power. With constraint (ii) also substituted in, we obtain the identical maximisation problem for either government and hence the identical optimal choice for  $S_2$  (which could be used to solve the distribution problem by deriving  $H(G_2, F_2) = F_2 + G_2$  and hence  $F_2$  and  $G_2$ ). The first order condition (FOC) for second period optimisation is:

$$(-1 - \gamma'(S_2)) V'(C_2) + 1 = 0, \quad (12)$$

which simply states for period 2 that the loss in marginal private consumption utility due to an increase in seigniorage must equal the gain in marginal public goods utility (which is unity according to equation (3)).

## 9 Solution: Fundamental Problem of the Government

The fundamental revenue and expenditure problem of the government can now be specified on the basis of government preferences as stated in (1) and equations (9) and (10). Government budget constraints (4) and private sector budget constraints (5) can be substituted into equations (9) and (10) for  $F_t + G_t =: X_t$  and  $C_t$ ,  $t = 1, 2$ , respectively. Considering the solution for the second period (which enters as a  $\lambda$  constraint), the fundamental maximisation problem is:

$$\begin{aligned} \max_{S_1, D, \lambda} \quad & V\left((1 - \tau)\bar{Y} - S_1 - \gamma(S_1)\right) + \rho V\left((1 - \tau)\bar{Y} - S_2 - \gamma(S_2)\right) \\ & + \left(\tau\bar{Y} + S_1 + D\right) + \rho \beta \left(\tau\bar{Y} + S_2 - (1 + \psi)D\right) \\ & + \lambda \left((-1 - \gamma'(S_2)) V'(C_2) + 1\right) \end{aligned} \quad (13)$$

We obtain three first order conditions, with respect to  $S_1$ ,  $D$  and  $\lambda$ . The latter corresponds to the aforementioned FOC derived from the maximisation in period 2 (equation 12). The other two are:

$$(-1 - \gamma'(S_1)) V'(C_1) + 1 - \rho\beta\psi_{S_1} = 0 \quad (14)$$

$$1 - (1 + \psi)\rho\beta - \rho\beta D\psi_D = 0$$

The first FOC requires that the marginal gain in public goods utility due to a marginal increase in first period seigniorage (which is unity due to assumption 2) equals the marginal

disutility of reduced first period private consumption plus the marginal disutility of discounted second period public consumption (which depends on the reaction of interest rate  $r$  on increased first period seigniorage,  $\psi_{S_1}$ ). The second FOC equates the marginal gain in public goods utility in period 1 due to a marginal increase in debt (which is unity) with its discounted disutility in period 2. The latter consists of two effects, a volume effect of increased  $D$  (which is  $(1 + \psi)\rho\beta$ ) and a price effect depending on the reaction of interest rate  $r$  on marginally increased debt  $D$ ,  $\psi_D$ . Note that the discount factor is  $\rho\beta$ , i.e. it includes the impact of political instability.

FOCs help to understand the mechanisms of the model and provide some prima facie understanding of effects, but they do not capture any feedback effects. The rest of the formal solution is technical and will only be sketched out here. Two more steps are required. First, FOCs are, of course, only the necessary conditions. The sufficient condition for a maximum is that the determinant of the Bordered Hessian of (13) must be positive. Finally, we want to characterize the impact of marginal changes of exogenous parameters on optimal values for government instruments. In the following, perturbation results are obtained for the four exogenous parameters of the model. The probability of government change  $\pi$  and political polarisation  $\alpha$  are subsumed by  $\beta$ , the political instability parameter, which was introduced in equation (10). Parameters  $\delta$  and  $\sigma$  indicate debt conditionality with respect to deficit and seigniorage, respectively. For all of these, perturbation results can be obtained, for instance, by deriving total differentials and using the Cramer Rule. There is no impact on second period seigniorage of any of the exogenous parameters, because second period optimisation is completely separate as derived in equation (12). For debt and first period seigniorage the results are as follows.

## 10 Result: Political Instability

First, we are interested in the effect of political instability  $\beta$  on the optimal government choice of debt and seigniorage in period 1. Remember that both the probability of government change  $\pi$  and political polarization  $\alpha$  are negatively related to  $\beta$ , which takes values between 0 (complete instability) and 1 (perfect stability). Applying total differentials leads to the following perturbation result, which holds at the equilibrium.

### Proposition 1 (Political Instability)

*The impact of increased political instability (lower  $\beta$ ) on debt and first period seigniorage depends on the specific functional format of the interest rate equation (as well as the functional format of private sector utility in period 1). For  $\psi_{S_1} > 0$ , but small, we obtain the following "normal reaction".<sup>6</sup>*

$$(i) \quad \frac{dD}{d\beta} < 0.$$

$$(ii) \quad \frac{dS_1}{d\beta} > 0$$

Increased political instability means that the second period is less valued. Debt is now a less costly source of revenue than seigniorage. Additional debt can be afforded because repayment in the second period is less likely, i.e. the second period is discounted more heavily. Given that there is more revenue now, it is optimal to reduce seigniorage in order to reduce the negative effect of seigniorage and its deadweight loss on private sector utility.

There are three effects on the second period government budget constraint, two price and a quantity effect. On the one hand, more debt in period 1 increases the interest rate and implies higher levels of debt repayment. On the other hand, less seigniorage has a partly offsetting effect through its dampening impact on the interest rate. Overall, the burden on

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<sup>6</sup> Confer appendix B for a sufficient condition and for the result, when  $S_1$  does not affect the interest rate (in violation of assumptions 7).

the second period government budget constraint is, however, increased. "Normal reaction" means that this is due to a rising level of debt.

This "normal reaction" is likely to occur, even if  $\psi_{S_1} > 0$  and large. However, an "abnormal reaction" cannot be excluded. Perturbation results based on general functional formats are too complex to give a clear analytical answer. Nonetheless, not much would be gained by producing an "abnormal reaction" in a simulation exercise. The logic is clear and is outlined in the following.

If the effect of  $S_1$  on the interest rate is large, it is optimal for the government to choose a low level of first period seigniorage irrespective of the existing degree of political instability. When political instability increases (lower  $\beta$ ), it is less costly for the government to strain the public budget in the second period. Under specific functional formats and parameter constellations, the optimal way of exploiting this may be to increase the interest rate by raising the level of seigniorage while reducing the level of debt. The latter has 2 effects. It reduces the debt repayment and has a dampening effect on the interest rate, thereby (partly) offsetting the increase caused by the higher level of seigniorage. First period public goods utility is increased, if the increase in seigniorage is larger than the reduction in debt. Then, under specific constellations, the welfare gain from increased first period public revenue may outweigh the loss caused by the increase in seigniorage. The loss includes: (i) the effect of higher seigniorage on the reduction of first period private sector utility; and (ii) the net effect of the first period public revenue composition on second period public goods utility (which comprises the aforementioned two price and one quantity effects on debt repayment). The "abnormal reaction" seems highly constructed, but is theoretically possible.

## 11 Discussion: Political Instability

The main result of this paper, the aforementioned "normal reaction" for the trade-off between debt and seigniorage was already obtained in a much more specific setting in Bohn

(2002). In that paper, debt is quantity constrained by international financial institutions, not price constrained as in this paper. The idea is that the country in question has voided all other sources of debt. Only institutions like the IMF determine the amount of debt they are willing to lend depending on debt conditionality based on fiscal and monetary criteria.

Both this paper and Bohn (2002) confirm the standard result of political instability producing myopic behaviour. However, they contradict the finding that the myopia results in more seigniorage. That result was obtained in Cukierman, Edwards and Tabellini (1992), where the government chooses to finance its budget with more inflationary finance while postponing structural reform. It was also obtained in Bohn (2000), where the government responds to debt conditionality based on monetary solidity by limiting inflationary finance this period in order to be eligible for higher levels of international credits next period.

In this paper as in Bohn (2002), there are debt conditionalities based on seigniorage as well as debt. These conditionalities are modelled as contemporaneous links. Both models reveal a trade-off between fiscal and monetary conditionality: myopia produced by political instability typically leads to less seigniorage and more debt.

## **12 Result and Discussion: Debt Conditionality**

Here, we are interested in the effect of debt conditionalities  $\sigma$  and  $\delta$  (based on seigniorage and deficit, respectively) on the optimal government choice of debt and seigniorage in period 1. For both conditionalities, we consider the case where an increase in  $\sigma$  or  $\delta$  translates into a higher interest rate charged for credits. However, the functional format remains general. Applying total differentials leads to the following perturbation result, which holds at the equilibrium.

**Proposition 2 (Debt Conditionalities)**

$$(i) \quad \frac{dS_1}{d\sigma} < 0.$$

$$(ii) \quad \frac{dS_1}{d\delta} > 0$$

$$(iii) \quad \frac{dD}{d\delta} < 0.$$

$$(iv) \quad \frac{dD}{d\sigma} > 0$$

The impact of increased debt conditionalites (higher  $\sigma$ , higher  $\delta$ ) on debt and first period seigniorage is as expected: conditionality on itself leads to a reduction, conditionality on the alternative source of revenue produces an increase. As in Bohn (2002) the trade-off effect of the two conditionalities is confirmed. The findings indicate, therefore, that it is difficult for international financial institutions to achieve both objectives, monetary and fiscal solidity, at the same time.

**13 Conclusion**

This paper introduces a parsimonious framework for studying the problem of optimal government finance under political instability. It is suited to analyse the case of developing and transition countries, where political instability is inherent to the political structure of the country rather than caused by electoral uncertainty as in Western democracies. A country's political situation is characterised by its uncertainty about government change and its political polarisation within society. Alternative means for financing government spending on public goods are considered: taxation, seigniorage, and foreign debt. The amount of available debt is determined by an interest rate, which is affected both by market conditions and debt conditionality (the latter being imposed by international financial institutions like the IMF).

Two main conclusions emerge from the analysis. First, political instability does lead to myopic government behaviour as argued in the literature. However, it is not optimal for the

government to increase revenue by expanding seigniorage. This result contradicts earlier findings by Cukierman, Edwards and Tabellini (1992) and Bohn (2000). Contrary to these previous models, here, debt and seigniorage are alternative sources of current period government revenue.<sup>7</sup> An increase in political instability leads to myopic behaviour, because there is a lower valuation of debt repayment obligations in the future. Hence the government typically desires a higher level of debt. Total government revenue is increased while optimality requires a reduction of seigniorage. The findings parallel those in Bohn (2002), even though the setting is much more general in this paper. Foreign debt is not only determined by debt conditionality as in Bohn (2002), but also influenced by international credit markets.

The second conclusion deals with effects of debt conditionality. Conditionalities based on monetary and fiscal solidity both reveal an important trade-off which arises from the fact that seigniorage and debt are alternative sources of current period government revenue. Conditionality on itself leads to a reduction, conditionality on the alternative source of revenue produces an increase. As in Bohn (2002) the trade-off effect of the two conditionalities is confirmed. These results cast doubt on the ferocity with which the IMF used to require debtor countries to achieve monetary and fiscal solidity at the same time. But our findings take us one step further: we can draw policy recommendations. According to the model, the trade-off between deficit reduction and monetary consolidation can be avoided, if debt conditionality alternatively refers to deficit or to seigniorage, but not to both. Which one to focus on depends on a judgement of the relative desirability of monetary versus fiscal solidity objectives.

Future work on public finance under political instability and debt conditionality could go in various direction. The first one refers to work in progress. We are going to test empirically the effects of debt conditionality and political instability studied in previous theoretical papers. Preliminary work indicates that this is going to be a difficult task. While there

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<sup>7</sup> In Cukierman, Edwards and Tabellini (1992), foreign debt is ignored. Bohn (2000) only captures future foreign debt in response to the seigniorage decision in the current period.



is data on political instability, data capturing the link between interest rates and debt conditionality applied to individual countries is not readily available. Such empirical work might, however, help shed more light on the effectiveness of (previous) IMF policies.

As for theoretical work, a natural complement to this short run model is a long run perspective including, nonetheless, political instability. This could be done in an infinite horizon framework or, possibly, in a three-period model. Not only would additional time periods contribute to a more complex model structure, but a number of additional issues would have to be addressed, for instance: (i) how to include growth in the model and study its impact on political instability; (ii) how to incorporate a government tax instrument; and (iii) how to include debt repayment in such a long run model. In a more extended framework that includes some of the above issues it might be conjectured that a certain initial level of political stability is required as a precondition for getting on a path of recovery. We might, for instance, get a multiple equilibria story for optimal government behaviour under political instability similar to the one obtained by, for instance, Ehrlich and Lui (1999) for optimal rent-seeking behaviour.

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# Appendix

## A Optimal Public Goods Spending

The following exposition draws on Cukierman, Edwards, and Tabellini (1992). The same approach is also used in Svensson (1998). For convenience, polarisation assumption (2) which is embedded in the government utility function  $H$  for public goods spending is restated for the type  $i$  government:

$$H^i(G^i, F^i) = \frac{1}{\alpha(1-\alpha)} \min\{\alpha G^i, (1-\alpha)F^i\}. \quad (\text{A.1})$$

Since (A-1) contains a minimum function, optimality can only be achieved for

$$(1-\alpha)F^i = \alpha G^i. \quad (\text{A.2})$$

As the utility function  $H$  for the type  $k$  government is symmetrical according to its definition in section 2, so is the optimal distribution between  $F^k$  and  $G^k$ :  $(1-\alpha)G^k = \alpha F^k$ .

Government  $i$ 's optimal total public goods spending  $X^i$  can be written as

$$X^i := F^i + G^i = \frac{G^i}{1-\alpha} = \frac{F^i}{\alpha}. \quad (\text{A.3})$$

By reinserting into utility function (A-1) the optimal values for  $F$  and  $G$  in terms of  $X$  ( $G^i = (1-\alpha)X^i$ ,  $F^i = \alpha X^i$ ) a simple result for total public goods utility  $H$  is obtained:

$$\begin{aligned} H^i(G^i, F^i) &= \frac{1}{\alpha(1-\alpha)} \min\{\alpha(1-\alpha)X^i, (1-\alpha)\alpha X^i\} \\ &= X^i = F^i + G^i. \end{aligned} \quad (\text{A.4})$$

We can now see that the denominator in equation (A-1) was chosen as a normalisation such that the marginal public goods utility is unity. Furthermore, given that utility function (A-1) is symmetrical for both types of government, the optimal values for  $F$  and  $G$  are crosswise identical ( $F^i = G^k$  and  $G^i = F^k$ ) and

$$H^i(G^i, F^i) = X^i = X = X^k = H^k(G^k, F^k). \quad (\text{A.5})$$

## B Sufficient Condition for Proposition 1

Sufficient conditions for the "normal reaction" stated in proposition 1 are as follows:

For  $\frac{dS_1}{d\beta} > 0$ , it suffices that

$$\psi(D\psi_D + D^2\psi_{DD} - 1 - \psi) < D\psi_{DS_1}(1 + \psi + D\psi_D) \quad (\text{B.1})$$

Given that the right hand side is positive, a more restrictive sufficient condition is that either term on the left hand side is smaller or equal to 0.  $\psi_{S_1} = 0$  is sufficient, but would violate assumption 7 (i). Alternatively, the following is sufficient:

$$D\psi_D + D^2\psi_{DD} - 1 - \psi < 0. \quad (\text{B.2})$$

For  $\frac{dD}{d\beta} < 0$ , it suffices that

$$\begin{aligned} & -\rho\beta (\psi_{S_1} + D\psi_{S_1D}) D\psi_{S_1} \\ & > \left[ (-\gamma''V' + (1 - \gamma')^2V'') - \rho\beta D\psi_{S_1S_1} \right] [1 + \psi + D\psi_D] \end{aligned} \quad (\text{B.3})$$

The term in the second square brackets on the right hand side is positive, whereas the one in the first square brackets is negative for  $\psi_{S_1S_1} \geq 0$ . (The latter term is still likely to be negative, even if  $\psi_{S_1S_1}$  turns negative as long as it remains within the limits prescribed by assumption 7 (iii)). Hence the condition is certainly fulfilled for  $\psi_{S_1} = 0$  and for  $\psi_{S_1} > 0$ , but small. It may even be fulfilled for larger values of  $\psi_{S_1}$ .