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# A Positive Theory of Fiscal Deficits and Government Debt

ALBERTO ALESINA
*Harvard University, NBER and CEPR*

and

GUIDO TABELLINI
*University of California, Los Angeles, NBER and CEPR*

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This paper considers an economy in which policymakers with different preferences alternate in office as a result of elections. Government debt is used strategically by each policymaker to influence the choices of his successors. If different policymakers disagree about the desired composition of government spending between two public goods, the economy exhibits a deficits bias; that is, debt accumulation is higher than it would be with a social planner. The equilibrium level of debt is larger the larger is the degree of polarization between alternating governments and the less likely it is that the current government will be re-elected.

## 1. INTRODUCTION

Budget deficits and debt accumulation can serve two purposes: they provide a means of redistributing income over time and across generations; and they serve as a means of minimizing the deadweight losses of taxation associated with the provision of public goods and services. This paper focuses on the latter issue. Thus, as in Barro (1979) and Lucas-Stokey (1983), public debt is modelled as a means of distributing tax distortions over time.

Barro (1985, 1986, 1987) has shown that this normative theory of fiscal policy can explain quite well the behaviour of public debt in the United States (at least up to the late seventies) and in the United Kingdom. However, this theory may not provide a complete explanation of two recent facts: (a) the recent rapid accumulation of government debt in several industrialized countries, including the United States, during peacetime; (b) the large variation in the debt policies pursued by different countries with similar economic conditions.

This paper suggests a positive theory of government debt policy which should provide useful insights in explaining these facts. The paper abandons the assumption that fiscal policy is set by a benevolent social planner who maximizes the welfare of a representative consumer. Instead, we consider an economy with two policymakers with different objectives alternating in office as a result of elections.

A large literature on the political economy of budget deficits already exists, much of it by James Buchanan and his associates. Most of this literature, however, is based upon the somewhat questionable notions of "fiscal illusion" and voters' irrationality.[1] In

1. Variants of this explanation of why governments run fiscal deficits can be found, for instance, in Buchanan-Wagner (1977) and Brennan-Buchanan (1980). Cukierman-Meltzer (1989) provide a rational politico-economic model of public debt. In their model, unlike in ours, public debt is used for intergenerational transfers and taxes are non-distortionary.

this paper, by contrast, the politicians' time horizon and discount factor coincide with those of the economy, and individuals act rationally and with full information as economic and political agents. Nonetheless, the equilibrium of our model generally exhibits a bias towards budget deficits.

The basic insight of the paper is that, in the presence of disagreement between current and future policymakers, public debt is used strategically by each government to influence the choices of its successors.[2] Disagreement amongst alternating policymakers and uncertainty about who will be appointed in the future prevent the current government from fully internalizing the cost of leaving debt to its successors. As a result, the equilibrium stock of public debt tends to be larger than it is socially optimal. In other words, it is the citizens' disagreement, rather than their myopia, that may generate a deficit bias in democracies.

More generally, our paper suggests that differences in political institutions can contribute to explain the variance in the debt policies pursued by different countries, or by the same country at different points in time. According to the results of our model, the equilibrium level of public debt tends to be larger: (i) the larger is the degree of polarization between alternating governments; (ii) the more likely it is that the curent government will not be re-appointed; (iii) the more rigid downward is public consumption.

The outline of the paper is as follows: the model is presented in Section 2. Section 3 analyzes its static properties. The optimal and time-consistent fiscal policies of an hypothetical social planner are described in Section 4. Section 5 characterizes the dynamic economic equilibrium, Section 6 studies voting. Section 7 discusses some extensions and Section 8 concludes.

## 2. THE MODEL

We consider a closed economy composed of a large number of atomistic individuals, acting as consumers, workers and voters. They are all born at the beginning of period zero and have the same time horizon. Both the finite-horizon case (two periods) and the infinite-horizon case are studied. Individual $i$ has the following objective function (intratemporal separability serves only to simplify the algebra):

$$w^i = E_0\{\textstyle\sum_{t=0}^{T} \delta^t[u(c_t^i)+v(x_t^i)+\alpha_i h(g_t)+(1-\alpha_i)h(f_t)]\}; \qquad 1>\delta>0; \qquad (1)$$

where $c$ is private consumption; $x$ is leisure; $g$ and $f$ are two different public goods in per capita terms; and $\delta$ is the discount factor. The functions $u(\cdot)$, $v(\cdot)$ and $h(\cdot)$ are continuous, at least three times continuously differentiable, strictly increasing and strictly concave. $E_0$ is the expectation operator conditional on the information available at time 0. Individuals differ only in their preferences for the two public goods; their disagreement is parameterized by the coefficient $\alpha_i$.

2. Persson–Svensson (1989) have independently developed a related model. Their paper differs from ours in the following respects: (i) they focus on the disagreement about the level of public expenditures, whereas we concentrate on disagreement about its composition; (ii) they consider a two-period model in which the current government is sure that it will not be reappointed, while we have a probabilistic change of government and we study both a two-period and an infinite-horizon model; (iii) they do not explicitly consider voting behaviour, while we develop a voting equilibrium compatible with the economic equilibrium: and (iv) they consider a small open economy, thus they assume an exogenously given world interest rate; we instead consider a closed economy, thus the interest rate is endogenously determined.

Each consumer is endowed with one unit of time, to be shared between labour and leisure. Labour can be transformed one-for-one into non-storable output. The government can impose a proportional tax on labour income, $\tau_t$, identical across consumers. Thus, the intertemporal budget constraint of the consumer is:

$$\sum_{t=0}^{T} \bar{q}_t c_t \leqq \sum_{t=0}^{T} \bar{q}(1-\tau_t)(1-x_t), \tag{2}$$

where $\bar{q}_t$ is the present value at time zero of one unit of output at time $t$, i.e. $\bar{q}_t = \Pi_{i=1}^{t} q_i$, $q_i$ being the inverse of the gross real interest rate in period $i$, and $\bar{q}_0 = 1$. With no loss of generality we assume throughout the paper that in period zero consumers do not hold any government debt.[3] With identical tax rates for all consumers, the superscript $i$ on $c$ and $x$ can be dropped since all the consumers choose the same level of private consumption and leisure.

At no cost the government can transform the output produced by the private sector into the two non-storable public goods, $g$ and $f$. Thus, in each period the government chooses the level and the composition of public consumption, the tax rate and the amount of borrowing (lending) from the consumers. The government can issue only fixed interest debt with one-period maturity.[4] There is no default risk: each government is committed to honouring the debt obligations of its predecessors.[5] The resource constraint (in per-capita terms) is given by:

$$c_t + x_t + g_t + f_t \leqq 1; \qquad t: 0, 1, \ldots, T. \tag{3}$$

Two "political parties", denoted $D$ and $R$, can hold office. We view these parties as the representatives of different "pressure groups", i.e. of different groups of consumers. Since all consumers make identical choices regarding consumption and leisure, the parties' difference in preferences is only about the composition of public consumption. The parties' preferences are as follows (the superscripts identify the party):

$$W^D = E_0\{\textstyle\sum_{t=0}^{T} \delta^t[u(c_t) + v(x_t) + h(g_t)]\}, \tag{4}$$

$$W^R = E_0\{\textstyle\sum_{t=0}^{T} \delta^t[u(c_t) + v(x_t) + h(f_t)]\}. \tag{5}$$

Thus, party $D$ is identified with the consumer (or "constituency") with $\alpha_i = 1$, and party $R$ is identified with the consumer (or "constituency") with $\alpha_i = 0$. This assumption simplifies the algebra: Section 7 shows that our results generalize to the case in which both parties care about both public goods, but with different weights. The preferences of the parties do not change over time and a prohibitive barrier prevents the entry of a third party.

Elections are held at the beginning of each period. Thus, a period is defined as a term of office. Electoral results are uncertain: party $D$ is elected with probability $P$ and

3. Our results generalize to arbitrary values of initial government debt. (See also footnote 11). The general results are available from the authors.

4. Lucas-Stokey (1983) show that the maturity structure of government debt can be used to ensure time-consistency of the socially optimal policy in a model with exogenous government spending. As discussed in Chapter VIII of Persson and Tabellini (1990), this result does not survive if government spending is determined endogenously, as in this model. Moreover, this role of the maturity structure concerns the strategic interaction between the government and the rest of the economy, and not the interaction between alternating governments with different preferences, which is the focus of this paper. For these reasons, and to simplify the analysis, we only consider one-period debt.

5. Cases of default "de jure" are relatively uncommon. Cases of "de facto" default by means of inflation are much more common, but cannot be addressed in a "real" model such as the present one. Alesina-Tabellini (1989) present a two-party open economy model in which default is explicitly considered; Tabellini (1989) studies a model in which redistributional concerns induce the voters to repay the government debt even if default is explicitly allowed.

party $R$ with probability $1-P$. For expositional purposes $P$ is temporarily assumed to be an exogenous constant: in Section 6 we complete the model with the endogenous determination of the political equilibrium.

The "representative consumer" (for the purpose of private economic decisions) solves (2) and (3) taking the stochastic processes that determine $\{\tau_t\}$, $\{g_t\}$ and $\{f_t\}$ as given. Since income taxes are the same for every consumer, the solution of this problem is characterized by:

$$u_c(c_t)(1-\tau_t)=v_x(x_t), \tag{6}$$

$$q_t u_c(c_t)=\delta E_t u_c(c_{t+1}), \tag{7}$$

where $u_c$ and $v_x$ denote the derivative of $u(\cdot)$ and $v(\cdot)$ with respect to their arguments (the arguments of the functions $u(\cdot)$ and $v(\cdot)$ will be omitted when there is no possibility of confusion). In (7), the expectation reflects the uncertainty of consumers about the future tax policy.

## 3. TAXES AND PUBLIC SPENDING FOR A GIVEN DEFICIT

No government can bind the taxation and expenditure policies of its successors, regardless of whether the successor belongs to the same party or not. The only way in which the policy of the current administration can influence the actions of its successors is through the law of motion of public debt. The model is solved by means of dynamic programming, to insure that the solution is a sequentially rational equilibrium of the game in which each government plays against its successors and "against" the private sector.[6]

Since the government objective function is time-separable, it is convenient to separate the government's optimization problem in two stages: the intra-period problem of choosing taxes and public consumption for a given fiscal deficit; and the intertemporal problem of choosing the size of the deficit. Each government maximizes its own objective function, either (4) or (5), under the constraints given by (3), (6) and (7).

Inspection of these maximization problems immediately yields the following results: (i) party $D$ supplies only good $g$ and party $R$ only good $f$;[7] (ii) for a given fiscal deficit, both parties choose the same tax rate and the same level of public consumption, although on different goods; thus, for a given deficit, private consumption and leisure are identical under either party.

These two results, together with the resource constraint (3), enable us to rewrite the static optimization problem faced by the party in office as follows, where $b_t$ is government debt at the beginning of period $t$;

$$\text{Max}_{c_t, x_t}\,[u(c_t)+v(x_t)+h(1-c_t-x_t)], \tag{8}$$

subject to:

$$H(b_{t+1}, b_t, c_t, x_t)=(c_t-b_t)u_c(c_t)+\delta u_c(c_{t+1})b_{t+1}-(1-x_t)v_x(x_t)\geqq 0. \tag{9}$$

6. Sequential rationality is the analogue of sub-game perfection in partially anonymous policy games of this kind. The game is partially anonymous because only aggregate variables and policy variables can be observed; hence proper sub-games do not exist. This point is further discussed in Persson-Tabellini (1990).

7. Throughout the paper we disregard the possibility of "cooperation" between the two parties. Both parties could benefit by agreeing to compromise to a certain constant composition of public spending. This agreement could be sustained as a sequentially rational equilibrium by means of trigger strategies as described in a different context by Alesina (1987, 1988b).

This problem is solved for given $b_t$ and $b_{t+1}$. The government budget constraint, (9), has been obtained by substituting (6) and (7) into a dynamic form of (2), to eliminate $\tau_t$ and all values of $c$ and $x$ dated $t+1$ or later.[8] Needless to say, the government does not choose $x$ and $c$ directly: it chooses taxes and public spending, affecting $x$ and $c$ indirectly. Throughout the paper we assume that the optimum is an interior point of the feasible set. The first-order conditions (if, say, party $D$ is in office) imply:

$$H_x(h_g - u_c) = H_c(h_g - v_x), \tag{10}$$

where $H_i$ denotes the derivative of $H$ with respect to the variable $i$. The second-order conditions are assumed to be satisfied.[9]

The first-order condition, (10), and the constraints (3) and (9), implicitly define the optimal private and public consumption and leisure choices in period $t$ as a function of $b_t$ and $b_{t+1}$, which are indicated as $c^*(b_t, b_{t+1})$, $x^*(b_t, b_{t+1})$, $g^*(b_t, b_{t+})\equiv f^*(b_t, b_{t+1})$. With virtually no loss of generality we shall assume that at the optimum the labour supply function is upward sloping. This assumption is sufficient (but not necessary) to prove some of the qualitative properties of $c^*$, $x^*$, $f^*$ and $g^*$.[10]

In Section 1 of the Appendix several useful results regarding the partial derivatives of $c^*$, $x^*$, $g^*$ and $f^*$ are established. For example it is shown that $c^*$ and $x^*$ are increasing, and $g^*$ and $f^*$ decreasing, in $b_t$. The intuition is that if $b_t$ increases more debt has to be serviced in period $t$. With a given end of period debt ($b_{t+1}$), the government is forced to reduce public consumption and to raise taxes. The private sector responds with an increase of its consumption of both leisure and output.

The solution of this static optimization problem defines the indirect utility of both parties in period $t$ as a function of the debt at the beginning and at the end of the period. Let us indicate this function for the party in office as $R^e(b_t, b_{t+1})$. This function is identical for both parties, since $g^* = f^*$ and both parties choose the same tax rate. Let $R^N(b_t, b_{t+1})$ denote the utility function of either party if not in office in period $t$:

$$\begin{aligned} R^N(b_t, b_{t+1}) &= u(c^*(b_t, b_{t+1})) + v(x^*(b_t, b_{t+1})) \\ &= R^e(b_t, b_{t+1}) - h(g^*(b_t, b_{t+1})). \end{aligned} \tag{11}$$

Section 2 of the appendix proves the following:

**Lemma 1.** *$R^e(b_t, b_{t+1})$ is strictly decreasing in $b_t$ and strictly concave in $b_t$ and $b_{t+1}$. $R^N(b_t, b_{t+1})$ is strictly increasing in $b_t$.* Both *$R^e$ and $R^N$ are continuous and differentiable.*

We now turn to the choice of the optimal time path for government debt. We start with the case in which policy is chosen by a social planner.

## 4. FISCAL POLICY WITH A SOCIAL PLANNER

A social planner has two characteristics: (a) he is "reappointed" with probability 1 in each period; (b) he adopts as his preferences a weighted average of the preferences of the citizens. For expositional purposes, we consider the effects of these two characteristics separately, starting with (a).

8. The expectations operator $E_t$ appearing in (2) has been omitted since, as noted in the text, for a given fiscal deficit the consumer faces no uncertainty.

9. The second-order sufficient conditions are, in addition to the strict concavity of $u(\cdot)$, $v(\cdot)$ and $h(\cdot)$: $\partial^2 H/\partial x^2 \leqq 0$, $\partial^2 H/\partial c^2 \leqq 0$, which implies assumptions about the third derivatives of $u(\cdot)$ and $v(\cdot)$.

10. The condition for an upward-sloping labour supply function is: $u_c + u_{cc}(c_t - b_t) \geqq 0$. All our results generalize to the case of a downward-sloping labour supply at the optimum if a very weak sufficient condition is satisfied (details are available).

Suppose that a policymaker, say party $D$, is certain of being reappointed each period. In this case the optimal policy with commitments would always balance the budget, as in Lucas–Stokey (1983). We now show that, with a zero initial government debt, the absence of commitments does not matter:

**Proposition 1.** *In equilibrium a social planner balances the budget in every period, even if he cannot make binding commitments.*

*Proof.* With an infinite horizon, the social planner faces the following problem of dynamic programming:

$$V^e(b_t) = \text{Max}_{b_{t+1}} \{R^e(b_t, b_{t+1}) + \delta V^e(b_{t+1})\}. \tag{12}$$

The first-order conditions are:

$$R_2^e(b_t, b_{t+1}) + \delta V_b^e(b_{t+1}) = 0, \tag{13}$$

$$V_b^e(b_t) = R_1^e(b_t, b_{t+1}), \tag{14}$$

where $R_i^e(\cdot)$, $i = 1, 2$, denotes the partial derivative of $R^e(\cdot)$ with respect to its $i$th argument. Consider the steady state first. From (13) and (14) it follows that in the steady state (i.e. for $b_t = b_{t+1} = b$) we obtain:

$$R_2^e(b, b) + \delta R_1^e(b, b) = 0. \tag{15}$$

Substituting the expressions for $R_2^e(\cdot)$ and $R_1^e(\cdot)$ derived in section 2 of the Appendix, equation (15) reduces to:

$$\frac{(h_g - u_c)}{H_c} \cdot \delta u_{cc} c_1^* b = 0, \tag{16}$$

where $c_1^*$ is the partial derivative of $c^*(b_t, b_{t+1})$ with respect to its first argument. Since generically $c_1^* \neq 0$, equation (16) can be satisfied if and only if $b = 0$. A slight generalization of these arguments shows that the same results hold period-by-period, and not just in the steady state, as well as in the finite horizon case.[11] ||

We now turn to the problem of choosing the optimal composition of public expenditures. If the social planner knows with certainty the distribution of the $\alpha^i$ across consumers he maximizes:

$$W^{SP} = \textstyle\sum_{i=1}^{N} \lambda_i w^i = \sum_{t=0}^{T} \delta^t [u(c_t) + v(x_t) + \hat{\alpha} h(g_t) + (1 - \hat{\alpha}) h(f_t)]. \qquad T \leqq \infty, \tag{17}$$

where $N$ is the number of consumers, $\hat{\alpha} = \sum_{i=0}^{N} \lambda_i \alpha_i$ and $\lambda_i$ are arbitrary weights such that $\sum_{i=1}^{N} \lambda_i = 1$. The optimal composition of public expenditures is a function of $\hat{\alpha}$ and satisfies the following condition:

$$\hat{\alpha} h_g = (1 - \hat{\alpha}) h_f. \tag{18}$$

It is easy to show that Proposition 1 applies identically to this case for any choice of $\hat{\alpha}$.

11. If $b_0 \neq 0$, then Proposition 1 needs to be rephrased so as to apply only to the steady state. Outside of the steady state, the planner runs a surplus (if $b_0 > 0$) or a deficit (if $b_0 < 0$) until the condition of zero outstanding debt is reached. Hence, if $b_0 \neq 0$ the absence of commitment matters. For a discussion of this issue see Persson–Tabellini (1990).

## 5. ALTERNATING GOVERNMENTS

### 5.1. The Two-Period Case

In the last period (period 1) both parties collect the same tax revenue, since they inherit the same debt and have to leave zero end-of-period debt. Thus, in period 0, the consumers face no uncertainty about $\tau_1$. It follows that the interest rate and the functions $R^e(\cdot)$ and $R^N(\cdot)$ defined in Section 3 are independent of $P$.

Suppose that party $D$ holds office at the beginning of period 0. The amount of debt that this party chooses to leave to period 1 ($b_1$) can be found by solving the following problem (recall that $b_0=0$):

$$\text{Max}_{b_i}\ V(0)=R^e(0,b_i)+\delta[PR^e(b_1,0)+(1-P)R^N(b_1,0)]. \tag{19}$$

The first-order condition can be written as:

$$R_2^e(0,b_1)=-\delta[PR_1^e(b_1,0)+(1-P)R_1^N(b_1,0)]. \tag{20}$$

The second-order conditions are assumed to be satisfied. The left-hand side of (20) is the marginal utility in period 0 of leaving debt to the future. The right-hand side is the expected marginal cost of inheriting debt tomorrow, discounted to the present by $\delta$. Equation (20) implicitly defines the equilibrium level of debt, $\bar{b}_1$, as a function of $P$:

**Proposition 2.** *$\bar{b}_1$ is a strictly decreasing function of the probability that the party in office in period 0 is reappointed.*

*Proof.* Suppose $D$ is in office in period 0 and recall that $P$ is the probability that $D$ wins the elections. By the implicit function theorem applied to (2), and by the second-order conditions:

$$\text{sign}\left\{\frac{\partial \bar{b}_1}{\partial P}\right\}=\text{sign}\,\{(R_1^e(\bar{b}_1,0)-R_1^N,(\bar{b}_1,0))\}=\text{sign}\,\{h_g g_1^*(\bar{b}_1,0).\}, \tag{21}$$

where the second equality follows from (A.1) and (A.2) in the Appendix, with $g_1^*$ being the derivative of $g^*$ with respect to its first argument. Lemma 1.A in the Appendix establishes that $g_1^*<0$. Hence, $\partial\bar{b}_1/\partial P<0$. The proof for when party $R$ is in office in period zero is symmetric. ||

Intuitively, increasing the probability of re-election raises the marginal cost of issuing debt (the right-hand side of (20)). To see why, note that the cost of leaving debt to the future consists of two components: the future tax distortions associated with the higher taxes and the reduced public consumption. The second component is born *only* if the party currently in offce is reappointed next period and can choose the desired public good. Thus, the larger the probability of re-election, the more the party in office internalizes the cost of leaving debt to the future, and the smaller is the equilibrium debt. In more colourful terms, by leaving debt to the future, today's government can force its successor to "pay the bills" and spend less on the public good that is worth nothing to today's government.

### 5.2. The Infinite-Horizon Case

In order to avoid the multiplicity of equilibria that inevitably arises in infinite-horizon dynamic games, we restrict each government to select strategies contingent only on the stock of debt outstanding at the beginning of its term of office. This implies that we do not explore reputational equilibria. It can be conjectured that such equilibria would bring the economy closer to, but presumably not on, the Pareto frontier of the game.[12]

We can characterize the solution only in the neighbourhood of $P=\frac{1}{2}$. In this case the optimization problem faced by the two parties is identical. Thus, the deficit, the tax rate and the level of public expenditure is the same for both parties; the only difference is about which public good is supplied. As in the two-period case, this eliminates consumers' uncertainty about future taxes so that $R^e(\cdot)$ and $R^N(\cdot)$ are independent of P.[13]

The dynamic programming problem solved by the party in office is:

$$V^e(b_t)=\text{Max}_{b_{t+1}}\{R^e(b_t, b_{t+1})+\delta PV^e(b_{t+1})+\delta(1-P)V^N(b_{t+1})], \tag{22}$$

where $V^e(\cdot)$ and $V^N(\cdot)$ are value functions of the party if elected and if non-elected respectively. Thus:

$$V^N(b_t)=R^N(b_t, b_{t+1})+\delta(PV^e(b_{t+1})+(1-P)V^N(b_{t+1})). \tag{23}$$

The first-order conditions are:

$$R^e_2(b_t, b_{t+1})=-\delta[PV^e_b(b_{t+1})+(1-P)V^N_b(b_{t+1})]. \tag{24}$$

Equation (24) has exactly the same interpretation of (20): the left-hand side of (24) represents the marginal utility of leaving debt to the future; the right-hand side is the expected marginal cost of inheriting debt tomorrow. Thus, the argument of Proposition 2 still applies.[14] From (24) we obtain:

**Proposition 3.** *In a neighbourhood of $P=\frac{1}{2}$, the steady-state level of public debt is always positive and locally stable if the sufficient condition c.1 of Lemma 1.A in Section 1 of the Appendix is satisfied.*

*Proof.* See Section 3 of the Appendix. ||

The condition alluded to in the text of Proposition 3 is needed to ensure that the total derivative of debt on public expenditure is negative in the steady state. Thus, as in the two-period model, alternating governments which disagree over the composition of public consumption issue more public debt than the social planner. The intuition is still as in the previous section: since governments are not certain of reappointment, they do not fully internalize the costs of leaving debt to their successors. In the two-period model, these costs take the form of higher taxes and lower public consumption in order to repay the debt in the final period. Here, these costs correspond to the payment of interest on the stock of debt.

As in the previous section, we can ask what are the consequences on public debt of changing the probability of electoral outcomes. The answer is that, in a neighbourhood of $P=\frac{1}{2}$ under the same condition of Proposition 3 plus an additional weak sufficient

12. The equilibrium that we consider is analogous to the notion of Markov-perfect equilibrium defined by Maskin-Tirole (1988) (but see footnote 6). Alesina (1987, 1988b) and Ferejohn (1986) consider reputational equilibria in repeated static political games.

13. Alternatively, one can reinterpret $P$ as being the (exogenous) probability of re-election for the current administration, irrespective of which party it belongs to. In this case, the results of this section would hold for any value of $P$, and not just in a neighbourhood of $P=\frac{1}{2}$. However, the political equilibrium described in Section 6 would not apply to this interpretation of $P$.

14. The second-order condition now requires: $R^e_{21}+\delta(PV^e_{bb}+(1-P)V^n_{bb})<0$.

condition, the stock of public debt issued by either party in the steady state is a decreasing function of the probability of that party winning the elections. The proof is available from the authors.

## 6. POLITICAL EQUILIBRIUM

In this section we analyze voting behaviour, to derive $P$ endogenously.

Consider first the two-period case, and suppose that elections are held at the beginning of period 1. Both parties choose the same tax rate in period 1, thus consumption and leisure are the same in period 1 regardless of the electoral outcome. Since voter $i$ votes for party $D$ if and only if the expected utility with $D$ elected is not lower than if $R$ is elected, we have that voter $i$ votes $D$ if and only if: (without loss of generality we assume that indifferent voters vote for party $D$):

$$[\alpha_i h(g^*(0, b_1)) - (1-\alpha_i)h(f^*(0, b_1)] = h(g^*(0, b_1))(2\alpha_i - 1) \geqq 0. \tag{25}$$

Since $h(g^*(b_1)) > 0$, (25) holds if and only if $\alpha_i \geqq \frac{1}{2}$. Let $\alpha_m$ be the value of $\alpha$ corresponding to the median voter: party $D$ wins if and only if $\alpha_m \geqq \frac{1}{2}$.

Electoral uncertainty arises because of the uncertainty about who is the median voter. Specifically, given a probability distribution for $\alpha_m$, the probability that party $D$ will be elected is given by:

$$P = \text{prob}\ (\alpha_m \geqq \tfrac{1}{2}). \tag{26}$$

From (26) it is apparent that $P$ is a constant from the point of view of period zero; in particular, $P$ is not a function of $b_1$.[15]

Note that there is no convergence of the parties towards the same policy. Since binding commitments are not available, and the horizon is finite, both parties can only credibly announce to the voters the time-consistent fiscal policy characterized in the preceding sections. This argument is developed more in detail in Alesina (1988b). The same results can be shown to apply in the infinite-horizon case. Tabellini–Alesina (1990) study a related political model in which the median voter theorem applies. It is shown that a bias towards deficit survives, under certain conditions, even in a direct democracy, provided that there is some uncertainty about the preference of future median voters.

We can summarize the results of sections 5 and 6 in the following:

**Proposition 4.** *A democracy in which citizens disagree about the composition of public expenditures exhibits higher deficits and debt accumulation than an economy with a social planner who is appointed for ever.*

## 7. EXTENSIONS

In this section we discuss two extensions: (i) We generalize the objective functions of the two parties to the case in which they care about both public goods, though with opposite weights. Thus:

$$W^D = \textstyle\sum_{t=0}^{T} \delta^t[u(c_t) + v(x_t) + \alpha h(g_t) + (1-\alpha)h(f_t)], \tag{27}$$

$$W^R = \textstyle\sum_{t=0}^{T} \delta^t[u(c_t) + v(x_t) + (1-\alpha)h(g_t) + \alpha h(f_t)], \tag{28}$$

15. Uncertainty about $\alpha_m$ may be due, for instance, to individual specific shocks to the costs of voting, that imply a random voting turnout, as in Ledyard (1984).

for any $1 > \alpha > 0$.[16] To fix ideas, we consider $\frac{1}{2} < \alpha < 1$ (the alternative case is completely symmetric). (ii) We assume that a minimum level $k > 0$ of both public goods must be provided. Thus we impose that $f \geqq k > 0$ and $g \geqq k > 0$. These constraints may reflect institutional or technological factors limiting the flexibility of the government decision process.

Our results can be summarized as follows (details are available):

(1) If the constraints on $g$ and $f$ are binding in the sense that each party supplies only the minimum amount $k$ of the good it likes the least, the results of the previous sections generalize directly.

(2) If neither of the constraints is binding a deficit bias still emerges if the following condition on the function $h(\cdot)$ applies: $\lambda(g) \equiv -h_{gg}/(h_g)^2$ is decreasing in $g$. This condition is stronger than decreasing absolute risk aversion, but it is satisfied by a large class of commonly used utility functions, like the power function.[17]

In both cases, it can be shown that the larger is $\alpha$, the larger is the deficit bias. Since a larger value of $\alpha$ means that the two parties are more polarized, we have:

**Proposition 5.** *The greater is the degree of polarization between the two parties the larger is the deficit bias.*

## 8. CONCLUSIONS

Public debt can be used by a policymaker to influence the choices of its successors. If there is disagreement between alternating governments, this strategic interaction generates a sub-optimal path of government debt. In particular, the government tends to overissue public debt relative to the case of full agreement. This tendency is stronger the greater is the degree of political polarization and of downward rigidity in public spending.

Related results have been independently obtained in a recent paper by Persson-Svensson (1989). They consider the case of two policymakers with different views about the level rather than the composition of government expenditure. They show that the "conservative" policymaker (i.e. the one which likes less public expenditure) may choose to leave deficits in order to force its "liberal" successor to spend less. Conversely, the "liberal" policymaker may leave a surplus to its conservative successors.

In our paper, by contrast, the disagreement concerns the composition of public spending, and it gives rise to a deficit bias irrespective of which party is in office.

From a positive point of view, the results reported above can contribute to explaining why different countries pursue very different debt policies under similar economic conditions. According to our results, different countries' experiences can be related to differences in the degree of political polarization, in the political stability, and in the flexibility of the government decision process concerning public consumption. More generally, this paper shows that fiscal deficits are the aggregate outcome of the political conflict between different groups of citizens. Recent empirical results by Roubini and Sachs (1989*a*, *b*) on OECD countries are generally supportive of this line of research.

From a normative point of view, these results contain some suggestions for institutional reforms. This paper does not provide an argument in favour of balanced budget

16. If $\alpha > 1$ the results obtained with $\alpha = 1$ are strengthened since party $D(R)$ attributes negative utility to good $f(g)$: thus neither party ever would supply a positive amount of this good (an analogous argument holds for $\alpha < 0$).

17. If this condition is not satisfied, both parties run a surplus. More detail about that role played by this condition in a related model can be found in Tabellini-Alesina (1990).

amendments. On this issue, we do not add anything to the existing literature on optimal fiscal policy, namely that fiscal deficits (surpluses) can be used to smooth tax distortions optimally over time. However, the paper does support the view that each government should not have complete discretion in its choice of how much deficit to leave to its successors. A practical normative implication is that different political parties should agree on a set of contingencies that would allow them to deviate from a balanced budget when in office (such as the occurrence of a war, or a recession). Each administration should be allowed to incur deficits only if the prespecified contingencies materialize. Needless to say, the relevant set of contingencies to be included in the escape clauses can be very hard to identify and serious problems of enforcement and monitoring may arise. In this respect, these normative prescriptions lead once again to the well known policy dilemma of choosing between simple rules and discretion.

## APPENDIX

1. **Lemma 1.A.** *Let* $c_1^* = \partial c_t/\partial b_t$, $c_2^* = \partial c_t^*/\partial b_{t+1}$, $G_c = \partial G/\partial c_t$, *and so on; then:*

(i) $g_1^* < 0$ *and* $x_1^* > 0$
(ii) $c_1^* > 0$ *and* $g_1^*(b, b) + g_2^*(b, b) < 0$ *for* $b \geqq 0$ *if*:

$$|h_{gg}| < \left| \frac{H_{xx}(h_g - u_c) + v_{xx}H_c + u_{cc}H_x(h_g - v_x)/u_c}{H_x - H_c} \right|. \tag{C.1}$$

*Proof.* First apply the implicit function theorem to the following two equations reproduced from the text:

$$H(\cdot) \equiv (c_t - b_t)u_c(c_t) + \delta u_c(c_{t+1})b_{t+1} - (1 - x_t)v_x = 0, \tag{9}$$

$$G(\cdot) \equiv H_x(h_g - u_c) - H_c(h_g - v_x) = 0. \tag{10}$$

Recall that by the resource constraint: $g_i^* = -(c_i^* + x_i^*)$, $i = 1, 2$. Finally use condition (C.1), the second-order conditions of footnote 9 and the condition in footnote 10 referring to an upward-sloping labour supply function to sign all these partial derivatives. Details of the algebra are available from the authors. ||

2. *Proof of Lemma* 1. Continuity of $R^e(\cdot)$ follows from the fact that the maximization is performed on a compact feasible set, and from the continuity of $u(\cdot)$, $v(\cdot)$ and $h(\cdot)$. (See the theorem of the maximum in Hildenbrand (1974).) Differentiability follows from the fact that $c^*$, $x^*$ and $g^*$ are continuously differentiable, as implied by the application of the implicit function theorem to (10). Strict concavity can be proved along the lines of Stokey-Lucas-Prescott (1989)—details are available upon request.

From the envelope theorem and from the first-order conditions from which equation (10) in the text is derived we obtain:

$$\frac{\partial R^e}{\partial b_t} = R_1^e = \frac{(h_g - u_c)}{H_c} H_{b_t} = \frac{(h_g - u_c)u_c}{H_c} < 0, \tag{A.1}$$

$$\frac{\partial R^e}{\partial b_{t+1}} = R_2^e = \frac{(h_g - u_c)}{H_c} H_{b_{t+1}} = \frac{(h_g - u_c)}{H_c} \delta[u_c(c_{t+1}) + b_{t+1}u_{cc}(c_{t+1})c_1^*(b_{t+1}, b_{t+2})]. \tag{A.2}$$

Finally, by definition of $R^N$, $\partial R^N/\partial b = u_c c_1^* + v_x x_1^*$, which can be shown to be positive once the expressions for $c_1^*$ and $x_1^*$ have been substituted in it. ||

3. *Proof of Proposition* 3. Equation (24) in the text implicitly defines $b_{t+1}$ as a function of $b_t$ and $P$: $b_{t+1} = B(b_t, P)$. We will use the following notation: $B_1 = \partial B(b_t, P)/\partial b_t$, and so on. The proof of local stability (i.e. that $|B_1| < 1$), is available from the authors.

To prove that the steady-state debt is positive, note that, with $P = \frac{1}{2}$ and using (22) and (23) in the text, we obtain:

$$V_b^N(b_{t+1}) = R_1^N(b_{t+1}, b_{t+2}) + B_1(b_{t+1})(R_2^N(b_{t+1}, b_{t+2}) - R_2^e(b_{t+1}, b_{t+2})). \tag{A.3}$$

Moreover, by the envelope theorem, $V_b^e(b_{t+1}) = R_1^e(b_{t+1}, b_{t+2})$. Substitute (A.5) into (23) of the text and use (11). In the steady state, we obtain:

$$R_2^e + \delta R_1^N - \delta B_1 h_g g_2^* + \delta P h_g [g_1^* + B_1 g_2^*] = 0. \tag{A.4}$$

Suppose that the steady-state level of public debt is 0. Computing $H_{b_t}$ and $H_{b_{t+1}}$, and using (A.2) one obtains $R_2^e = -\delta R_1^e$. Substituting this expression in (A.4) and using (11) of the text again to simplify, we obtain:

$$(P-1)(g_1^* + B_1 g_2^*)\delta h_g = 0. \tag{A.5}$$

By Lemma 1.A, $g_1^* + g_2^* < 0$ and $g_1^* < 0$. Since $B_1 < 1$, (A.5) then yields a contradiction, unless P = 1. A slightly more elaborate argument (which again makes use of equation (A.5)) also rules out the possibility of a negative debt in the steady state. Needless to say, (A.5) is satisfied if and only if $P = 1$, i.e. in the case of the social planner. ||

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