Voting on the Budget Deficit

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This paper analyzes a model in which a group of rational individuals votes over the composition and time profile of public spending. All voters agree that a balanced budget is ex ante optimal. However, if there is disagreement between current and future majorities, a balanced budget is not a political equilibrium under majority rule. Under certain conditions a majority of the voters favors a budget deficit, and the equilibrium deficit is larger the greater is the polarization among voters. (JEL 320,025)

Opinion polls show that American voters disapprove of the federal budget deficit. However, it is politically difficult to reach an agreement on how to balance the budget: several polls show that even though voters dislike deficits, they are not in favor of any specific measure to reduce them.[1]

Two explanations for this apparent inconsistency of opinions are commonly proposed. One is that voters do not understand the concept of budget constraint, and suffer from "fiscal illusion." However, this notion is difficult to reconcile with standard assumptions of rationality.[2] The other is that disagreement generates cycling and prevents the existence of a stable majority in favor of balancing the budget. As a result, individual preferences about intertemporal fiscal policy cannot be aggregated, and no action can be taken to balance the budget. However, this argument is consistent with any outcome (deficit, surplus, balance) since the political equilibrium is indeterminate.

This paper provides an alternative explanation of budget deficits, that is based upon the inability of current voters to bind the choices of future voters. This lack of commitment, coupled with disagreement between current and future majorities, introduces a time inconsistency in the dynamic social choice problem that determines the size of budget deficits or surpluses. The policies desired by the current majority would not be carried out if future majorities exhibit different preferences. This induces the current majority to choose a debt policy that is not *ex ante* optimal for society as a whole. The deviation from optimality can be in the direction of excessive surpluses or deficits. The paper shows that a large class of individual utility functions leads to a social choice of budget *deficits*. This explains why it is hard to agree on how to eliminate deficits, even if there is a consensus that they may be socially suboptimal.

Our results have a simple economic intuition. Consider a rational voter who is presented with a number of options on how much to spend in the current period, and over what items. He votes not only on the intertemporal profile of spending, but also

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[1]Both recent polls (*New York Times*, November 1987) and polls taken in the early 1980s (Allan Blinder and Douglas Holtz-Eakin, 1983) show that a large majority of Americans is in favor of balanced budget amendments. A much lower fraction of voters is in favor of any specific measure to reduce budget deficits.

[2]For recent arguments explaining the deficit as the result of "fiscal illusion," see James Buchanan et al. (1987) and the references quoted therein. Kenneth Rogoff and Anne Sibert (1989) show that suboptimal budget deficits may be observed if voters are rational but imperfectly informed, but only before elections and not over long time periods.

on how to allocate the resources acquired by issuing debt (or lost through a surplus). Suppose that there is uncertainty about the future composition of public spending, because the identity of future majorities is still unknown. Then, whereas the majority who runs a budget deficit also chooses how to allocate the debt proceeds, the allocation of the burden of repaying the debt is not under its control. Under appropriate conditions this asymmetry prevents the current majority from fully internalizing the costs of budget deficits, the more so the greater is the difference between its preferences and the expected preferences of the future majority.

The paper also shows that if this asymmetry is removed, and the vote on the deficit is taken behind a "veil of ignorance" on how the debt proceeds are spent, then the voters unanimously choose a balanced budget. That is, in this model a balanced budget is *ex ante* efficient. This implies that current voters would like to precommit future governments to a balanced budget rule, but no majority wants to be bound by the rule. Thus, a balanced-budget rule is enforceable only if a qualified majority is required to abrogate it.

Our results are related to those of other papers on intertemporal politico-economic models of fiscal policy. In particular, Alberto Alesina and Guido Tabellini (1987, 1989) and Guido Tabellini (1989) analyze a general equilibrium model in which two ideologically motivated parties randomly alternate in office and disagree on the optimal composition of public spending, or on the level of taxation of different constituencies. Torsten Persson and Lars Svensson (1989) considers a government that knows that its successor will want to increase public spending. In these papers as in ours, public debt is a strategic variable that affects the actions of future policymakers.

In this earlier literature, however, either the political equilibrium is exogenously given (as in Torsten Persson and Lars Svensson, 1989), or voters have to choose between two ideological candidates with fixed positions (as in Alberto Alesina and Guido Tabellini, 1987, 1989 and Guido Tabellini, 1989). In the latter case, in equilibrium both parties choose the same deficit, even though they choose a different composition of government spending. Thus, in effect, in these papers voters do not have a choice on the deficit. In particular, the question remains of whether the deficit would disappear if a centrist party promising to balance the budget enters the political arena. In the present paper there are no constraints on the policy options available to the voters. Any proposal can be voted upon in a pairwise comparison, and the voters directly vote on the size of the deficit.

The idea that state variables can be used to influence future voting outcomes is applicable to other public choice problems, besides those concerning budget deficits. For example, Ami Glazer (1987) exploits this insight to investigate the choice of durability in public capital projects. He shows that uncertainty about future voting outcomes generates a bias toward overinvesting in long run projects. Other possible applications are to privatization decisions and defense policy.

Finally, our argument is completely different from the idea that deficits occur because the current generation does not internalize the costs of taxing future generations: in our model everybody has the same time horizon. In an overlapping generations model with no altruism, on the other hand, current voters would be unanimously in favor of the largest possible budget deficit, so as to redistribute the income of future generations toward themselves. In such a model, the equilibrium would always be a corner solution and the size of budget deficits would be determined exclusively by the borrowing capacity of the government.[3]

The rest of the paper is organized as follows. Section I describes the model. The political equilibrium is computed in Section II. Section III discusses normative and positive implications for the issue of balance

[3]Alex Cukierman and Allan Meltzer (1989) analyze an overlapping generations model in which individuals have a bequest motive of various intensities. The equilibrium budget deficit in that model reflects the preferences for intergenerational redistribution of current voters. Our approach and that of Cukierman and Meltzer are by no means contradictory, although very different.

budget amendments. The last section suggests some extensions.

I. The Model

A group of heterogeneous individuals decides by majority rule on the consumption of two public goods, g and f. The group is endowed with one unit of output in each period, and it can borrow or lend to the rest of the world at a given real interest rate, with no loss of generality assumed to be 0. The world lasts two periods, and all the outstanding debt has to be repaid in full at the end of the second period. Thus, the group faces the intertemporal constraint:

$$g_1 + f_1 - b \leq 1 \tag{1a}$$

$$f_2 + g_2 + b \leq 1, \tag{1b}$$

where subscripts denote time periods and b denotes debt. In addition, the nonnegativity constraints hold: $g_i, f_i \geq 0$, $i = 1, 2$. Hence, (1b) immediately implies $-1 \leq b \leq 1$. Throughout the paper we assume that in equilibrium $-1 < b < 1$. The extension to the case $b = 1$ is straightforward, and just involves some changes in notation. At the beginning of each period, the group votes on how much to consume of each public good in that period. Thus, in period 1 the group cannot precommit to consume a specific quantity of g_2 and f_2 in the following period.

The preferences of the ith member of the group are:

$$W^i \equiv E\left\{ \sum_{t=1}^{2} \left[\alpha^i u(g_t) + (1-\alpha^i) u(f_t)\right] \right\} \tag{2}$$

where $u(\cdot)$ is concave, strictly increasing, twice continuously differentiable, and satisfies the Inada condition: $u'(0) \to \infty$. $E(\cdot)$ denotes the expectation operator. With no loss of generality, we assume that voters do not discount the future; thus the rate of time preference is equal to the world real interest rate. This eliminates any incentive to borrow or lend other than those which are the explicit focus of this paper.

The parameter α^i which identifies voter i is distributed over the $[0,1]$ interval. With only a minor change in notation, all the results can be extended to allow for values of α^i greater than 1 or negative.

This specification of individual preferences allows for disagreement about which proportion of the two public goods to consume. However, it implies that all individual preferences belong to the class of "intermediate preferences" defined by Jean Michel Grandmont (1978).[4] This class has the following useful property: individual preferences are indexed by the parameter α^i and the distribution of preferences within the group is fully summarized by the distribution of α^i. As shown by Grandmont (1978), since α^i is a scalar, preferences are single peaked and the median voter result applies: provided that all policy options are compared pairwise, the group decisions under majority rule coincide with the most preferred policy of the individual corresponding to the median value of α, denoted α^m. Thus, the political equilibrium can be computed by solving the problem of maximizing (2) subject to (1), with $\alpha^i = \alpha^m$ in (2).

A crucial feature of the model is that even though individual preferences remain stable over time, the identity of the median voter need not be the same in periods 1 and 2 (this is the reason for having the expectations operator in equation (2)). Changes in the identity of the median voter over time may be due to: (i) random shocks to the costs of voting that affect the participation rate (see John Ledyard, 1984, for a formalization of this idea); or (ii) changes in the eligibility of the voting population (for instance, because

[4]Any expected utility function that is linear in a vector of parameters belongs to this class. Linearity is not essential in Grandmont (1978), but it is here, since we consider an *expected* utility function. The essential property of intermediate preferences is that supporters of distinct proposals are divided by a hyperplane in the space of most preferred points. See also Andrew Caplin and Barry Nalebuff (1988).

of minimum age requirements, or because of geographical movements of the population). As discussed in subsection II.D below, the extent to which these events change the median voter's preferences, in turn, depends on the underlying distribution of individual preferences.

This simple setup can be interpreted as a stylized version of several richer models. The most direct interpretation is that of a "club" with a fixed endowment to be allocated to different uses. With minor changes, the club can be interpreted as a country in which taxes are fixed and economic agents have access to a linear storage technology or to international capital markets. In an interior equilibrium, the real rate of interest on public debt equals the technologically given rate of return on storage or the world rate of interest. The extension to a model with endogenous distortionary taxation significantly increases the complexity of the analysis, without qualitatively changing the basic message of this paper. Alberto Alesina and Guido Tabellini (1987) illustrate this point in a model with a much simpler political structure.

II. Political Equilibrium

A. *The Last Period*

Consider the last period, and let α_2^m denote the value of α^i corresponding to the median voter in period 2. Two cases are possible, depending on the value of α_2^m.

If $1 > \alpha_2^m > 0$, then the median voter is at an interior optimum. In this case, his choices satisfy the following first-order condition:

$$(3)\quad \alpha_2^m u'(g_2) - (1-\alpha_2^m)u'(1-b-g_2) = 0.$$

Equations (3) and (1b) implicitly define the equilibrium values g_2^* and f_2^* as a function of α_2^m and b. Let us indicate these functions as $g_2^* = G(\alpha_2^m, b)$ and $f_2^* = 1 - b - g_2^* \equiv F(\alpha_2^m, b)$. The implicit function theorem applied to (3) and (1b), shows that, for $1 > \alpha_2^m > 0$, $G_\alpha = -F_\alpha > 0$, $-1 < G_b < 0$ and $-1 < F_b < 0$, where G_α, G_b, F_α, and F_b denote the partial derivative of $G(\cdot)$ and $F(\cdot)$ with respect to a_2^m and b, respectively.

If, instead, $\alpha_2^m = 1$ or $\alpha_2^m = 0$, then the median voter of period 2 is at a corner. If $\alpha_2^m = 1$, he sets $g_2^* = 1 - b$ and $f_2^* = 0$; thus $G_b = -1$ and $F_b = 0$. Symmetric results hold if $\alpha_2^m = 0$.

B. *The First Period: Preliminary Results*

In period 1 there is uncertainty about the identity of the median voter of period 2. Hence, from the point of view of the voters in period 1, the parameter α_2^m in (3) is a random variable. The policy most preferred by the median voter of period 1 (whose preferences are denoted by α_1^m) can be found by solving the following optimization problem:

$$(4)\quad \max_{g_1, b} \{ \alpha_1^m u(g_1) + (1-\alpha_1^m) u(1-g_1+b) + E[\alpha_1^m u(G(\alpha_2^m, b)) + (1-\alpha_1^m) u(F(\alpha_2^m, b))] \}.$$

The current median voter maximizes an expected utility function, since in the second period g_2 and f_2 may be chosen by a different majority. The expectation operator is taken with respect to α_2^m. Thus, today's voters choose the value of the state variable b taking into account how this choice influences the policies chosen by future majorities.[5]

If $1 > \alpha_1^m > 0$, the first-order condition relative to g_1 is:

$$(5)\quad \alpha_1^m u'(g_1) - (1-\alpha_1^m) u'(1+b-g_1) = 0.$$

Equation (5) implicitly defines the optimal values g_1^* and f_1^*, as a function of α_1^m and b: $g_1^* = g(\alpha_1^m, b)$, $f_1^* = f(\alpha_1^m, b)$. Using the

[5]This setting is reminiscent of that analyzed in Robert Strotz (1956) and Bezalel Peleg and Menahem Yaari (1973), where a consumer with time inconsistent preferences solves a dynamic optimization problem. In those papers, like here, the time consistent solution is the noncooperative equilibrium of a game played by successive decision makers.

same notation as before, it can be shown that, for $1 > \alpha_1^m > 0$, $1 > g_b > 0$, and $f_b = 1 - g_b$. If instead $\alpha_1^m = 1$ (or $\alpha_1^m = 0$), then the median voter in period 1 is at a corner and chooses respectively $f_1^* = 0$ and $g_1^* = 1 + b$ (or $g_1^* = 0$ and $f_1^* = 1 + b$).

The intertemporal choice is described by the first-order condition of problem (4) relative to b, which for $b < 1$ is:

$$(6)\quad \alpha_1^m u'(g(\alpha_1^m, b)) + E\big[\alpha_1^m u'(G(\alpha_2^m, b))G_b + (1-\alpha_1^m) \times u'(F(\alpha_2^m, b))F_b\big] = 0,$$

where G_b and F_b are functions of α_2^m and b. Despite the concavity of $u(\cdot)$, the second-order conditions are not satisfied unless an additional mild condition is imposed. We assume throughout the paper that this condition is satisfied for any value of α_2^m and α_1^m.[6]

[6] This second-order sufficient condition can be stated as follows:

$$(\text{F.1})\quad R(f_2)^3 R(g_2) + R(g_2)^2 R(f_2)^2 + (1-\gamma)R'(g_2)R(f_2)^2 + \gamma R(g_2)^3 R(f_2) + \gamma R(g_2)^2 R(f_2)^2 + (\gamma - 1)R'(f_2)R(g_2)^2 > 0,$$

where

$$\gamma = \frac{1-\alpha_1^m}{\alpha_1^m}\,\frac{1-\alpha_2^m}{\alpha_2^m}$$

and where

$$R(\cdot) = -u''(\cdot)/u'(\cdot)$$

is the coefficient of absolute risk aversion of $u(\cdot)$.In turn, a sufficient (but not necessary) condition for (F.1) to hold is that $R(f_2)R(g_2) + R(g_2)^2 + R'(g_2) > 0$ and $R(f_2)R(g_2) + R(f_2)^2 + R'(f_2) > 0$.

The first term on the left-hand side of (6) is the marginal gain of issuing one more unit of debt; at the optimum, this must coincide with the marginal utility of spending one extra unit on either of the two public goods (good g in (6)). The second term of (6) is the expected marginal disutility of repaying the debt, by cutting public spending tomorrow. This term takes into account that the future composition of public spending depends on α_2^m. The solution to equation (6) determines the equilibrium value of debt, b^*, chosen by majority rule in period 1.

In order to sign b^* in the next subsection we consider equation (6) at the point $b = 0$. If at this point equation (6) is satisfied, then $b^* = 0$. If instead at $b = 0$ the left-hand side of (6) is positive (negative), then by the second-order condition $b^* > 0$ ($b^* < 0$).

C. *The Equilibrium Level of Debt*

Consider first the case in which the median voter at time 1 is certain that he will also be the median voter in period 2 (i.e., $\alpha_1^m = \alpha_2^m$ with certainty). The second term in (6) reduces to $\alpha_1^m u'(G(\alpha_1^m, b))$, so that $b^* = 0$ is the only solution to (6) for any value of α_1^m. Intuitively, since the discount rate coincides with the real interest rate (they are both zero), in the absence of political instability the median voter chooses to spend an equal aggregate amount in both periods. It is easy to show that $b^* = 0$ is also the policy that would be chosen by a social planner maximizing a weighted sum of individual utilities, for any choice of weights in the planner's objectives. Thus, with no disagreement between current and future majorities, the political equilibrium lies on the Pareto frontier.

The remainder of this section investigates the case in which $\alpha_2^m \neq \alpha_1^m$ with positive probability. It is convenient to divide the second term on the left-hand side of (6) into the weighted average of two conditional expectations: the expectation conditional on the event that $1 > \alpha_2^m > 0$; and the expectation conditional on the event that $\alpha_2^m = 1$ or $\alpha_2^m = 0$.

Although special, the second case provides the simplest illustration of why political instability creates incentives to issue public debt. In this case future median voters are expected to be at a corner, so that they spend in only one kind of public good: g_2 if $\alpha_2^m=1$, and f_2 if $\alpha_2^m=0$. If $\alpha_2^m \neq \alpha_1^m$ with positive probability, we have:

PROPOSITION 1: *(i) If either* $\alpha_2^m=0$ *or* $\alpha_2^m=1$, *then* $b^*>0$. *(ii)* b^* *is greater the larger is the difference between* α_1^m *and the expected value of* α_2^m.

PROOF:

(i) Let $\alpha_2^m=1$ with probability π and $\alpha_2^m=0$ with probability $1-\pi$, $1>\pi>0$. Then, using (5), equation (6) can be rewritten as:

$$\begin{aligned}(7)\qquad \alpha_1^m u'(g_1^*)-\tilde{\alpha}u'(1-b)&\\ =(1-\alpha_1^m)u'(f_1^*)&\\ -\tilde{\alpha}u'(1-b)&\\ =0,&\end{aligned}$$

where $\tilde{\alpha}=\alpha_1^m\pi+(1-\pi)(1-\alpha_1^m)$. Clearly, $\tilde{\alpha} \leq \mathrm{Max}(\alpha_1^m,(1-\alpha_1^m))$, with strict inequality if $\alpha_1^m \neq 1/2$. Moreover, at the point $b=0$, $u'(1-b)\leq u'(g(\alpha_1^m,b))$ and $u'(1-b)\leq u'(f(\alpha_1^m,b))$, with strict inequality if $1>\alpha_1^m>0$. Hence, at the point $b=0$ the two terms in the left-hand sides of (7) are always strictly positive. By the second-order conditions this implies $b^*>0$. (ii) The expected value of α_2^m is π. Fix α_1^m, and consider b^* as a function of π. We have:

$$(8)\qquad \frac{db^*}{d\pi}=\frac{db^*}{d\tilde{\alpha}}\frac{d\tilde{\alpha}}{d\pi}=\frac{db^*}{d\tilde{\alpha}}(2\alpha_1^m-1).$$

Applying the implicit function theorem to (7), we obtain that $db^*/d\tilde{\alpha}<0$. Hence,

$$(9)\qquad \frac{db^*}{d\pi}\lesseqgtr 0 \quad \text{as} \quad \alpha_1^m \gtreqless \frac{1}{2}.$$

Thus, if $\alpha_1^m>1/2$, a lower value of π increases b^*. And conversely, if $\alpha_1^m<1/2$, a higher value of π increases b^*. Hence, b^* increases with the difference between α_1^m and the expected value of α_2^m. □

The intuition is that an increase in debt today implies a reduction of aggregate spending tomorrow. But tomorrow only one kind of public good will be consumed. Hence, with positive probability (and with probability 1 if $1>\alpha_1^m>0$), this reduction of spending will affect only the good with a low marginal utility from the point of view of today's median voter. Thus, the median voter of period 1 does not fully internalize the cost of issuing debt: he finds it optimal to spend in excess of the current aggregate endowment. Moreover, the incentive to borrow is stronger the lower is the marginal utility of the future public good. This is more likely to happen if the future median voter has very different tastes from the current median voter.

We now show that, under appropriate conditions, this basic intuition extends to the more general case in which α_2^m lies in the open interval (0,1). With no loss of generality, suppose that over this interval α_2^m is distributed according to a continuous probability function $H(\cdot)$, where $H(\alpha)\equiv \mathrm{prob}(\alpha_2^m\leq\alpha)$. Then (6) can be rewritten as:

$$(10)\qquad \int_0^1\left[\alpha_1^m u'(g_1^*)-v(\alpha_2^m)\right]dH(\alpha_2^m)=0,$$

where $v(\alpha_2^m)$ is the marginal cost of repaying the debt, given that in period 2 the median voter tastes parameter is α_2^m. After some transformations we obtain:

$$(11)\qquad v(\alpha_2^m)=$$
$$\frac{u'(g_2^*)u'(f_2^*)\left[\alpha_1^m\lambda(f_2^*)+(1-\alpha_1^m)\lambda(g_2^*)\right]}{u'(g_2^*)\lambda(g_2^*)+u'(f_2^*)\lambda(f_2^*)},$$

where $g_2^*=G(\alpha_2^m,b)$, $f_2^*=F(\alpha_2^m,b)$, and where $\lambda(\cdot)\equiv -u''(\cdot)/[u'(\cdot)]^2$ is the "concavity index" of $u(\cdot)$ as in Gerard Debreu and Tjalling C. Koopmans (1982).

We now assume that $u(\cdot)$ has the following property.[7]

[7]This condition can also be stated as:

$$u'''(x)>2[u''(x)]^2/u'(x), \qquad 1>x>0.$$

(c) The concavity index of $u(x)$, $\lambda(x)$, is decreasing in x, for $1>x>0$.

That is, we assume that $u(\cdot)$ becomes less concave in the sense of the index of Gerard Debreu and Tjalling C. Koopmans (1982) as consumption increases. This hypothesis is more restrictive than decreasing absolute risk aversion: it implies that the coefficient of absolute risk aversion falls more rapidly than marginal utility as consumption increases. This hypothesis is satisfied for several commonly used utility functions, such as any CES function $u(x)=x^{\gamma}/\gamma$ with $1>\gamma>0$.

The Appendix proves that, at the point $b=0$, $\alpha_1^m u'(f_1)-v(\alpha_2^m)>0$ for any $\alpha_2^m \neq \alpha_1^m$ if $u(\cdot)$ satisfies condition (c). Hence, under this condition, at the point $b=0$ the marginal gain of issuing debt exceeds the corresponding expected marginal cost (i.e., the left-hand side of (10) is strictly positive at the point $b=0$). Thus:

PROPOSITION 2: *Given that* $\alpha_2^m \in (0,1)$, $b^*>0$ *if (c) holds.*

Next, let us define the probability distribution $H(\alpha_2^m)$ as "more polarized relative to α_1^m" than the distribution $K(\alpha_2^m)$ if, for any continuous increasing function $f(\cdot)$, the following condition is satisfied:

$$(12)\quad \int_0^1 f(|\alpha_2^m-\alpha_1^m|)\,dH(\alpha_2^m) > \int_0^1 f(|\alpha_2^m-\alpha_1^m|)\,dK(\alpha_2^m).$$

That is, a more polarized probability distribution assigns more weight to values of α_2^m that are further apart from α_1^m. The Appendix also proves that, if condition (c) holds, then for any $b>0$ the expression $[\alpha_1^m u'(g_1^*)-v(\alpha_2^m)]$ is an increasing function of $|\alpha_2^m-\alpha_1^m|$ (strictly increasing if $|\alpha_2^m-\alpha_1^m|>0$). Then, using (10) and appealing to the second-order conditions, we also have:[8]

PROPOSITION 3: *Under the same condition of Proposition* 2, b^* *is larger the more polarized is the probability distribution of* α_2^m *relative to* α_1^m *over the interval* $(0,1)$.

If the concavity index $\lambda(x)$ is everywhere increasing (constant) for $1>x>0$, then Propositions 2 and 3 hold in reverse: $b^*<0$ ($b^*=0$), and b^* is more negative if $H(\alpha_2^m)$ is more polarized. If $\lambda(x)$ is not monotonic over $1>x>0$, then the sign of b^* is ambiguous.

The role played by condition (c) is highlighted in Figure 1. The downward sloping line denotes the opportunity set faced by the median voters in both periods if $b=0$. A positive value of b shifts this line to the right in period 1, and to the left in period 2. A and B denote the points chosen in periods 1 and 2 by the median voters of type α_1^m and α_2^m respectively, again for $b=0$. For concreteness, it has been assumed that $\alpha_1^m>1/2>\alpha_2^m$. The indifference curves for the median voter of type α_1^m in periods 1 and 2 are labeled I and II, respectively. Finally, the upward sloping lines EP_1 and EP_2 denote the income expansion paths of types α_1^m and α_2^m. With a decreasing concavity index, the voters' indifference curves become flatter at higher levels of income; that is, the two public goods become closer substitutes. As a result, the divergence between the choices of the two types of median voter increases with income, and their income expansion paths diverge.[9] To put it differently, with a decreasing concavity index for $u(\cdot)$, disagreement concerning the optimal composition of g and f is a luxury good: it grows with the overall size of public spending.

The ambiguity of the sign of b^* for $1>\alpha_2^m>0$ is due to the opposite influence of two countervailing forces. By running a surplus

[8]The same results would go through if other measures of distance between α_2^m and α_1^m were used in (12), such as euclidean norm or $(\alpha_1^m-\alpha_2^m)^2$.

[9]The income expansion paths are not necessarily linear: Their slopes can be shown to equal $R(g_2^*)/R(f_2^*)$ and $R(f_2^*)/R(g_2^*)$ for EP_2 and EP_1, respectively, where $R(\cdot)\equiv -u''(\cdot)/u'(\cdot)$ is the coefficient of absolute risk aversion of $u(\cdot)$. Note that the income expansion paths would be divergent even if points A and B were both below the 45° line, that is, if either $\alpha_1^m, \alpha_2^m>1/2$, or $\alpha_1^m, \alpha_2^m<1/2$.

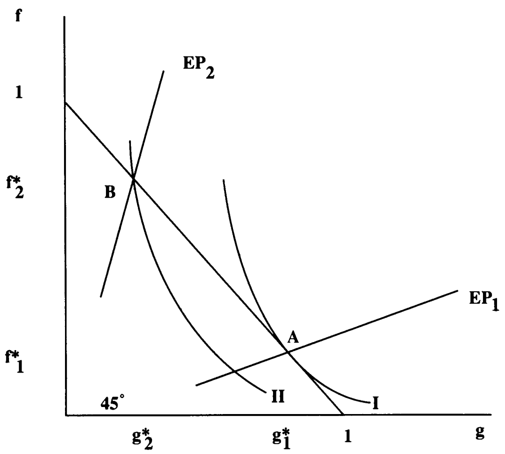

FIGURE 1

($b < 0$), the median voter in period 1 moves A to the left along EP_1 and B to the right along EP_2; this has the effect of reducing the distance between the indifference curves labeled I and II. Hence, a surplus "buys insurance" for the median voter of period 1, since it tends to equalize the median voter's utility in the two periods. This is the force that works in the direction of making a surplus today more desirable.

On the other hand by running a deficit ($b > 0$), the median voter of period 1 moves B to the left along EP_2. This takes the future composition of public spending toward the point that is preferred by today's median voter. This is the force that provides the incentive to issue public debt today. Debt is used strategically, to influence the future spending decision in the direction preferred by the current majority.

Condition (c) guarantees that the second effect dominates the first. This condition is more likely to be satisfied if the slopes of EP_1 and EP_2 are very divergent from each other (that is, if the substitutability of g and f increases very rapidly with income); or if the indifference curves are very flat (that is, if the utility function is not very concave), because in this case the indifference curves labeled I and II are close to each other.

Summarizing, Propositions 1–3 imply that an equilibrium with debt occurs if: (i) the future median voter has extreme preferences and is at a corner (i.e., $\alpha_2^m \notin (0,1)$); or (ii) the concavity index of $u(\cdot)$ is decreasing. Moreover, in both cases, the size of debt is larger the greater is the likelihood of values of α_2^m very different from α_1^m; that is, using the previous terminology, the more polarized are the current and future majorities.

In a more general model, the future median voter could be at a corner even if $1 > \alpha_2^m > 0$. For instance, if the utility function $u(\cdot)$ did not satisfy the Inada conditions, so that the indifference curve of Figure 1 would intersect either the horizontal or the vertical axis. Alternatively, if the public goods g and f had to be provided in some minimum amounts (for instance, because of survival reasons), the future decision maker could be at a corner even for $1 > \alpha_2^m > 0$. In both cases, the income expansion paths of future majorities would be either vertical or horizontal, so that issuing debt would always take the composition of public spending in the desired direction.[10]

D. *Positive Implications*

Propositions 1–3 relate the size of budget deficits to the instability of the median voters' preferences over time. This type of instability, in turn, depends upon the distribution of individual preferences within society. We now argue that the more "homogeneous" are the preferences of different individuals, *coeteris paribus* the more stable are the median voter preferences over time.

Consider a family of density functions indexed by ε: let $\gamma(\alpha, \varepsilon)$ be the frequency distribution of α over the $[0,1]$ interval, where α is the parameter that summarizes individual preferences in equation (2). Thus, ε represents a perturbation of the distribution of the voters' preferences, associated with random shocks to the voting participation or to the eligibility of the voting population.

[10] Note however that the probability that the future decision maker is at a corner would be endogenous in this case, and in particular it would depend on the size of the debt. This adds another dimension to the problem.

The median voter's preferences, $\alpha^m(\varepsilon)$, are then defined implicitly by:

$$\int_0^{\alpha^m} \gamma(\alpha, \varepsilon)\, d\alpha - \frac{1}{2} = 0. \tag{13}$$

The relationship between α^m and ε depends on the properties of the density function $\gamma(\alpha, \varepsilon)$: by applying the implicit function theorem to (13) one obtains:

$$\frac{d\alpha^m}{d\varepsilon} = -\frac{\int_0^{\alpha^m} \gamma_\varepsilon(\alpha, \varepsilon)\, d\alpha}{\gamma(\alpha^m, \varepsilon)}, \tag{14}$$

where $\gamma_\varepsilon(\alpha, \varepsilon) \equiv \partial\gamma(\cdot)/\partial\varepsilon$. The numerator of (14) is the area underneath the density function that is shifted from one side to the other of α^m as ε varies. According to (14), for a given value of the numerator, the term $d\alpha^m/d\varepsilon$ is larger in absolute value the smaller is $\gamma(\alpha^m, \varepsilon)$. That is, if there are relatively few individuals in the population that share the median voter's preferences (i.e., if $\gamma(\alpha^m, \varepsilon)$ is small for all ε), then α^m varies a lot as the distribution is perturbed. Conversely, if the median voter preferences are representative of a large part of the population (i.e., if $\gamma(\alpha^m, \varepsilon)$ is large), then α^m is stable even in the face of large perturbations.

This result is illustrated in Figure 2. Consider the top distribution first. When ε changes from ε_1 to ε_2, a fraction of individuals corresponding to the area A is moved from the right to the left of $\alpha_1^m = \alpha^m(\varepsilon_1)$, to the area $A^1 = A$. This area is the numerator of (14). The new median voter, $\alpha_2^m = \alpha^m(\varepsilon_2)$, is found by equating the area between α_1^m and α_2^m, B, to the area A. Repeat the same perturbation to the distribution in the bottom of Figure 2. Clearly, the same area B corresponds to a larger horizontal distance between α_1^m and α_2^m: since the frequency of the population around α^m is relatively small, the median voter's preferences shift by more than in the case of the upper distribution. This is the sense in which a more polarized distribution of voters' preferences is associated with more instability in the induced probability distribution of the median voter's preferences.

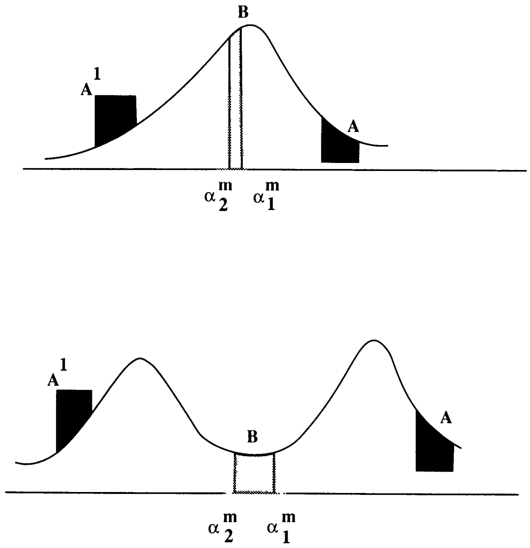

FIGURE 2

These considerations are suggestive of a testable implication that can explain the observed cross-country differences in debt policies. In more unstable and polarized political systems, there is a higher probability that future majorities will allocate government revenues to uses that are not valued by the current majority. Hence, according to our results, more polarized and politically unstable societies should exhibit larger deviations from budget balance, and if condition (c) is satisfied, these deviations should be in the direction of budget deficits.

III. Constitutional Constraints on the Budget Deficit

Section II.C shows that a social planner with stable preferences always chooses $b^* = 0$, for any weighting of individual utilities. That is, a balanced budget is always a component of the first best policy. On this ground, it is tempting to conclude that a budget deficit is inefficient in this model. However, this argument should be qualified. By assumption, a social planner chooses the composition of both periods 1 and 2 public goods according to a stable social welfare function. This assumption is violated in the political equilibrium of the model and in any real world political regime: the current majority cannot precommit the spending choices of future majorities. Hence, the solution to the social planner's optimum is not necessarily the optimal social contract for a group of individuals who cannot precommit the spending choices of future governments.

In order to characterize such an optimal social contract, we need to ask what is the optimal level of debt when there is uncertainty about the median voter preferences in both period 2 *and* period 1. Suppose that b is chosen under a "veil of ignorance," before knowing the composition of public spending in period 1. Following John Rawls (1971) and James Buchanan and Gordon Tullock (1962), we can think of a constitutional amendment on budget deficits as being chosen in this way. The optimal level of b for agent i is then determined as the solution to the following problem:

$$(15)\quad \operatorname*{Max}_{b} E\{\alpha^i[u(g(\alpha_1^m,b)) + u(G(\alpha_2^m,b))] + (1-\alpha^i)[u(f(\alpha_1^m,b)) + u(F(\alpha_2^m,b))]\},$$

where E is the expectations operator with respect to the random variables α_1^m and α_2^m; and where $g(\cdot)$, $f(\cdot)$, $G(\cdot)$, and $F(\cdot)$ are defined implicitly by (5) and (3) of the previous section. If α_1^m and α_2^m are drawn from the same prior distribution, then it is easy to show that the only solution to (15) is $b=0$, for any value of α^i. Using the terminology of Bengt Holmstrom and Robert Myerson (1983), we conclude that a balanced budget rule is "*ex ante* efficient": before knowing the identity of the current majority, the group unanimously favors a balanced budget.[11]

If however the value of α_1^m is known when choosing b, then we are back in the equilibrium examined in the previous section, where a majority might support a deficit. These results may explain why the majority of voters seems to generally favor an abstract notion of balanced budgets, even though when choosing specific policies the same majority votes in favor of budget deficits (see the literature quoted in fn. 1). Balanced budgets are *ex ante* efficient; therefore, voters asked in a poll would approve of a balanced budget constitutional amendment. However, the same voters may favor a budget deficit in the current period, if uncertain about the preferences of future majorities.

More generally, each current majority does not want to be bound by the rule, even though it wants the rule for all future majorities. However, a budget rule taking effect at some prespecified future date would be irrelevant: if the rule can be abrogated by a simple majority, then any future majority would follow the policy described in Section II and would abrogate the rule. Using again the terminology of Bengt Holmstrom and Robert Myerson (1983), we conclude that in our model a balanced budget rule, though *ex ante* efficient, is not "durable" under simple majority.

This problem could be overcome by requiring a qualified majority to abrogate the rule. But this requirement would greatly reduce the flexibility with which to respond to

[11] If α_1^m and α_2^m have the same probability distribution, say $H(\cdot)$, then the first-order condition of (15) with respect to b can be written as:

$$\alpha^i\int_0^1[u'(g(\alpha,b))g_b(\alpha,b) + u'(G(\alpha,b))G_b(\alpha,b)]\,dH(\alpha) + (1-\alpha^i)\int_0^1[u'(f(\alpha,b)f_b(\alpha,b) + u'(F(\alpha,b))F_b(\alpha,b)]\,dH(\alpha)=0.$$

If $b=0$, the terms inside each integral sum to zero. Hence, by the second-order conditions, $b=0$ is the solution to (15). Unanimity would be lost if the distributions of α_1^m and α_2^m in (15) were different.

unexpected events. A budget rule could contain escape clauses, such as for cyclical fluctuations of tax revenues or wars. However, since it is very difficult or even impossible to list all relevant contingencies, requiring a very large majority to abandon (even temporarily) the budget balance constraint may be counterproductive. Presumably, in a model with uncertainty and constraints on the degree of "complexity" of the rule, there would be an "optimal qualified majority" corresponding to the optimal point on the tradeoff between commitment and flexibility.

Summarizing, there is a role for institutions that enable society to separate its intertemporal choices from decisions concerning the allocation of resources within any given period. Without this separation, the conflict over the allocation of resources within each period distorts society's intertemporal choices. However, there is also an inescapable conflict between preserving sufficient flexibility to meet unexpected contingencies, and the enforcement of this separation. Thus, as in many other problems of macroeconomic policy, such as monetary policy, society has to choose between simple rules and discretion.[12]

IV. Summary and Extensions

Disagreement between current and future voters about the composition of public expenditure generates a suboptimal path of public debt. Public debt is the legacy left by today's majority to the future, and under specific conditions it tends to increase with the likelihood of disagreement between current and future voters. The results of this paper are in principle testable. On time-series data for a single country, we should observe sustained budget deficits whenever a government with extreme preferences relative to the historical average wins the temporary support of a majority of the voters. On cross-countries data, more polarized and politically unstable countries should have a larger stock of debt outstanding than more homogeneous and stable societies. Nouriel Roubini and Jeffrey Sachs (1989a, b) present encouraging evidence along these lines.

Some possible generalizations of the basic framework of this paper are suggested in Section I. Another feasible extension would be to have an infinite horizon, by applying the dynamic programming solution procedure discussed in Alberto Alesina and Guido Tabellini (1987). With an infinite horizon, cooperation between current and future majorities could be sustained by trigger strategy equilibria. In these equilibria the path of public debt would approach the socially efficient value. However, this would require cooperation between successive majorities: cooperation amongst different voters within the same time period would not solve the intertemporal distortions that are the focus of this paper. Hence, this form of cooperation necessitates substantial coordination among voters. In addition, with discounting of the future, the qualitative implications of reputational equilibria are similar to those of the equilibrium studied in the present paper, as argued in a different context by Alberto Alesina (1987, 1988a).

Finally, a natural and yet difficult extension of the basic model would be to allow the voters to choose whether or not to repudiate the debt. In fact, the results of this paper are driven by an asymmetry in the possibility of commitments: even though voters cannot bind the future allocation of spending, they can force future majorities to fully service the debt. This assumption is realistic if applied to industrialized economies during recent decades. But still the puzzle remains of what is the source of this asymmetry. Some recent literature has em-

[12] Interestingly, in the case of budget deficits in the United States this conflict has been resolved in different ways at the federal and state government levels. Whereas the federal government and legislature have retained full discretion in their borrowing policies, the constitution of most states in the United States forbids the issue of state or local government debt to finance current expenditures. These state restrictions on public borrowing probably reflect the 19th century history of defaults of local and state debts (see B. V. Ratchford, 1941, and William A. Scott, 1893). But the asymmetry between the federal and state restrictions on public borrowing may also be due to the value of discretion being higher at the federal than at the state level: expenditures and revenues of state governments are generally easier to predict than those of the federal government.

phasized that reputation creates incentives to honor the debt of previous governments.[13] A second answer closer to the spirit of this paper is that defaulting on the government debt brings about political and redistributional costs.[14] Further investigation of this point is the task of future research.

APPENDIX

For a given value of b, $v(\alpha_2^m)$ is continuous in $1 > \alpha_2^m > 0$ (since $u(\cdot)$ is assumed to be twice continuously differentiable). After some algebra, $v'(\alpha_2^m)$ simplifies to:

$$v'(\alpha_2^m) = \frac{u'(g_2^*)\Delta\left(\frac{1-\alpha_1^m}{\alpha_1^m} - \frac{1-\alpha_2^m}{\alpha_2^m}\right)}{[R(g_2^*)+R(f_2^*)]^2}\frac{dg_2^*}{d\alpha_2^m},$$

where

$$\text{(A1)} \qquad \frac{dg_2^*}{d\alpha_2^m} > 0 \text{ and}$$

$$\Delta = R(g_2^*)\left[R(f_2^*)^2 + R'(f_2^*)\right] + \left[R(g_2^*)^2 + R'(g_2^*)\right].$$

If $\lambda(x) \equiv -u''(x)/[u'(x)]^2 \equiv R(x)/u'(x)$ is decreasing in x for $1 > x > 0$, then $\Delta < 0$. Hence for any b:

$$\text{(A2)} \qquad v'(\alpha_2^m) \gtreqless 0 \text{ as } \alpha_2^m \lesseqgtr \alpha_1^m,$$

if (c) holds. These properties imply that, under (c), $v(\alpha_2^m)$ reaches a maximum at the point $\alpha_2^m = \alpha_1^m$, and is strictly decreasing in $|\alpha_2^m - \alpha_1^m|$ if $\alpha_2^m \neq \alpha_1^m$. Hence, for given α_1^m and given b, the expression $[\alpha_1^m u'(g_1) - v(\alpha_2^m)]$ reaches a minimum at $\alpha_2^m = \alpha_1^m$ and is strictly increasing in $|\alpha_2^m - \alpha_1^m|$ if $\alpha_2^m \neq \alpha_1^m$.

Consider now this expression at the point $b = 0$. The discussion on p. 8 of the text implies that, at $b = 0$, $\alpha_1^m u'(g_1) - v(\alpha_1^m) = 0$. Since, as shown above, under (c) $\alpha_1^m = \operatorname{argmax} v(\alpha_2^m)$, we have that, if $b = 0$:

$$\alpha_1^m u'(g_1) - v(\alpha_2^m) \geq 0$$

with strict inequality if $\alpha_2^m \neq \alpha_1^m$.

[13]See in particular Herschel Grossman and John Van Huyck (1987). A larger literature has investigated the problem of external debt repudiation, for instance, Jeffrey Sachs (1984), Jeremy Bulow and Kenneth Rogoff (1989), Herschel Grossman and John Van Huyck (1988).

[14]Recent accounts of historical episodes of debt repayments in Europe during the interwar period lend support to this second view (see for instance Alberto Alesina (1988b) and B. Eichengreen (1989)). Guido Tabellini (1989) analyzes a model in which in equilibrium a majority of the voters is in favor of repaying the public debt outstanding, so as to avoid wealth redistributions.

REFERENCES

Alesina, Alberto, "Macroeconomic Policy in a Two-Party System as a Repeated Game," *Quarterly Journal of Economics*, August 1987, *102*, 651–78.

______, (1988a) "Credibility and Policy Convergence in a Two-Party System with Rational Voters," *American Economic Review*, September 1988, *78*, 796–805.

______, (1988b) "The End of Large Public Debts," in F. Giavazzi and L. Spaventa eds., *High Public Debt: The Italian Experience*, Cambridge University Press and CEPR, Cambridge, 1988.

______ **and Tabellini, Guido,** "A Positive Theory of Fiscal Deficits and Government Debt in a Democracy," NBER Working Paper No. 2308, July 1987.

______ **and** ______, "External Debt, Capital Flights and Political Risk," *Journal of International Economics*, 1989, forthcoming.

Barro, Robert, "On the Determination of Public Debt," *Journal of Political Economy*, Part 1, October 1979, *87*, 940–47.

Blinder, Allan, and Holtz-Eakin, Douglas, "Public Opinion and the Balanced Budget," NBER Working Paper No. 1234, 1983.

Buchanan, James, Rowley, Charles and Tollison, Robert, *Deficits*, Oxford, UK: Basil Blackwell, 1987.

______ **and Tullock, Gordon,** *The Calculus of Consent*, Ann Arbor: University of Michigan Press, 1962.

Bulow, Jeremy and Rogoff, Kenneth, "A Recontracting Model of External Debt," *Journal of Political Economy*, February 1989, *79*, 155–78.

Caplin, Andrew and Nalebuff, Barry, "On 64% Majority Rule," *Econometrica*, July 1988, *56*, 787–814.

Cukierman, Alex and Meltzer, Allan, "A Political Theory of Government Debt and Deficits in a Neo-Ricardian Framework," *American Economic Review*, September 1989, *79*, 713–31.

Debreu, Gerard and Koopmans, Tjalling C., "Additively Decomposed Quasi-convex Functions," *Mathematical Programming*, *24*, February 1982, 1–38.

Eichengreen, B., "The Capital Levy in Theory and Practice," in R. Dornbusch and M. Draghi, eds., Cambridge: Cambridge University Press, forthcoming 1989.

Ferejohn, John, "Incumbent Performance and Electoral Control," *Public Choice*, January 1986, *50*, 5–26.

Glazer, Ami, "Politics and the Choice of Durability," mimeo., University of California at Irvine, 1987.

Grandmont, Jean Michel, "Intermediate Preferences and the Majority Rule," *Econometrica*, March 1978, *46*, 317–30.

Grossman, Herschel and Van Huyck, John, "Nominally Denominated Sovereign Debt, Risk Shifting and Reputation," NBER Working Paper No. 2259, 1987.

______ **and** ______, "Sovereign Debt as a Contingent Claim: Excusable Default, Repudiation, and Reputation," *American Economic Review*, December 1988, *78*, 1088–97.

Holmström, Bengt and Myerson, Robert, "Efficient and Durable Decision Rules with Incomplete Information," *Econometrica*, November 1983, *51*, 1799–819.

Ledyard, John "The Pure Theory of Large Two-Candidate Elections," *Public Choice*, August 1984, *44*, 7–41.

Lucas, Robert and Stokey, Nancy, "Optimal Monetary and Fiscal Policy in an Economy Without Capital," *Journal of Monetary Economics*, July 1983, *12*, 55–93.

Peleg, Bezalel and Yaari, Menahem, "On the Existence of a Consistent Course of Action When Tastes Are Changing," *Review of Economic Studies*, July 1973, *40*, 391–401.

Persson, Torsten and Svensson, Lars, "Checks and Balances on the Government Budget," *Quarterly Journal of Economics*, May 1989, *104*, 325–46.

Ratchford, B.V., *American State Debts*, Durham, NC: Duke University Press, 1941.

Rawls, John, *A Theory of Justice*, Cambridge: Harvard University Press, 1971.

Rogoff, Kenneth and Sibert, Anne, "Equilibrium Political Business Cycles," *Review of Economic Studies*, January 1988, *55*, 1–16.

Roubini, Nouriel and Sachs, Jeffrey, (1989a) "Political and Economic Determinants of Budget Deficits in Industrialized Democracies," *European Economic Review*, forthcoming, 1989.

______ **and** ______, (1989b) "Government Spending and Budget Deficits in the Industrial Countries," *Economic Policy*, Spring 1989, *8*.

Sachs, Jeffrey, "Theoretical Issues in International Borrowing," *Princeton Studies in International Economics*, 54, May 1984.

Scott, William A., *The Repudiation of State Debts*, Boston: T. Crowell & Co., 1893.

Strotz, Robert, "Myopia and Inconsistency in Dynamic Utility Maximization," *Review of Economic Studies*, *23*, 1956, 165–80.

Tabellini, Guido, "Domestic Politics and the International Coordination of Fiscal Policies," *Journal of International Economics*, forthcoming, 1989.

______, "The Politics of Intergenerational Redistribution," NBER Working Paper No. 3058, 1989.