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2 A Model of Endogenous Fiscal Deficits and Delayed Fiscal Reforms

Andrés Velasco

2.1 Introduction

Two striking facts characterize the recent fiscal policy of a number of countries. First, since 1973 there has been a pronounced and systematic increase in government spending and budget deficits (both measured as a percentage of GDP). This is true of both OECD economies and developing countries such as those in Latin America.[1] Second, in some cases fast debt accumulation has been allowed to go on unchecked for long periods of time, giving rise to a path that is inconsistent with intertemporal solvency. In some extreme cases, such as those of Mexico, Argentina, and Bolivia in the 1980s, drastic changes in spending and taxes were eventually required to restore solvency. In other serious but less dramatic cases—such as those of Belgium and Italy, where the public debt is above 100 percent of GNP and growing—lasting fiscal stabilization is yet to occur.

Neither feature is easy to reconcile with the neoclassical model (Barro 1979) that views debt accumulation as a way to spread over time the costs of distortionary taxation. While the neoclassical model fits the U.S. data reasonably well (Barro 1986), cyclical and intertemporal smoothing factors cannot fully account for the recent increase in peacetime deficits in OECD countries (Roubini and Sachs 1989).[2] Furthermore, the tax-smoothing model does not seem

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1. On the OECD, see Alesina and Perotti 1994. The fiscal experience of a number of Latin American countries is also reported and analyzed in Tornell and Velasco 1995 and references therein. See also the essays in Larraín and Selowsky 1991.

2. In a recent paper, Bizer and Durlauf (1990) argue that U.S. tax rates do not seem to be a random walk, as implied by the theory. Rather, they find an eight-year cycle for tax changes, a feature suggestive of a political equilibrium.

to fit the budget data from developing countries (Edwards and Tabellini 1991; Roubini 1991).

Even harder to justify as the result of rational government action are the debt bubbles (and sometimes the accompanying inflation) that occur when stabilization is delayed, as discussed by Alesina and Drazen (1991). If the need for an eventual fiscal correction can be foreseen, nothing can be gained by waiting. This is especially true if distortionary taxes, especially inflation, are heavily used during the transition.

This paper develops a political-economic model of government behavior that can throw light on both of these puzzles. To do so, it goes beyond the standard model of a representative individual and a benevolent policymaker bent on maximizing the individual's welfare. It considers a society divided into several influential interest groups, each of which benefits from a particular kind of government spending. The government is assumed to be weak, in that each of the interest groups can influence fiscal authorities to set net transfers on the group's target item at some desired level. Hence, we have a case of "fragmented" fiscal policymaking.

This setup can be interpreted in one of several ways, all of which have counterparts in countries' recent experience. First, spending pressures may arise from sectoral ministers or parliamentary committees with special interests that overwhelm a weak finance minister. In a detailed set of studies of the European Community in the 1970s and 1980s, von Hagen (1992) and von Hagen and Harden (1994) conclude that budgeting procedures that lend the finance minister "strategic dominance over spending ministers" and "limit the amendment powers of parliament" are strongly conducive to fiscal discipline. The opposite arrangement often leads to sizable deficits and debts.[3] The three countries with weakest budgetary procedures (those with the weakest finance minister, most parliamentary amendments, etc.) had deficits that averaged 11 percent of GDP in the 1980s, while the three countries with the strongest procedures had deficit ratios of 2 percent. The accumulated public debt stocks were also very different between these two sets of countries.[4] Similar results are reported by Alesina et al. (1996) in their study of 20 Latin American and Caribbean countries. Using a methodology quite similar to that of von Hagen, they find that the 6 countries with the strongest fiscal processes had, between 1980 and 1993, fiscal surpluses that averaged 1.8 percent of GDP; the 7 countries with the weakest processes had deficit ratios of 2.2 percent over the same period.

3. More specifically, von Hagen (1992) constructs an index characterizing EU national budget processes on four grounds: (*a*) strength of the prime minister or finance minister in budget negotiations; (*b*) existence of overall budget targets fixed early on and limits on parliamentary powers of amendment; (*c*) transparency of the budget document; and (*d*) limited discretion in the implementation of the budget.

4. More generally, Roubini and Sachs (1989a,b) and Grilli, Masciandaro, and Tabellini (1991) have shown that among OECD countries, those with proportional representation systems and fractionalized parties tend to display high deficits and debt.

Second, spending may be set by decentralized fiscal authorities representing particular geographical areas. The cases of Argentina and Brazil are instructive.[5] They are both federal countries in which over the last two decades many spending responsibilities have been transferred to the subfederal level. Lacking sufficient revenues of their own and facing unclear rules, subfederal governments have systematically run deficits that de facto have become the responsibility of the federal authorities. There have generally been three mechanisms through which state and provincial entities could "pass on" their deficits: *(a)* borrowing from state development banks, which in turn could rediscount their loans at the central bank—in effect monetizing the subfederal deficits; *(b)* obtaining discretionary lump sum transfers from the federal government, generally requested around election time and after large debts had been accumulated; and *(c)* accumulating arrears with suppliers and creditors, which (for either legal or political reasons) were eventually cleared up by the federal authorities. Understanding that at least part of the cost would be borne by others, subfederal governments have been tempted to overspend and overborrow. Similar troubles affected the former Yugoslavia. They are also becoming increasingly severe in Russia, as Wallich (1992) and Sachs (1994) argue.

Third, transfers may be determined by money-losing state enterprises facing soft budget constraints—for instance in Mexico and Brazil in the 1970s or in Russia and some countries of Eastern Europe more recently. As Kornai (1979) emphasized, state firms have an incentive to pay excessive wages (thus simply reducing the profit stream that would go to the Treasury) and engage in large and risky investments (managers benefit from running larger firms but bear none of the investment risk). Bankruptcy is not a real threat, as government subsidies and bailouts from state banks often extend the life of distressed firms. Lipton and Sachs (1990), among others, have pointed out that this problem became increasingly acute with the decline of Communism and the beginning of transition. Holzmann (1991) estimates that in Eastern Europe during the 1980s budgetary subsidies to state enterprises averaged almost 10 percent of GDP.

The inefficiencies that arise when several groups or officials with redistributive aims have control over fiscal policy have been recognized in the literature. Weingast, Shepsle, and Johnsen (1981) and, more recently, Chari and Cole (1993) and Chari, Jones, and Marimon (1994) show that having the supply of local public goods financed with national or federal revenues creates incentives for pork barrel spending. Aizenman (1991) and Zarazaga (1993) have argued that if fiscal and/or monetary policy are decided upon in a decentralized manner, a "competitive externality" arises that gives the economy an inflationary

5. The case of Argentina is studied in Jones, Sanguinetti, and Tommasi 1997 and World Bank 1990a, b, and c and that of Brazil in Shah 1990 and Bomfin and Shah 1991. Stein, Talvi, and Grisanti (chap. 5 in this volume) discuss fiscal arrangements at the subnational level for all of Latin America and the Caribbean.

bias. What all these models have in common is that, because the benefits from spending accrue fully to each group, while the costs are spread over all groups, incentives are distorted and a "spending bias" emerges.

As Alesina and Perotti (1994) stress, however, the models in the literature so far are essentially static, focusing on the level of expenditures rather than on the behavior of debt and deficits.[6] This chapter by contrast, focuses on the dynamic aspects of fragmented fiscal policymaking in the context of an infinite horizon model. Fiscal authorities are confronted with an explicit intertemporal trade-off: high deficits today mean lower spending or higher taxes tomorrow. Does a divided government structure lead rational fiscal authorities to run debts and deficits that are "too high" in some well-defined sense? The model in section 2.3 below provides an affirmative answer to this question. If government net assets (the present value of future income streams minus outstanding debts) is the common property of all fiscal authorities, then a problem arises that is logically quite similar to the "tragedy of the commons" that occurs in marine fisheries or public grazing lands (Levhari and Mirman 1980; Benhabib and Radner 1992). Two distortions are present if n agents share the stock of the resource. First, each uses the whole stock and not one-nth of it as the basis for consumption or spending decisions. Second, the return on savings as perceived by one agent is the technological rate of return (the rate of interest or the rate of growth of natural resource stocks) minus what the other $n - 1$ agents take out. Hence, to the extent that savings depends positively on the rate of return, each agent undersaves (overspends in the case of fiscal policy, overexploits in the case of natural resources). This means that deficits are incurred and debts accumulated even in contexts where there is no incentive for intertemporal smoothing, so that a central planner guiding fiscal policy would run a balanced budget.[7] In short, the model exhibits a "deficit bias."

But any empirically plausible model must account not only for debt accumulation. After all, since the borrowing binge of the 1970s and 1980s many countries (particularly in Europe and Latin America) have drastically restructured their fiscal policies and curtailed debt growth. Indeed, the model of this paper can also account for fiscal stabilizations—that is to say, changes in fiscal policy that end the process of debt accumulation.

For that purpose I study trigger-strategy equilibria, in which interest groups coordinate on a zero-deficit path for spending and threaten to return to the excess-deficit path the period after a defection has been detected. Groups' payoffs depend on the outstanding stock of government debt. A fiscal stabilization

6. A partial exception is Chari and Cole 1993, who consider a two-period model.

7. Of course, this is not the only type of "political economy" explanation for the existence of budget deficits. An important explanation is provided by Persson and Svensson (1989), Tabellini and Alesina (1990), and Alesina and Tabellini (1990). In their models, society is divided into groups with different preferences (over the composition of government spending, for instance). Because current majorities know that in the future a different majority with different preferences may be in control of fiscal policy, those currently in power attempt to "bind" the actions of their successors by leaving them a large public debt.

may not be sustainable from low levels of debt (high levels of government net assets), but may become sustainable once debt reaches a sufficiently high level. The intuition for this result is simple. As debt grows and the government becomes poorer, the static efficiency gains associated with stabilization become more attractive relative to the payoff groups can obtain by continuing to transfer aggressively, until eventually low spending and stabilization become sustainable in equilibrium. Thus, the model suggests a rationale for the popular notion that "things have to get very bad before they can get better again." Or, in the sense of Alesina and Drazen (1991), the model can generate delayed stabilizations.

The paper is structured as follows. Section 2.2 sets up the basic model, while section 2.3 characterizes a simple Markov-Nash equilibrium of the dynamic game between the interest groups and derives the endogenous budget deficit. Section 2.4 introduces "trigger strategies," and section 2.5 characterizes the "switching equilibrium" that results in a delayed fiscal reform. Section 2.6 analyzes the effects of adverse shocks, while section 2.7 offers a summary and some conclusions.

2.2 The Basic Model

There are n symmetric groups, indexed by $i, i = 1, 2, \ldots, n$. Each can be thought of as a particular constituency or recipient of government largesse. Net transfers to group i—denoted by g_i—can be interpreted as subsidies to its members minus the taxes that group pays, or net spending on a public good that only benefits those in group i. Hence, g_i can be positive or negative, but there is a maximum negative transfer (tax), denoted by $\bar{g}$, that can be extracted from any group.

Any excess of expenditure over revenues can be financed by borrowing in the world capital market at a constant gross real rate R, which is exogenous given the assumption that the economy is small and open. Accumulated debts are a joint liability of all n groups, as would be the case with the national debt in any country. The government budget constraint therefore is

$$(1) \qquad b_{t+1} = Rb_t + y - z_t - \sum_{i=1}^{n} g_{it},$$

where y denotes exogenous nontax government revenue (e.g., income from state enterprises or transfers from abroad)[8] and b_t is the stock of the internationally traded bond held by the government at time t, which can be interpreted as the gross international reserves minus outstanding public debt—both earning or paying the interest rate R. The variable z_t represents a deadweight loss per period of time; conditions under which this cost is incurred are made explicit below.

8. This serves simply as a shift parameter, which is useful in section 2.6 below. Before that, nothing changes if it is simply set to zero.

As is usual in this kind of setting, we impose on the government the solvency condition

$$(2) \qquad \lim_{t\to\infty} b_t R^{-t} \geq 0,$$

which simply ensures that debt does not grow without bound. Solving equation (1) as of any time t and imposing equation (2) yields

$$(3) \qquad \sum_{i=1}^{n} \sum_{s=t}^{\infty} g_{is} R^{-(s-t)} \leq Rb_t + \left(\frac{R}{R-1}\right) y - \sum_{s=t}^{\infty} z_s R^{-(s-t)},$$

which has the standard interpretation that the present value of all net transfers as of t cannot exceed the value of the government's assets plus the present value of all of its net income (inclusive of possible deadweight losses). Adding $[R/(R-1)]\, n\bar{g}$ to both sides of equation (3) we obtain

$$(4) \quad \sum_{i=1}^{n} \sum_{s=t}^{\infty} (g_{is} + \bar{g}) R^{-(s-t)} \leq R\left[b_t + \frac{y + n\bar{g}}{R-1} - R^{-1} \sum_{s=t}^{\infty} z_s R^{-(s-t)}\right] \equiv Rw_t,$$

where w_t can be interpreted as the maximum wealth the government can have, starting from assets b_t and given the expected sequence $\{z_s\}_{s=t}^{\infty}$. Notice from this definition that w_t must be nonnegative for the government to remain solvent: otherwise at some later point transfers would have to be below $-\bar{g}$, something that is infeasible given our assumptions.

How do groups interact in order to determine fiscal policy? The key assumption is that the central fiscal authority is weak, and that group i itself can determine (subject to a constraint made explicit below) the sequence $\{g_{it}\}_{t=0}^{\infty}$. While each group has many members, they act in a coordinated fashion (through a congressional leader or member of the cabinet, for example) in setting the level of net transfers g_{it}.

To ensure that the lack of coordination in ministers' actions does not lead to a violation of the solvency condition, it is necessary to impose a rule that prevents ministers' total desired net transfers from exceeding the maximum feasible amount. Suppose that after groups decide on their target transfers g_{it}, these are satisfied by the central fiscal authority (the finance minister or the president) as long as

$$(5) \qquad g_{it} \leq (R/n) w_t, \quad \forall i \text{ and } \forall t.$$

Any minister whose desired net transfer violates equation (5) simply gets zero.[9] Application of this rule leads to $\sum_{i=1}^{n} g_{it} \leq Rw_t$ for all i and all t.

9. Note that this rule simply prevents solvency from being violated as a result of the lack of coordination among ministers. Why the government as a whole (represented by the finance minister or president) chooses to remain solvent—or not to default—is a question beyond the scope of this paper. I simply assume away the possibility of default, as does most of the literature on optimal fiscal policy. For important papers that study default explicitly in similar contexts, see Bulow and Rogoff 1989, Atkeson 1991, and Chari and Kehoe 1993a and b.

The leader of group i maximizes the objective function

$$U_i = \sum_{s=t}^{\infty} \log(g_{is} + \bar{g})R^{-(s-t)} \tag{6}$$

with respect to g_{it} starting at each time $t > 0$, subject to equations (1), (2), and (5). Thus, groups' utility is an increasing function of the excess of the actual net transfer they receive over the minimum they could have received. I assume a logarithmic utility function in order to get closed-form solutions.

Equations (1), (2), (5), and (6) provide the setting for a dynamic game among the leaders of the n groups. Before constructing equilibria for that game, however, it is useful to ask about the level of transfers that would be chosen by a benevolent planner that maximized the joint welfare of all groups (with equal weights for each). It is easy to show that, because groups' subjective rate of time preference is equal to the world rate of interest, the planner would to each group to transfer one-nth of the government's permanent income. Thus,

$$g_{it} = \frac{(R - 1)b_t + y - \left(\frac{R - 1}{R}\right)\sum_{s=t}^{\infty} z_s R^{-(s-t)}}{n}, \tag{7}$$

which—if all n groups follow it—ensures that debt is constant if z_t is constant. This policy is used below as a benchmark with which to compare game outcomes.

Assume finally that, if and only if all groups agree to stabilize, the deadweight loss disappears:

$$z_t = \begin{cases} 0 \text{ if } g_{it} = \dfrac{(R - 1)b_t + y - \left(\frac{R - 1}{R}\right)\sum_{s=t}^{\infty} z_s R^{-(s-t)}}{n} \ \forall i \\ z \text{ otherwise.} \end{cases} \tag{8}$$

Notice that if all groups follow the transfer policy in equation (7), then $z_t = 0$ for all t; as a result, debt is constant throughout. I will refer to such policies as being associated with "fiscal stabilization."

The assumption on the deadweight loss in equation (8) can be justified by the presence of static efficiency gains associated with stabilization. The suggested interpretation is that government resources are no longer wasted in dealing with lobbyists, in the spirit of Krueger (1974) and Bhagwati (1982). Alternatively, following Alesina and Drazen (1991), the net gain to government finances associated with stabilization could be interpreted as a switch to nondistortionary taxes or a lowering of tax collection costs, so that the government gets more revenue (net of costs) for each unit of output obtained from the private sector. Or, one could assume that stabilization produces a permanent increase in government income, perhaps in transfers from abroad intended to reward sound fiscal behavior. All that matters for the results below is that the gains from stabilizing extend beyond the dynamic benefits of curtailing net transfers and debt accumulation. In the interest of realism, I henceforth assume that $z < y$.

The timing of actions is as follows. The economy enters period t with government assets Rb_t. Government net transfers then take place, with the n groups simultaneously setting their transfers g_{it}. The deadweight loss then occurs according to equation (8).

I now characterize more formally the game among the groups and its corresponding equilibrium:

DEFINITION 1. *A strategy is a sequence* $\{g_{it}\}_{t=0}^{\infty}$ *for each player.*

DEFINITION 2. *An equilibrium for this game is represented by a set of strategies, one for each player, such that no group can improve its total payoff by a unilateral change in strategy at any point in the game.*

2.3 Endogenous Government Deficits

In this section I focus on simple Markovian strategies in which net transfers are a function of the state variable only, and temporarily assume away more complex behavior, such as trigger strategies, based on the previous history of the game.

Since the setting is log-linear, I construct an equilibrium in which each player uses policy rules such that actions are linear functions of the relevant state variable:

$$g_{it} = \mu + \phi R b_t, \tag{9}$$

where μ and ϕ are coefficients to be endogenously determined.

Suppose that starting at time t, group i expects that all other groups will employ rule (9) for all $s \geq t$. Then, debt evolves according to

$$b_{t+1} = Rb_t[1 - (n - 1)\phi] - (n - 1)\mu + y - z_t - g_{it}. \tag{10}$$

Group i's best response is therefore the solution to the problem

$$V(b_t) = \max_{g_{it}}\{\log(g_{it} + \bar{g}) + R^{-1}V(b_{t+1})\}, \tag{11}$$

subject to equations (5) and (10). Using this best response, and using the fact that all groups are symmetric, one can endogenously determine the coefficients μ and ϕ.

The Euler equation that corresponds to problem (11) is

$$g_{it+1} + \bar{g} = (g_{it} + \bar{g})[1 - (n - 1)\phi]. \tag{12}$$

Suppose next that μ and ϕ are such that equation (7) does not occur in equilibrium (we will check later, of course, whether this supposition is selfconfirming). It follows that in equation (10) we may replace z for z_t $\forall t$. As the appendix shows in greater detail, combining the resulting equation with equations (10) and (12), and imposing symmetry across all n groups we obtain

$$\mu = \frac{R(y - z) + (n - 1)\bar{g}}{1 + n(R - 1)} \text{ and } \phi = \frac{R - 1}{1 + n(R - 1)}, \tag{13}$$

so that each group's policy rule is

$$\begin{aligned} g_{it} &= \left(\frac{R}{1 + n(R - 1)}\right)\left[(R - 1)b_t + y - z + \left(\frac{n - 1}{R}\right)\bar{g}\right]\forall t \\ &= \phi R w_t - \bar{g}. \end{aligned} \tag{14}$$

Notice that $\phi R < R/n$, so that rule (5) is satisfied.

Clearly, the policy in equation (14) is a strategy in the sense of definition 1. It is also feasible, in that rule (5) is satisfied.[10] Then a set of such a strategies, one for each group, constitutes an equilibrium in the sense of definition 2: the strategies are best responses to themselves. The resulting Markov-Nash equilibrium is subgame perfect. That is because the strategies are specified as a function of the state (in this case debt), not of time. Hence, no group leader has an incentive to change strategies as a result of the mere passage of time.

Notice also that the policy rule in equation (14) does not correspond to the "stabilizing" net transfers rule in equation (7). Thus, given equation (8), the conjecture that $z_t = z$ $\forall t$ is confirmed.

Substituting equation (14) into equation (1), we obtain

$$b_{t+1} = \left(\frac{R}{1 + n(R - 1)}\right)b_t - \left(\frac{n - 1}{1 + n(R - 1)}\right)(y - z + n\bar{g}) < b_t, \tag{15}$$

where the inequality follows from the fact that $R/[1 + n(R - 1)] < 1$ as long as $n > 1$.

This result can also be expressed in terms of government wealth. It is the case that $1 - n\phi = 1/[1 + n(R - 1)]$. Using this result in equation (A5) we have

$$\frac{w_{t+1}}{w_t} = \frac{R}{1 + n(R - 1)} < 1. \tag{16}$$

Hence, w_t goes to zero only asymptotically, and solvency condition 2 in the text is satisfied.

Expressions (15) and (16) show two sides of the same result: there is an endogenously determined fiscal deficit, debt is accumulated and government wealth decreases over time: fragmented fiscal policymaking leads to a "deficit bias."

10. The solvency condition (2) is also satisfied, as I show below.

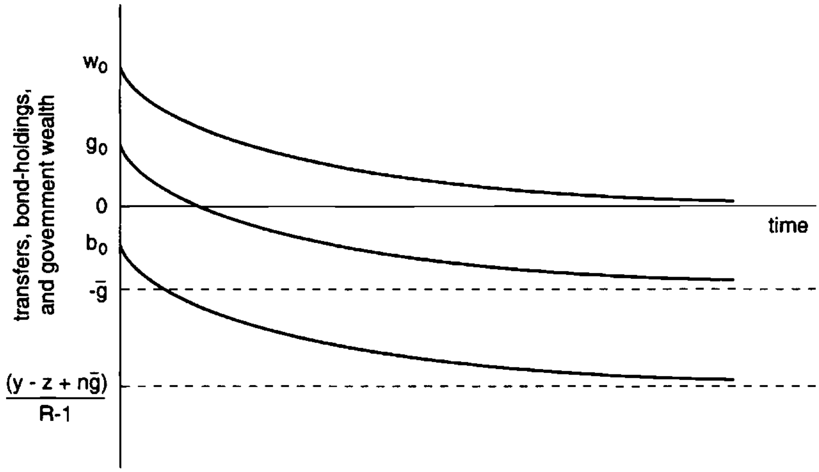

Fig. 2.1 Time path of deficits and related variables

How does the deficit bias depend on the number n of interest groups, and hence on the degree of fragmentation of the policymaking process? Since $\phi = (R - 1)/[1 + n(R - 1)]$, given policy rule (14) it is clear that each group's desired transfers are decreasing in n. However, total transfers ng_{it} are easily shown to be increasing in n. This is reflected in equation (16), which shows that the speed with which government wealth falls is also an increasing function of n. Hence, the larger the number of interest groups (the larger the degree of fragmentation in policymaking), the greater the deficit bias.

Figure 2.1 shows the behavior of transfers g_{it}, bond-holdings b_t, and government wealth w_t as a function of time.[11] The time path of transfers is particularly interesting: they are initially positive and large, fall as government wealth falls, and eventually become positive (that is, groups eventually begin paying taxes). In the limit, as time goes to infinity and government wealth goes to zero, taxes converge to their maximum feasible level $\bar{g}$.

The reason for this set of results—particularly the "deficit bias"—is simple. Property rights are not defined over each group's share of overall revenue or debt. A portion of any government wealth not spent by one group will be spent by the other group. Hence, there are incentives to raise net transfers above the collectively efficient rate. As in the "tragedy of the commons" literature, there is overconsumption and overborrowing.

Using equations (14) and (15) in equation (6), one can easily obtain the utility that each group obtains along this equilibrium path

11. Notice that initial bond-holdings can be positive or negative, as long as they are not so negative as to make initial wealth nonpositive. As drawn, initial bond-holdings are negative—that is to say, the government is a debtor.

$$V^m(b_t) = \left(\frac{R}{R-1}\right) \times \left[\log\{(R-1)b_t + y - z + n\bar{g}\} + \left(\frac{R}{R-1}\right)\log\left(\frac{R}{1+n(R-1)}\right)\right], \tag{17}$$

where "m" stands for "Markov."

Consider now what is the utility that accrues to players if stabilization is achieved—that is, if transfer behavior accords with the planner's solution. If at time t each player were to agree to transfer according to equation (7), government debt would remain constant forever, and the corresponding value would be

$$V^s(b_t) = \left(\frac{R}{R-1}\right)\log\left(\frac{(R-1)b_t + y + n\bar{g}}{n}\right), \tag{18}$$

where "s" stands for "stabilization." Comparing equations (17) and (18) we see that $V^s(b_t) > V^m(b_t)$ for any b_t. Relative to the stabilizing outcome, the path involving a fiscal deficit is characterized by two inefficiencies. First, an intratemporal one: lobbying imposes a deadweight loss, reflected in the fact that $z > 0$. Second, an intertemporal one: given that government nontax revenue is constant and the rate of discount is equal to the rate of interest, a benevolent planner maximizing a weighted average of the utility of both groups would never find it optimal to borrow. Here the groups borrow, purely for strategic reasons, and this results in lower utility for all players.[12]

2.4 Incentive Constraints and Debt Dependence

Can the two groups, acting in a decentralized manner, ever coordinate on a better outcome? Can they ever coordinate on stabilization, with net transfers at levels such that the fiscal deficit is eliminated and government debt growth stopped? To answer these questions, I focus on trigger strategy equilibria, and characterize equilibrium paths along which groups receive utilities that are at least as high as those that they could obtain by higher immediate net transfers and suffering retaliation later on.

DEFINITION 3. *A trigger strategy is an implicitly agreed upon net transfer path for each player, plus the threat of a reversion to the stationary Markov-Nash path forever the period after a defection takes place.*

Suppose the agreed-upon net transfers path is the stabilizing one, described above in equation (7).[13] If implemented starting from a level of debt b_t, such a

12. Notice that $\log n + [R/(R-1)] \log \{R/[1-n(R-1)]\} < 0$, so that $V^s(b_t) > V^m(b_t)$ even if $z = 0$, so that no intratemporal distortion exists.

13. Here I follow the tradition of the folk-theorem literature for repeated games—see, for instance, Fudenberg and Maskin 1986—and the dynamic game literature—Chari and Kehoe 1993a

path would yield utility as in equation (18). A group can always defect from the agreed-upon path, and will do so when the utility associated with defection is higher than that associated with the path.

What is the optimal defection? The nondefecting groups obviously continue to follow the policy in equation (7) during the period of defection. Given that starting the next period all will revert to the Markov-Nash path, the defecting group must solve

$$V^d(b_t) = \max_{g_{it}}\{\log(g_{it} + \bar{g}) + R^{-1}V^m(b_{t+1})\}, \tag{19}$$

subject to

$$b_{t+1} = \gamma R b_t + \left[1 - \left(\frac{n-1}{n}\right)\right](y - z_t) - g_{it}, \tag{20}$$

where $\gamma \equiv \{1 - [(n-1)/n]\,[(R-1)/R]\} < 1$, and to equation (5). Notice that in equation (19) $V^m\,(b_{t+1})$ is given by equation (17), and "d" stands for "defection." The solution to this problem is

$$\begin{aligned} g_{it} &= \gamma[(R-1)b_t + y - z] + \bar{g}\left(\frac{n-1}{R}\right) \\ &= \gamma\left(\frac{R-1}{R}\right)Rw_t - \bar{g}. \end{aligned} \tag{21}$$

Note that, since $\gamma\ [(R-1)/R] < 1/n$, condition (5) is satisfied: even when deviating and requesting relatively larger transfers, the deviating group attempts to get less than one-nth of available resources.

Using equations (19), (20), and (21), total utility from defecting when assets equal b_t can be written as

$$\begin{aligned} V^d(b_t) &= \left(\frac{R}{R-1}\right)\log[(R-1)b_t + y - z + n\bar{g}] \\ &+ \left(\frac{R}{R-1}\right)^2 \log\left(\frac{R}{1 + n(R-1)}\right) \\ &+ \left(\frac{R}{R-1}\right)\left[\log\gamma - \log\left(\frac{R}{1 + n(R-1)}\right)\right]. \end{aligned} \tag{22}$$

Notice that, as one would expect, $V^d\,(b_t) > V^m\,(b_t)$, for the expression in the second line of equation (22) is positive as long as $n > 1$. By cheating and

and b, Benhabib and Velasco 1996—in asking whether the first-best path (in this case the path with constant debt) can be sustained through trigger strategies. But clearly, in this model as in the earlier ones in the literature, one could also ask whether other, less desirable, outcomes can be sustained as well.

obtaining net transfers according to equation (21) at time t, while the remaining $(n - 1)$ groups adhere to the more frugal rule (7) during that period, group i increases its utility.[14]

We can now return to the question of whether the stabilizing, constant-debt path can ever be sustained. If both groups follow such a path, they receive utilities $V^s(b_t)$ as shown in equation (18). If a group defects, on the other hand, it receives $V^d(b_t)$, as shown in equation (22). Individual rationality dictates that the agreed-upon path will be followed if and only if $V^s(b_t) \geq V^d(b_t)$. Using equations (18) and (22), this is equivalent to

$$(23)\quad \log\left[\frac{(R-1)b_t + y + n\bar{g}}{(R-1)b_t + y + n\bar{g} - z}\right] \geq \frac{\log\left(\dfrac{R}{1 + n(R-1)}\right)}{R-1} + \log\left[n - (n-1)\left(\frac{R-1}{R}\right)\right].$$

When equation (23) is satisfied, stabilization becomes self-enforcing.

The only endogenous variable in equation (23) is the stock of government debt. There are two cases, given that the left-hand side of equation (23) is always positive and monotonically decreasing in b_t. First, if the right-hand side of equation (23) is negative, equation (23) is satisfied for all levels of debt. Second, if the right-hand side of equation (23) is positive, there is one level of debt for which equation (23) is satisfied with equality. Figure 2.2 plots $V^s(b_t)$ and $V^d(b_t)$ as a function of b_t in this second case. At low levels of debt, total utility from defecting exceeds total utility from stabilizing, but this situation is reversed as debt grows. The schedules cross once, at the point labeled b^*.

Individual rationality dictates that along an equilibrium path a group's utility must be at least as high as the utility associated with deviating from that path. In the second case above, condition (23) can be interpreted as revealing that this constraint binds at some levels of government debt but not at others. In particular, it binds at only low levels of debt: as long as the government is rich, groups are tempted to defect and consume as much as they can.

But incentives change with higher debt: because stabilization involves the elimination of the deadweight loss, the payoff associated with defecting falls more quickly than that associated with stabilization as debt rises. Put differently, the static gain associated with stabilizing becomes more desirable to groups as debt increases and the government becomes poorer. Only when the

14. In fact, the second line in equation (22) has a ready interpretation along these lines. The parameter $\gamma < 1$ is the share of government wealth left over after all other $(n - 1)$ groups have done their spending in the case of defection; the expression $R/[1 + n(R - 1)] = 1 - (n - 1)\phi$ is the share of government wealth left over after all other $(n - 1)$ groups have done their spending in the case of Markov-Nash behavior. The difference of the logarithm of the two is the welfare gain to group i of cheating on the other $(n - 1)$ groups.

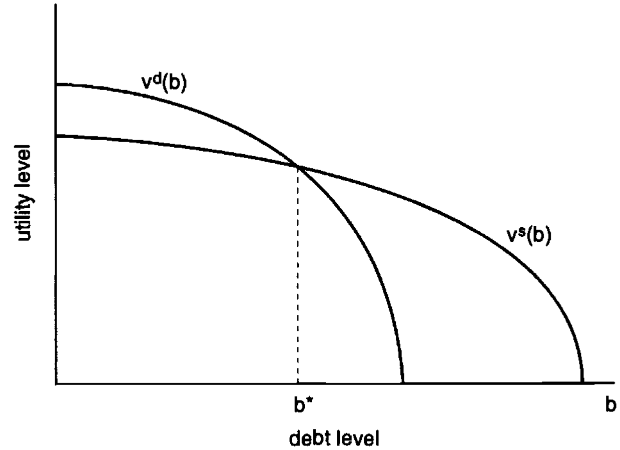

Fig. 2.2 Utility levels from stabilizing versus defecting

stock of debt is so high that the payoff associated with defection falls below that associated with stabilization does the latter become self-sustaining.

2.5 Delayed Stabilization

I have shown that stabilization may be sustainable from some levels of the stock of debt, but not from others. In particular, it could well be that the economy starts out at a level of debt sufficiently low such that stabilization is not possible. But it is not clear thus far whether and how the economy will get to the debt threshold where stabilization can be achieved. In what follows I characterize "switching equilibria" of the sort described by Benhabib and Radner (1992): groups follow an agreed-upon path until debt reaches a level such that it is individually rational to stabilize. At that point, a "switch" takes place and the fiscal deficit is eliminated. Because the necessary debt accumulation takes time, stabilization is "delayed," as in Alesina and Drazen 1991.

Just as in the case of simple trigger strategies, there are many paths for net transfers that are potentially sustainable. To keep matters simple, I focus on the case in which groups follow simple Markov-Nash transfer policies until the switch takes place.[15]

15. I have established that stabilization will occur when debt reaches b^*. Any set of spending policies that takes debt from b_0 to b^*, and that is sustainable through the threat of reversion to Markov if anyone deviates, will give rise to a switching equilibrium. There could be many such paths. More generally, it would be of interest to search for the best switching path; that would involve the difficult task of jointly choosing the best sustainable path to the switching point and after the switching point. To the best of my knowledge, there exist no general results characterizing this kind of "second best" equilibria. For some limited progress, see Benhabib and Rustichini 1991 and Benhabib and Velasco 1996.

DEFINITION 4. *A switching path is given by*

$$g_{it} = \begin{cases} \left(\frac{R}{1 + n(R - 1)}\right)\left[(R - 1)b_t + y - z + \left(\frac{n - 1}{R}\right)\bar{g}\right] & \text{if } b_t < b^* \\ \left(\frac{1}{n}\right)[(R - 1)b_t + y] & \text{if } b_t \geq b^* \end{cases}$$

DEFINITION 5. *A switching strategy consists of following the path in definition 4 as long as no one deviates. If a deviation takes place, groups revert to Markov-Nash net transfers after one period. Hence, a switching strategy is nothing but a generalized trigger strategy.*

DEFINITION 6. *A switching equilibrium for this game is represented by a set of switching strategies, one for each player, such that no group can improve its total payoff by a unilateral change in strategy at any point in the game.*

To characterize such an equilibrium one must describe the behavior of the economy prior to reaching b^*. If all groups consume according to equation (14), it will take T periods to reach b^*, where T is the smallest number such that

$$(24)\ b_T = b_0\left(\frac{R}{1 + n(R - 1)}\right)^T + \left(\frac{y - z + n\bar{g}}{R - 1}\right)\left[\left(\frac{R}{1 + n(R - 1)}\right)^T - 1\right] \geq b^*,$$

which is simply the solution to difference equation (15).

If stabilization takes place, equations (23) and (24) jointly determine the stock of debt and the time at which it will occur. In figure 2.3, equation (23) appears as the schedule RR and equation (24) appears as the schedule SS. Their intersection occurs at T and b^*.

As usual, to be an equilibrium this path must be such that the continuation value at every point of the trajectory (that is, the utility of behaving in a Markov-Nash fashion until b reaches b^* and stabilizing thereafter) must be at least as large as the value of defecting. Once $b \geq b^*$ this is indeed the case, by the definition of b^*. What about when $b < b^*$? In that case, a defecting group must solve

$$(25)\qquad V^d(b_t) = \max_{g_{it}}\{\log(g_{it} + \bar{g}) + R^{-1}V^m(b_{t+1})\}$$

subject to

$$(26)\qquad b_{t+1} = Rb_t[1 - (n - 1)\phi] + (y - z_t) - (n - 1)\mu - g_{it}$$

and to equation (5). But this is exactly the problem solved in computing the Markov-Nash equilibrium above. We know the corresponding solution is that

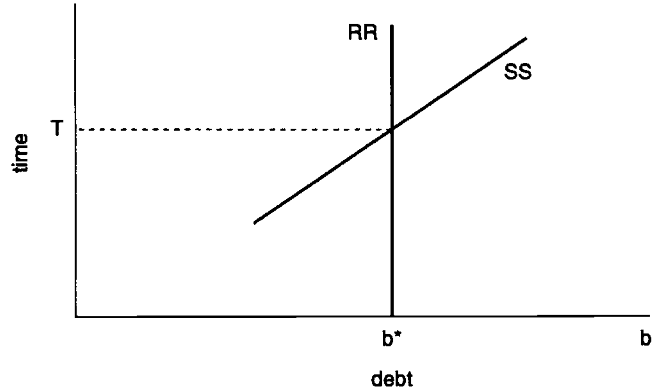

Fig. 2.3 Equilibrium time of stabilization

in equation (14). Hence, a group that—when confronted with the policy specified in definition 4 for the case of $b < b^*$—chooses to maximize its current-period utility, knowing that everyone will revert to Markov-Nash behavior in the future, does exactly what definition 4 specifies. The path is therefore also self-sustaining for the range $b < b^*$.

The conclusion is that the strategies for each group contained in definition 5 do indeed constitute an equilibrium in the sense of definition 6: they are best responses to themselves. The associated equilibrium has two phases. In the first one, when debt is low, net transfers by groups are high, a fiscal deficit occurs, and debt is accumulated. In the second, when debt reaches the relevant threshold, net transfers fall, the deficit is closed, and debt accumulation ceases. We therefore have a delayed stabilization or, more precisely, a delayed fiscal reform.

2.6 The Effects of Economic Crises

The possibility of delayed fiscal stabilization places the economy in a second-best situation, in which exogenous shocks can have unexpected effects on welfare. Hirschman (1985), in the context of the Latin American experience, conjectured that adverse external shocks may prompt economic reforms and thereby have unexpected beneficial effects. In the same vein, Drazen and Grilli (1993) showed that an economic crisis may alter relative payoffs in such a way as to reduce the equilibrium delay in implementing a stabilization program and thereby increase welfare. That paradoxical result also holds in the present model.

For simplicity, identify an economic crisis with a permanent fall (as of time 0) in exogenous nontax revenue y. This could be interpreted, for instance, as

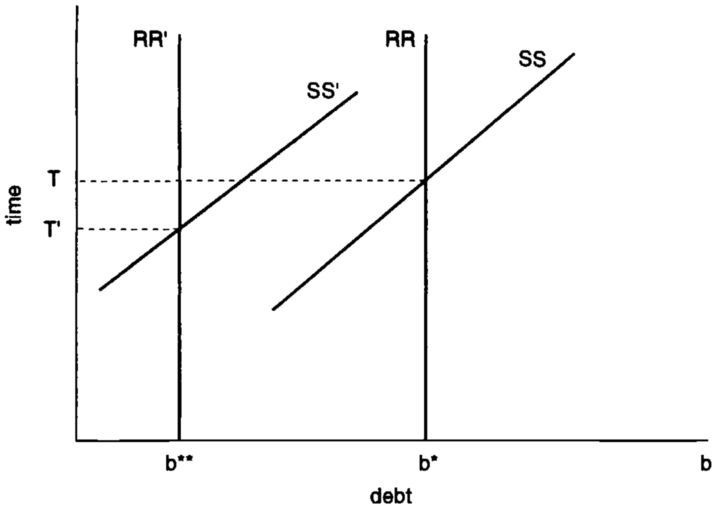

Fig. 2.4 Effect of shock to nontax revenue on time of stabilization

an adverse terms-of-trade shock that lowers the value of income from state enterprises (oil in Mexico or Indonesia, copper in Chile or Zambia).

Such a shock has two effects.[16] First, it lowers the debt threshold and the length of time that elapses before fiscal stabilization takes place. As can be seen in figure 2.4, both RR and SS shift to the left; the new intersection is such that both b^* and T fall.[17] Ceteris paribus, that raises groups' welfare: loosely, since the Markov-Nash path yields lower utility than does the stabilizing path, switching from one to the other at an earlier date must be good for welfare. But second, the permanent fall in y lowers total government resources available for making net transfers; ceteris paribus, that lowers groups' welfare.

Hence, the sign of the net effect is ambiguous, leaving open the possibility that the discounted utility that groups derive from government transfers could indeed rise as a result of the adverse shock!

2.7 Conclusions

Economists have spent much time and energy modeling the allocation of resources in those regions of the modern economy where the market system indeed does allocate resources. But there is a very large portion of such economies—the government sector—within which there are no private property rights, and where the allocation of resources does not follow market forces. If

16. Formal proofs of the statements that follow are available from the author upon request.
17. This is not obvious from the picture, but can be shown algebraically.

we move beyond the view of government as a monolithic entity that behaves like a single individual, economics must provide an account of how economic decisions are made among government groups, and how politics both frames and determines those decisions.

This paper suggests one of the simplest possible models of a government with many controllers and fragmented policymaking—one in which government net income is a "commons" from which interest groups can extract resources. This setup has striking macroeconomic implications. First, fiscal deficits emerge even when there are no reasons for intertemporal smoothing. Second, those deficits can be sometimes eliminated, but only after a delay during which government debt is built up. Thus, the model offers a plausible rationale for the tardiness in stabilizing that we often observe in real-life economies.

Appendix

Recall that in equation (4) in the text we defined the variable

$$w_t \equiv b_t + \frac{y - z + n\bar{g}}{R - 1}, \tag{A1}$$

expressed here for constant z_t. It follows from equation (A1) and budget constraint (1) in the text that

$$w_{t+1} = Rw_t - \sum_{i=1}^{n} (g_{it} + \bar{g}). \tag{A2}$$

Using definition (A1), we can write the policy rule as

$$g_{it} + \bar{g} = \phi R w_t . \tag{A3}$$

It follows that

$$\frac{g_{it+1} + \bar{g}}{g_{it} + \bar{g}} = \frac{w_{t+1}}{w_t} = 1 - (n - 1)\phi , \tag{A4}$$

where the second equality comes from Euler equation (12) in the text.

Using equation (A3) in (A2) we have

$$\frac{w_{t+1}}{w_t} = R(1 - n\phi). \tag{A5}$$

Combining equations (A4) and (A5) we have

$$1 - (n - 1)\phi = R(1 - n\phi), \tag{A6}$$

which implies $\phi = (R - 1)/[1 + n(R - 1)]$. This, together with definition (A1), reveals that $\mu = [R(y - z) + (n - 1)\bar{g}]/[1 + n(R - 1)]$, as it appears in the text.

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