11 Government domestic debt and the risk of default: a political–economic model of the strategic role of debt

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1 Introduction

Until recently, most research and controversy on macro fiscal policies was about when and whether debt-financed government deficits have real effects on aggregate output and employment. This problem has typically been studied in a model of a representative agent (or overlapping generations of representative agents) interacting with a benevolent government maximizing a Social Welfare Function. Naturally, only a limited set of issues (such as the role of fiscal policy in favouring optimal capital accumulation or in minimizing the deadweight loss of distortionary taxation) can be addressed within this framework (see Blanchard and Fischer, 1989, for an extensive discussion of this approach). Thus, a particularly important aspect of fiscal policy suppressed in this model is the (intragenerational) redistributive effect of fiscal policy and the consequent political conflicts arising from these distributional concerns. Behind the representative agent lurks a lot of heterogeneity, whether in terms of income and asset-holdings or of preferences. This paper focusses on the question of how differences in income and asset-holdings give rise to differences in preferences concerning fiscal policy and investigates how democratic political institutions solve the social choice problem of what fiscal policy to implement, when agents have conflicting preferences.

Our model is much inspired by the experience of public debt management and the political conflicts surrounding it in several European countries during the interwar period. This was a time when one of the major problems confronting the various governments was how to deal with the huge debt-overhang problem inherited from World War I. Very broadly, in several countries there was a clear conflict over fiscal policy between right-wing parties representing the interests of the rentiers (among others) and thus favouring conservative fiscal policies aimed at preserving the real value of government debt and other forms of nominal domestic savings, and left-wing parties representing the interests of the workers and unemployed and who favoured reflationary fiscal policies as well as increased expenditures on public goods. In several instance when left-wing parties were elected (as for instance the 'Cartel des Gauches' in 1924 and the 'Front Populaire' in 1936 in France) there shortly followed a period of more or less high inflation (fed by sharp increases in government spending) which amounted to a *de facto* default on public debt. Conservative governments on the contrary practiced severe fiscal restraint and endeavoured to curb inflation (see Alesina, 1988, for an illuminating survey of interwar debt policies in Europe).

We construct a model where these conflicts over fiscal policy clearly emerge as a result of differences in incomes between agents. We then analyse how fiscal policy is determined when the government is assumed to be in the hands of a political party elected through majority voting. The political party in power is assumed to pursue the interests of it own constituency rather than a general Social Welfare Function. In this paper, we restrict attention to a two-party system: the left-wing party identifies with the interests of agents having incomes below the average while the right-wing party represents those agents with incomes above the average. These party objectives give rise to fiscal policies where the left-wing party favours large government expenditure on public goods with concomitant high levels of taxation and/or high levels of indebtedness, and the right-wing party favours low levels of expenditure, low taxes and low levels of outstanding debt. The fiscal policy that is implemented is that of the party which wins the elections.

Within this model we address two sets of questions: first, what role if any does public debt play in the dynamic political game between the two parties in constraining the actions of future administrations? Second, to what extent does current fiscal policy have an impact on the outcome of future elections? Concerning the first question, large levels of outstanding debt constrain future governments both in terms of limiting future expenditure on public goods and in forcing higher levels of taxation to repay the debt. We show that a left-wing government anticipating the victory of its conservative rival in the next elections finds it worthwhile to accumulate large levels of government debt in order both to 'substitute intertemporally' the provision of public goods and to increase redistribution in the future by imposing higher levels of taxation.[1] Surprisingly, however, this is the only instance where a government wishes to exploit the commitment effect of debt. Conservative governments do not wish to constrain future left-wing governments by excessively accumulating debt. Our results are thus in contrast with the earlier work of Alesina and Tabellini, (1987a, 1988), and Persson and Svensson (1989). Section 4 deals extensively

with the *commitment effect of debt*. It discusses the precise connections between these papers and ours. It also points out that the commitment value of debt disappears when future governments are allowed to default on inherited outstanding debt. We show that current fiscal policies have an impact on the outcome of future elections only if future administrations contemplate the possibility of default (either through inflation or explicit default). Our model is one of complete information with forward-looking agents, where current fiscal policy only matters if it changes agents' preferences about future fiscal policies. It turns out that preference reversals can only occur if there is a risk of default. The basic point is as follows: a current conservative government accumulating large levels of debt can swing the outcome of future elections in its favour because its left-wing rival is rationally expected to default on the debt while the conservative party is rationally expected to repay it. The larger the outstanding debt the more voters become concerned with maintaining the real value of debt and thus the more favourably inclined they are towards a conservative administration. Large levels of debt change the outcome of elections to the extent that they shift the conflict about fiscal policy away from issues of more or less expenditure on public goods towards issues of more or less monetization of the debt. Interestingly, left-wing parties may be able to use debt in the same way as the conservative government above. The circumstances in which this happens are described in Section 5.

2 The model

We consider a closed economy with no foreign debt or lending. This economy is composed of a continuum of agents who all live for two periods. At the beginning of each period, elections are held to appoint a new government. Agents have identical preferences but different incomes. Each agent is identified by a parameter α which measures his income in each period (agents earn the same income in both periods). The source of agents' earnings is not modelled. The economy's income distribution in the absence of intertemporal transfers is given by $f(\alpha)$ with support $[0, 1]$. The individual voters' preferences are assumed to be represented by the utility function:

$$U(c_t; g_t) = \log(c_1 + g_1) + \beta \log(c_2 + g_2) \tag{1}$$

where c_t is consumption of the private good in period t and g_t is consumption of the public good; β is the discount factor. Of course, this is a rather special utility function. We adopt it mainly to make calculations tractable. Our results hold for a much wider class of utility functions.[2]

The public good, g_t, is provided by the government.[3] In fact, in our model the government's role is limited to determining the level of current expenditure on the public good and the method of financing it. In period 1 the government can choose between various combinations of tax and debt financing. In period 2 only taxes are available to finance both debt repayments and expenditure on the public good.

Throughout most of the paper we assume that income-tax rates are uniform and, to begin with, we shall make the additional assumptions that:

(i) taxes are not distortionary.

(ii) the rate of transformation between the private and the public good is equal to one. Later in the paper we relax the latter assumption.[4] We denote by τ_1 and τ_2 the tax rates in periods 1 and 2 respectively. The government can choose any tax rate between zero and one.[5] Finally, given the tax rate τ_1 in period one and given the government's expenditure on public goods g_1, and amount of public debt accumulated in period 1 is given by the government's budget constraint:

$$D = g_1 - \int_0^1 \tau_1 \alpha f(\alpha)\, d\alpha \tag{2}$$

The interest rate at which the government can borrow, r, will be determined endogenously in the model.

Now, an agent with income α, anticipating government expenditures on the public good, g_1 and g_2, financed with tax rates τ_1 and τ_2 solve the following intertemporal consumption problem:[6]

$$\left.\begin{aligned} &\max_{c_1; c_2; s} \ \log(c_1 + g_1) + \beta \log(c_2 + g_2) \\ &\text{s.t.} \quad c_1 + s \leq \alpha(1 - \tau_1) \\ &\qquad\quad c_2 \leq \alpha(1 - \tau_2) + s \cdot \rho \end{aligned}\right\} \tag{3}$$

where $\rho \equiv 1 + r$.

We model the political process as follows:

At each period there are two political parties competing to be elected: a left-wing party and a right-wing party.[7] Once a party is in power it has total control over τ_t and g_t. Prior to the election, a party cannot commit itself to pursuing a particular fiscal policy if it is elected.[8] To fix ideas, we represent the sequences of moves and events in the time-line (Figure 11.1): Whichever party get more votes is elected. How do we distinguish between a left-wing and a right-wing party? We assume that the left-wing party represents primarily the interests of those individuals whose income is below the *average income* in the economy. The right-wing party represents primarily the interests of those whose income is above the average. More specifically, we suppose that the left-wing party maximizes the interests of some income group $\alpha_L < E\alpha$; and that the right-wing party maximizes the interests of some income group $\alpha_R > E\alpha$. Both α_R and α_L are exogenously given, and we do not consider the question of how a party may wish to choose α in order to maximize the probability of being elected.

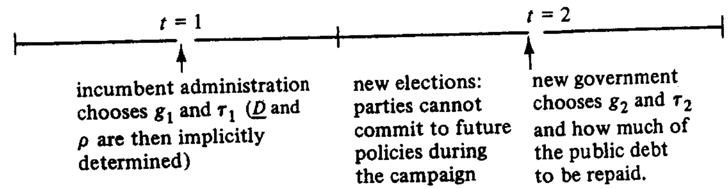

Figure 11.1 The time line

We shall be interested in the subgame-perfect equilibria of this game. As usual, one solves for these equilibria backwards. This is particularly straightforward in this model since there is perfect information and no uncertainty.[9] The only potential difficulty arises from the endogeneity of the interest rate. The individual agents' savings decisions depend on their (rational) expectations about future policy as well as on the equilibrium interest rate; and the latter simultaneously influences and depends on future policy. Before solving for the perfect equilibria of the game described above, we shall consider various scenarios which will serve as helpful benchmarks. We begin by solving for the optimal government policies when the government is respectively a social planner, a right-wing dictator and a left-wing dictator, assuming that the government does not default on outstanding public debt in period 2. Then we solve for the political equilibrium, first assuming no default and secondly, allowing the period-2 governments to default on outstanding public debt.

3 Optimal policy decisions of a social planner and of right-wing and left-wing dictators

Throughout this paper we only consider optimal time-consistent policies. These are the relevant benchmarks to compare with the dynamic political equilibrium. We call a dictator a government pursuing the interests of his own clientele and who remains in power in periods 1 and 2.[10] A social planner, on the other hand, maximizes the utility of a representative average consumer. We are particularly interested in finding out how much debt each type of government wants to accumulate in period 1.

To begin with, consider the optimal savings behaviour of an agent with income α. Solving the maximization problem (3) yields the following savings function:

$$s(\alpha;\rho,\tau_t,g_t)=\frac{\beta\rho(g_1+\alpha(1-\tau_1))-(g_2+\alpha(1-\tau_2))}{(1+\beta)\rho} \tag{4}$$

The equilibrium interest rate r is then given by the following equation:

$$\int_0^1 s(\alpha;\rho,\tau_t,g_t)f(\alpha)\,d\alpha=D \tag{5}$$

where $\rho=1+r$.

The LHS represents the net supply of savings and the RHS the demand for savings. Using equation (4) and the two government budget constraints, $g_1=\tau_1 E\alpha+D$ and $g_2=\tau_2 E\alpha-D\rho$ (where $E\alpha$ denotes the average income in the economy), one easily solves for the equilibrium interest rate:

Lemma 1: In equilibrium we have $\rho=1/\beta$ for all levels of debt $D\in[0;E\alpha\cdot\beta]$.

Proof. Obvious.

The level of outstanding debt cannot exceed $E\alpha\cdot\beta$, for otherwise the government is unable to pay back all the public debt in period 2.[11]

Consider first the optimal policy chosen by a social planner in periods 1 and 2. We suppose that the social planner maximizes the utility of a representative average consumer. The main reason for selecting this social welfare function is that it allows us to characterize a point on the Pareto-frontier abstracting from distributional issues between high- and low-income agents. This is not the case, for instance, with the utilitarian welfare function which corresponds to maximizing the sum of the utilities. The latter welfare function leads to perfect equality as the social optimum in our model.[12]

Thus, in period 2 the social planner chooses τ_2 and g_2 to maximize the utility of the consumer with income $E\alpha$:

$$\log\left[g_2+E\alpha(1-\tau_2)+\frac{s(E\alpha;\rho,\tau_t,g_t)}{\beta}\right] \tag{6}$$

where $g_2=\tau_2 E\alpha-\dfrac{D}{\beta}$. (Recall $\rho=1/\beta$ from lemma 1).

Substituting for g_2 in (6) it is clear that the social planner is indifferent between any second-period tax rate $\tau_2\in\left[\dfrac{D}{\beta E\alpha};1\right]$.[13] Since taxes are non-discretionary, and since the rate of transformation between the private and the public good is equal to one, *the social planner is indifferent between any feasible level of expenditure on public goods.*

A similar result holds in period 1. In the first period, the social planner chooses τ_1, D and g_1 to solve:

$$\left.\begin{aligned}&\max_{\tau_1;D}\ \log(c_1+g_1)+\beta\log(c_2+g_2)\\&\text{subject to: } c_1=E\alpha(1-\tau_1)-s(E\alpha;\rho,\tau_t,g_t)\\&\qquad g_1=\tau_1E\alpha+D\\&\qquad c_2=E\alpha(1-\tau_2)-s(E\alpha;\rho,\tau_t,g_t)\cdot\frac{1}{\beta}\\&\qquad g_2=\tau_2E\alpha+D\rho\end{aligned}\right\} \tag{7}$$

Now, notice that $\dfrac{d(c_i+g_i)}{d\tau_i}=0$; $(i=1,2)$. Consequently, the social planner is indifferent between any level of taxation $\tau_i\in[0,1]$. It is also straightforward to see that $\dfrac{d(c_i+g_i)}{dD}=0$; $(i=1,2)$, so that *the social planner is indifferent between any feasible level of debt and therefore between feasible level of period 1 expenditure on public goods.* This result is reminiscent of the *Ricardian equivalence theorem*, to the extent that the government's financial structure is indeterminate as a result of individuals' intertemporal arbitrage behaviour. That is to say, when the government deficit increases today, agents save more to pay future increases in taxes (note that $\dfrac{ds(\alpha;\rho,\tau_t,g_t)}{dD}=1$ so that one extra dollar of deficit today is exactly offset by an extra dollar of savings). However our result is more general than the Ricardian equivalence theorem, since government expenditure decisions here are endogenous. The indeterminacy is not only in the financial structure, but also in the optimal level of government expenditure. One might refer to this result as 'Ricardian super indeterminacy'. To complete our characterization of the social optimum note that if the social planner were allowed to default on public outstanding debt in period 2, it is easy to show that he would be indifferent between default and no default. This is altogether not surprising given that taxes are assumed to be nondistortionary.

As will become clear below, the social planner's optimal policy differs from that of a left-wing or right-wing dictator. Consider first the optimal fiscal policy of a dictator of type α in period 2 (in other words, the optimal policy of a government which represents the interests of the income-group α): the government then chooses τ_2 and g_2 to solve:

$$\left.\begin{aligned}&\max_{\tau_1;g_2}\ \log(c_2+g_2)\\&\text{subject to: } c_2=\alpha(1-\tau_2)+\rho\cdot s(\alpha;\rho,\tau_t,g_t)\\&\text{and}\qquad g_2=\tau_2\cdot E\alpha-D\rho\end{aligned}\right\} \tag{8}$$

where s, ρ, D are taken as given).

Solving (8) one easily obtains the result that if $\alpha > E\alpha$, the government chooses $g_2 = 0$ and $\tau_2 = \dfrac{D\pi}{E\alpha}$. In other words, the government chooses to minimize expenditure on the public good. Vice-versa, if $\alpha \leq E\alpha$, the government chooses $\tau_2 = 1$ and $g_2 = E\alpha - D\rho$; that is, the government maximizes expenditure on the public good.

In period 1, a dictator of type α chooses τ_1 and D to solve:

$$\left.\begin{aligned} &\max_{\tau_1;D} \log(c_1 + g_1) + \beta\log(c_2 + g_2^*) \\ &\text{subject to: } c_1 = \alpha(1 - \tau_1) - s(\alpha; \rho, \tau_t, g_t) \\ &\qquad\qquad c_2 = \alpha(1 - \tau_2^*) + s(\alpha; \rho, \tau_t, g_t)\rho \\ &\text{and} \qquad g_1 = \tau_1 E\alpha + D \\ &\qquad\qquad g_2^* = \tau_2^* E\alpha - D\rho \end{aligned}\right\} \tag{9}$$

where g_2^* and τ_2^* are the solutions to problem (8) and where

$$s(\alpha; \rho, \tau_t, g_t) = \frac{\tau_1 E\alpha + D + \alpha(1 - \tau_1) - (\tau_2^* E\alpha - D/\beta + \alpha(1 - \tau_2^*))}{\dfrac{(1+\beta)}{\beta}}$$

One can easily verify that if $\alpha \leq E\alpha$, then both $c_1 + g_1$ and $c_2 + g_2$ (as defined in (9)) are increasing in τ_1. It follows that the optimal solution is to set $\tau_1 = 1$. Vice-versa, if $\alpha > E\alpha$, then $c_1 + g_1$ and $c_2 + g_2$ are decreasing in τ_1 so that the solution then is to set $\tau_1 = 0$. Thus if a dictator wants to maximize tax revenues (and expenditure on public goods) he wants to do so in both periods. The same is true if he wants to minimize taxes. Given our assumptions on α_L and α_R, this means that *a left-wing dictator wants to maximize expenditure on public goods*, and a *right-wing dictator wants to minimize expenditure*.

It remains to determine how much debt each type of dictator is willing to incur in period 1. *A left-wing dictator, who sets $\tau_1 = \tau_2 = 1$, will be indifferent between any level of debt below $E\alpha \cdot \beta$.* This follows from the fact that both $c_1 + g_1$ and $c_2 + g_2$ (as defined in (9)) remain constant as the level of debt is changed. The left-wing dictator is indifferent between debt and taxes, since any increase in debt today implies a corresponding reduction in expenditure on the public good tomorrow so that the increase in utility from more expenditure on public goods today is exactly offset by a reduction in utility tomorrow.

To determine how much debt a right-wing dictator is willing to accumulate in period 1, it suffices again to see how $(c_1 + g_1)$ and $(c_2 + g_2)$ vary with D. The right-wing dictator minimizes public expenditures and thus sets $\tau_1 = 0$; $\tau_2 = \dfrac{D\rho}{E\alpha}$. Total consumption in periods 1 and 2, respectively, for an individual of type α_R then becomes:

$$c_1 + g_1 = D + \alpha_R - \frac{D + \dfrac{\alpha_R D}{E\alpha}\cdot\dfrac{1}{\beta}}{\dfrac{1+\beta}{\beta}} \tag{10}$$

$$c_2 + g_2 = \alpha_R\left(1 - \frac{D}{E\alpha}\cdot\frac{1}{\beta}\right) + \frac{D + \dfrac{\alpha_R D}{E\alpha}\cdot\dfrac{1}{\beta}}{(1+\beta)} \tag{11}$$

Differentiating (10) and (11) with respect to D, one obtains:

$$\frac{\partial(c_1 + g_1)}{\partial D} = \frac{1}{1+\beta}\left(1 - \frac{\alpha_R}{E\alpha}\right); \quad \frac{\partial(c_2 + g_2)}{\partial D} = \frac{1}{1+\beta}\left(1 - \frac{\alpha_R}{E\alpha}\right) \tag{12}$$

Since $\alpha_R > E\alpha$ by assumption we obtain the conclusion that a *right-wing dictator strictly prefers not to issue any public debt in period 1*. This result is all the more striking in that taxes are not distortionary in our model. The intuition behind this result is straightforward. The consumers with incomes above the average bear most of the taxation cost of servicing the debt in period 2. In fact, it is easy to verify that those consumers with incomes below the average pay less than one dollar in taxes for any one dollar of debt repayment they receive. Therefore, debt accumulation indirectly serves the role of a redistributive tax. This explains why right-wing administrations strictly prefer not to accumulate debt. It does not, however, explain why left-wing administrations are indifferent between debt accumulation and no debt accumulation. The latter result is obtained because taxes and expenditure on public goods are a (weakly) superior instrument of income redistribution; so that the role of debt in redistributing income becomes irrelevant.

4 Dynamic political equilibrium with no default

If elected, a right-wing administration will choose to minimize expenditure on the public good by setting the period-2 tax rate $\tau_2 = \max\left\{0; \dfrac{D\rho}{E\alpha}\right\}$. A left-wing administration will do the opposite and set $\tau_2 = 1$. This was established in the previous section. Note that the policy objective in period 2 of each type of administration is the same *regardless of what fiscal policy was implemented in period 1.* What affects the policy objective in period 2 is only the location of the political party in power ($\alpha_L < E\alpha < \alpha_R$).

Voters know the policy objectives of each party and rationally foresee what fiscal policy each party will implement. We assume that voters always vote and that they vote for the party implementing the fiscal policy which is in their individual best interest.[14] Our model has a useful feature which considerably simplifies the derivation of the political equilibrium in period 2: we can define an income-group, denoted by $\hat{\alpha}$, such that all voters with this income are indifferent between the policies of a right-wing government and those of a left-wing government. This income group is uniquely determined, and all voters with incomes α less than $\hat{\alpha}$ vote for the left-wing candidate and all voters with incomes above $\hat{\alpha}$ vote for the right-wing candidate. In other words, our model has the feature that income is a perfect predictor of voting behaviour. In Section 3, it was shown that a government representing the income group $E\alpha$ is indifferent between minimizing or maximizing expenditure on the public good for any given first-period fiscal policy. It follows that in our model $\hat{\alpha} = E\alpha$, and that there is a left-wing majority if the median income $\alpha_m \leqslant E\alpha$ and a right-wing majority when $\alpha_m > E\alpha$. Our discussion so far not only characterizes the second-period political equilibrium, but also establishes our first important result:

Proposition 1: *When governments cannot default on outstanding domestic debt, then past and current budget deficits have no strategic effect. In other words, public debt cannot be used to influence the outcome of future elections.*

Proposition 1 follows from the fact that each candidates' period 2 fiscal policy and the median voter's preferences remain the same for any $D \in [0, E\alpha \cdot \beta]$. Thus, with no default, public debt can only be used to *constrain* the policies of future administrations as in Alesina and Tabellini (1987a) and Persson and Svensson (1989). The remaining part of this section will be devoted to the analysis of optimal first-period fiscal policy when the incumbent party knows that it will be replaced in period 2. We determine to what extent the party in place in period 1 wants to constrain the policies of its opponent in period 2.

We begin with the case where a left-wing administration in period 1 knows that it will be followed by a right-wing administration in period 2. Such a situation might arise, for instance, if after the period-1 elections there was a shift in income distribution (or a change in tastes) such that in the new elections in period 2 there is a right-wing majority (that is, $f(\alpha)$ is such that $\alpha_m > E\alpha$). Then, the left-wing administration will choose its fiscal policy, $\mathfrak{f} \equiv (\tau_1, D, g_1)$ to maximize the utility of its clientele, anticipating the policy followed by the right-wing administration in period 2:

$$\begin{cases} \max\limits_{\tau_1, D, g_1} \log(c_1 + g_1) + \beta \log(c_2 + g_2) \\ \text{subject to:} \quad c_1 + g_1 = \tau_1 E\alpha + D + \alpha_L(1 - \tau_1) - s(\alpha_L; \rho) \\ \qquad\qquad\quad c_2 + g_2 = \alpha_L\left(1 - \dfrac{D\rho}{E\alpha}\right) + s(\alpha_L; \rho)\cdot\rho \end{cases} \tag{13}$$

where $s(\alpha_L; \rho) = s(\alpha_L; 1/\beta) = \dfrac{\tau_1 E\alpha + D + \alpha_L(1 - \tau_1) - \alpha_L\left(1 - \dfrac{D\rho}{E\alpha}\right)}{(1 + \beta)/\beta}$.

Again, it is easy to verify that $\dfrac{\partial(c_1 + g_1)}{\partial \tau_1} > 0$ and $\dfrac{\partial(c_2 + g_2)}{\partial \tau_1} > 0$, so that the left-wing government sets $\tau_1 = 1$. More interesting is the debt policy; we have:

$$\frac{\partial(c_1 + g_1)}{\partial D} = 1 - \frac{1 + \dfrac{\alpha_L}{E\alpha}\cdot\dfrac{1}{\beta}}{(1 + \beta)/\beta} = \frac{1}{1 + \beta}\left[1 - \frac{\alpha_L}{E\alpha}\right] \tag{14}$$

and

$$\frac{\partial(c_2 + g_2)}{\partial D} = \frac{1}{1 + \beta}\left[1 - \frac{\alpha_L}{E\alpha}\right] \tag{15}$$

since $\alpha_L < E\alpha$ (by assumption), we have that both period 1 and period 2 utility is increasing in D. We thus obtain our second noteworthy result:

Proposition 2: *A left-wing government followed by a right-wing government will run budget deficits in order to 'constrain' the right-wing government.*

In fact the left-wing government will choose to accumulate the maximum sustainable public debt: $D = E\alpha \cdot \beta$. The intuition behind Proposition 2 is simple. By accumulating public debt, the left-wing government can increase expenditure on public goods in period 1. This increases the period-1 utility of all consumers with incomes below the average. It is perhaps more surprising that it also increases their utility in period 2. This follows from the fact that most of the tax burden of servicing the debt falls on wealthy consumers with incomes above the average. For any one dollar of debt repayment by the right-wing government in period 2, a consumer with income less than the average is taxed less than one dollar. Thus debt accumulation with no default amounts to an indirect income transfer from the wealthy to the poor. The only income group that is neither hurt nor favoured by debt accumulation is the average-income group. It follows that, from the perspective of a left-wing party, being replaced by a right-wing party accumulation is favourable in both periods.[15]

We close this section with the case where a right-wing administration is followed by a left-wing administration. We know that the left-wing administration will choose $\tau_2 = 1$ and $g_2 = E\alpha - D\rho$, so that the right-wing administration chooses $\phi = (\tau_1, D, g_1)$ to solve:

$$\begin{cases} \max_{\tau_1, D, g_1} \log(c_1 + g_1) + \beta \log(c_2 + g_2) \\ \text{s.t.} \quad c_1 + g_1 = \tau_1 \cdot E\alpha + D + \alpha_R(1-\tau_1) \\ \qquad\qquad - \dfrac{\tau_1 E\alpha + D + \alpha_R(1-\tau_1) - (E\alpha - D/\beta)}{(1+\beta)/\beta} \\ \qquad c_2 + g_2 = E\alpha - D/\beta \\ \qquad\qquad + \dfrac{1}{\beta}\left[\dfrac{\tau_1 E\alpha + D + \alpha_R(1-\tau_1) - (E\alpha - D/\beta)}{(1+\beta)/\beta}\right] \end{cases} \tag{16}$$

Again it is straightforward to check that a right-wing administration will minimize taxes in period 1 ($\tau_1 = 0$). If we differentiate $(c_1 + g_1)$ and $(c_2 + g_2)$ with respect to D, we obtain:

$$\frac{\partial(c_1 + g_1)}{\partial D} = 1 - \frac{1 + 1/\beta}{(1+\beta)/\beta} = 0 \tag{17}$$

$$\frac{\partial(c_2 + g_2)}{\partial D} = -\frac{1}{\beta} + \frac{1}{\beta}\left[\frac{1 + 1/\beta}{(1+\beta)/\beta}\right] = 0 \tag{18}$$

This implies that a right-wing administration followed by a left-wing administration is indifferent between any level of debt $D \in \left[0, \dfrac{E\alpha}{\beta}\right]$:

Proposition 3: *A right-wing administration followed by a left-wing administration does not gain by constraining the future administration's policy choices through the accumulation of debt.*

This result is in sharp contrast to the conclusions obtained by, say Persson and Svensson (1989); and also to those obtained in the present model when a right-wing administration is followed by another right-wing administration. The reason why the right-wing incumbent is indifferent is because debt plays no indirect redistributive role when all income is taxed away in period 2. As a result, any increase in debt today resulting in an increase in period-1 utility is exactly offset by a decrease in utility in period 2, since the equilibrium interest rates is $\rho = \dfrac{1}{\beta}$.

7 Dynamic political equilibrium with costless default

We have already pointed out in Section 3 that with no distortionary taxes, a social planner is indifferent between default and no default in period 2. Our first important result of this section is that both a left-wing government and a right-wing government strictly prefer default in period 2, even though taxes are non-distortionary. We go on to show, however, that this conclusion crucially depends on the assumption that the rate of transformation between the private and the public good is (less than or) equal to one. As soon as the rate of transformation exceeds one, it is no longer generally true that both types of government strictly prefer default.

Consider first the default decision of a left-wing administration ($\alpha_L < E\alpha$) inheriting a total debt of D. We know that such an administration maximizes expenditure on public goods by setting $\tau_2 = 1$. If it defaults, total expenditure on public goods is given by $E\alpha$, and every consumer in the economy gets utility $\log E\alpha$.[16] If it does not default, then total expenditure on the public good is $E\alpha - D/\beta$ and a consumer with income α gets period-2 utility of $\log[E\alpha - D/\beta + s(\alpha, 1/\beta) \cdot 1/\beta]$. Thus a left-wing administration prefers to default if and only if: $E\alpha > E\alpha - D/\beta + s(\alpha_L; 1/\beta) \cdot 1/\beta$

$$D > s(\alpha_L; 1/\beta) \tag{19}$$

We know from the credit-market equilibrium that

$$D = \int_0^1 s(\alpha; 1/\beta) f(\alpha)\, d\alpha = Es(\alpha; 1/\beta) = s(E\alpha; 1/\beta) \tag{20}$$

The last equality in (20) follows from the linearity of the savings function $s(\alpha; 1/\beta)$ in α. Since $\alpha_L < E\alpha$, it follows that (19) is verified for all $D \in (0, E\alpha \cdot \beta)$. Thus we obtain:

Proposition 4: *A left-wing administration (such that $\alpha_L < E\alpha$) strictly prefers to default on any positive level of outstanding public debt.*

By refusing to repay the outstanding debt, a left-wing administration can increase even further its expenditure on public goods. Since savings are an increasing function of income, default becomes another form of redistributive taxation. A left-wing government represents the interests of those agents who benefit from this redistribution and therefore favours default. This is altogether not very surprising. We were, however, astonished at first to get the next result about the incentives to default of a right-wing administration. We know that the latter wants to minimize expenditure on the public good and therefore sets $\tau_2 = \max\left\{0, \dfrac{D}{\beta E\alpha}\right\}$ if it does not default. In that case, an individual with income α gets a period-2 utility of

$\log\left[\alpha\left(1-\frac{D}{\beta E\alpha}\right)+s(\alpha;1/\beta)\right]$. If the right-wing government defaults, period-2 utility becomes simply $\log\alpha$. Thus a right-wing government defaults if and only if:

$$\alpha_R > \alpha_R\left[1-\frac{D}{\beta E\alpha}\right]+s(\alpha_R;1/\beta)\cdot 1/\beta \tag{21}$$

where $\alpha_R > E\alpha$).

In words, if the cost of increased taxation required to finance debt repayments outweigh the benefits to those individuals with incomes above the average, then the right-wing government prefers to default. It turns out that the costs are always greater than the benefits for any positive level of inherited debt:

Proposition 5: *A right-wing administration such that $\alpha_R > E\alpha$ defaults on any positive level of outstanding debt.*

Proof. Condition (21) is equivalent to

$$\alpha_R\frac{D}{E\alpha} > s(\alpha_R;1/\beta)$$

where:

$$s(\alpha_R;1/\beta)=\frac{D+\alpha_R(1-\tau_1)+E\alpha\cdot\tau_1-\alpha_R\left[1-\frac{D}{\beta E\alpha}\right]}{(1+\beta)/\beta}$$

$$\leqslant\frac{D\left[1+\frac{\alpha_R}{E\alpha}\cdot\frac{1}{\beta}\right]}{(1+\beta)/\beta}$$

but

$$\alpha_R\frac{D}{E\alpha} > \frac{D\left[\beta+\frac{\alpha_R}{E\alpha}\right]}{(1+\beta)}\geqslant s(\alpha_R;1/\beta)$$

since

$$\alpha_R(1+\beta) > \beta E\alpha+\alpha_R \Leftrightarrow \alpha_R > E\alpha$$ □

We pointed out earlier that if there is no default, then the agents with incomes above the average pay more in taxes to finance debt repayment than the value of their bond holdings. It is then obvious that they should prefer the government to default. The implications of Propositions 4 and 5 are far-reaching. *If default is costless, there does not exist a rational-expectations political equilibrium where government expenditures are financed through debt* (except in the degenerate case where $\alpha_L = \alpha_m = E\alpha = \alpha_R$). This is all the more striking as taxes are not distortionary. The reason why there cannot be positive public debt in equilibrium is that no one will agree to lending to the government in period 1 if they anticipate default in period 2. Another obvious consequence of these propositions is that public debt plays neither a strategic nor a constraining role when default is costless *ex-post*.[17]

To leave it at that, however, would be misleading. It turns out that Propositions 4 and 5 are not robust to small changes in the parameters of the model. Specifically, if the rate of transformation between the private good and the public good is $1+\lambda$ ($\lambda > 0$) instead of 1, then Propositions 4 and 5 are no longer generally valid.[18]

The main modification introduced into the model the rate of transformation is given by $1+\lambda$ is that the subset of income groups preferring expenditure maximization (respectively, expenditure minimization) on public goods no longer coincides with the subset of income groups who prefer default on public debt when period-2 tax rates are maximized (respectively, minimized). As a result, there exists a range of middle-income groups who strictly prefer no default. We demonstrate this last point rigorously below and investigate the implications of this result for the dynamic political equilibrium.

When the rate of transformation between the private and the public good is less than one, supplying the public good becomes less attractive, other things being equal. As a result, one should expect fewer income groups to prefer expenditure maximization on public goods than before. This is indeed the result we obtain here: if a government representing income group α is elected in period 2, it will set the tax rate τ_2 to solve:

$$\left.\begin{aligned}&\max_{\tau_2}\ \log(c_2+g_2)\\&\text{subject to:}\quad c_2=\alpha(1-\tau_2)+s(\alpha;\rho)\cdot\rho\\&\qquad\qquad g_2=\frac{\tau_2 E\alpha-D\rho}{1+\lambda}\end{aligned}\right\} \tag{22}$$

(assuming that there is no default on public debt). Notice that any dollar raised through taxes and spent on the public good yields $\frac{1}{1+\lambda}$ more units of the public good. From the first-order conditions we obtain that

$$\left.\begin{aligned}&\tau_2^*=1 && \text{if } \alpha\leqslant\frac{E\alpha}{1+\lambda}\\&\tau_2^*=\max\left\{0;\frac{D\rho}{E\alpha}\right\} && \text{if } \alpha>\frac{E\alpha}{1+\lambda}\end{aligned}\right\} \tag{23}$$

While in the previous sections all income groups below the average income strictly preferred maximum expenditure on public goods, now only those income groups below $\frac{E\alpha}{1+\lambda}$ prefer expenditure maximization.

If the public good is more expensive to produce one should also expect that fewer income groups prefer default in order to increase expenditure on the public good, and consequently that fewer possible administrations would choose to default in period 2.

The next result shows that this intuition is indeed correct! Assuming that the first-period tax rate has been set equal to zero,[19] consider how an elected government located at α assesses a default decision:

Suppose first that $\tau_2 = 1$. In that case default is attractive if and only if:

$$\frac{E\alpha}{1+\alpha} > \frac{E\alpha - D\hat{\rho}}{1+\lambda} + s(\alpha;\hat{\rho})\cdot\hat{\rho}$$

or

$$\frac{D}{1+\lambda} > s(\alpha;\hat{\rho}) \tag{24}$$

where:

$$s(\alpha;\rho) = \frac{\beta\rho\left(\frac{D}{1+\lambda}+\alpha\right) - \frac{E\alpha - D\rho}{1+\lambda}}{(1+\beta)\rho} \tag{25}$$

and $\hat{\rho}$ is the (correctly anticipated) equilibrium interest rate in period 2 when $\tau_2 = 1$ and the elected government does not default:

We can then establish the following lemma:

Lemma 1: $\exists \underline{\alpha} \in (0, E\alpha)$ such that if τ_2 is to be chosen equal to 1, then all income groups $\alpha \in (0, \underline{\alpha})$ prefer *default* whereas all income groups $\alpha \in (\underline{\alpha}, 1)$ prefer *no default*. Furthermore $\underline{\alpha}$ is increasing in D, and $\underline{\alpha}(0) = E\alpha$.

Proof. First, the equilibrium interest rate $\hat{\rho}$, when the period-2 government is expected both to set $\tau_2 = 1$ and to avoid default, is defined by:

$$Es(\alpha;\hat{\rho}) = s(E\alpha;\hat{\rho}) = D,$$

where $s(\alpha;\rho)$ is defined in (25).

We then have, for all α:

$$\begin{aligned} s(\alpha;\hat{\rho}) &= D + (s(\alpha;\hat{\rho}) - s(E\alpha;\hat{\rho})) \\ &= D + \frac{(\alpha - E\alpha)\beta}{1+\beta} \end{aligned} \tag{26}$$

Hence (24) can be rewritten as:

$$\frac{D}{1+\lambda} > D + \frac{(\alpha - E\alpha)\beta}{1+\beta}$$

Which in turn is equivalent to:

$$\alpha < \underline{\alpha}(D) = E\alpha - \frac{(1+\beta)\lambda D}{(1+\lambda)\beta} \tag{27}$$

We immediately verify that: $\underline{\alpha}(0) = E\alpha$ and that $\underline{\alpha}$ is decreasing in D. □

In words: when the rate of transformation between public and private goods is greater than one and if $\tau_2 = 1$, the range of middle incomes which strictly prefer no default increases with the amount of outstanding debt, D.[20] Furthermore, our analysis so far implies that a (left-wing) government located between $\alpha = 0$ and $\alpha = \underline{\alpha}$ chooses $\tau_2 = 1$ and defaults on its outstanding debt; whereas a government located between $\underline{\alpha}$ and $\frac{E\alpha}{1+\lambda}$ chooses $\tau_2 = 1$ and no default.

Consider next how agents assess the default decision when the government in place in period 2 minimizes expenditure on the public good (i.e., when $\tau_2 = 0$ or $\tau_2 = \frac{D\rho}{E\alpha}$ depending on whether the government honours its debts). Then an agent earning income α strictly prefers the government to default if and only if:

$$\alpha > \alpha\left(1 - \frac{D\rho}{E\alpha}\right) + \rho\cdot s(\alpha;\rho)$$

or:

$$\frac{\alpha D}{E\alpha} > s(\alpha;\rho) = \frac{\beta\rho\left(\frac{D}{1+\lambda}+\alpha\right) - \alpha\left(1 - \frac{D\rho}{E\alpha}\right)}{(1+\beta)\rho} \tag{28}$$

($s(\alpha;\rho)$ is derived assuming that the government will not default).

We can then prove the following lemma which is similar to Lemma 1.

Lemma 2: If τ_2 is to be minimized by the period-2 government, then all income groups $\alpha < E\alpha$ prefer *no default*, and all income groups above $E\alpha$ prefer *default*.

Proof. We begin by deriving the equilibrium interest rate, ρ^*, when the period-2 government is expected to set $g_2 = 0$: the equilibrium interest rate is given by the equation:

$$Es(\alpha;\rho^*) = s(E\alpha;\rho^*) = D \tag{29}$$

where $s(\alpha;\rho)$ is defined in (28).

Now, let $g(\alpha) = \frac{\alpha D}{E\alpha} - s(\alpha;\rho^*)$

From (29), we have: $g(E\alpha) = 0$.

Furthermore g is linear in α and therefore monotonic in α. Next, we can show that the function g is increasing in α. Indeed, we have $g(1) > 0$ and

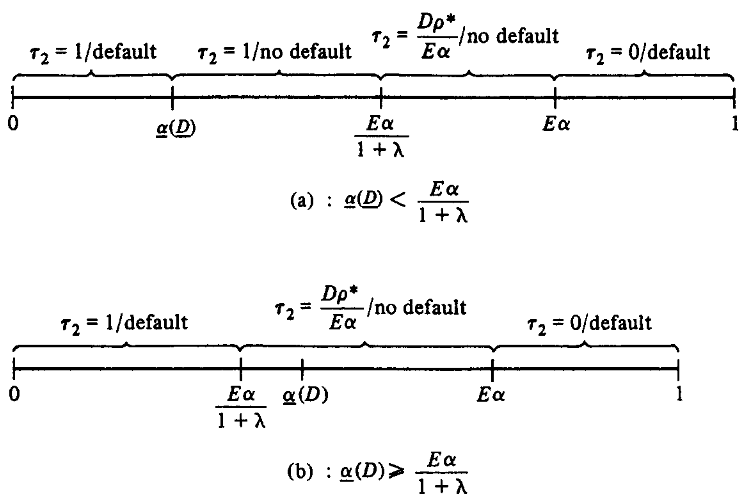

Figure 11.2 The optimal default decision

$g\left(\frac{E\alpha}{1+\lambda}\right) < 0$. This follows from the fact that when $\alpha = 1$, inequality (28) becomes equivalent to:

$$(1+\lambda)D > D\lambda + D\cdot E\alpha,$$

which is automatically true since $E\alpha < 1$; this establishes: $g(1) > 0$; when $\alpha = \frac{E\alpha}{1+\lambda}$, inequality (28) becomes equivalent to:

$$\beta\rho^*(1+\beta)D > \beta\rho^*(1+\beta)D + \beta\cdot(\rho^*\beta - 1),$$

which is violated since

$$\beta\rho^* = \frac{E\alpha(1+\lambda)}{E\alpha(1+\lambda) - D\lambda} > 1$$

hence $g\left(\frac{E\alpha}{1+\lambda}\right) < 0$ and Lemma 2 is proved. □

Lemma 2 then implies that a moderate-right-wing government located between $\frac{E\alpha}{1+\lambda}$ and $E\alpha$ chooses both no default and minimum taxation in period 2 $\left(\text{i.e. } \tau_2 = \frac{D\rho^*}{E\alpha}\right)$; on the other hand a government located between $E\alpha$ and 1 chooses to default and sets $\tau_2 = 0$.

Figure 11.2 representing the support of the income distribution function

summarizes our results about optimal tax rates in period 2 and the default decision when $\tau_1 = 0$:

As we shall now see, the presence of the middle-class of incomes *$\alpha \in [\underline{\alpha}, E\alpha]$ can create a situation where it is in the interest of a moderate right-wing party in power to excessively accumulate public debt in order to raise the likelihood of being reelected.* Recall that a left or right-wing party was (somewhat arbitrarily) defined to be a party representing primarily the interests of the income groups respectively *below* the *average* and *above* the average. Casual empiricism suggests that this is not always an unreasonble approximation. In the same spirit we shall define a *moderate-left-wing party* as one that puts more weight on middle-income groups but remains favourable to large public expenditure on public goods and a *moderate-right-wing* party as one that puts more weight on middle-income groups but prefers fiscal restraint. In terms of our model, a *moderate-left party* defends the interests of income groups $\alpha \in \left(\underline{\alpha}, \frac{E\alpha}{1+\lambda}\right)$ and a *moderate-right* party represents the interests of those groups $\alpha \in \left(\frac{E\alpha}{1+\lambda}; E\alpha\right)$.

The next two propositions establish that under certain conditions a moderate right-wing party in power in period 1 may:

(i) successfully modify the voting behaviour of the median voter by accumulating debt and thus ensure its reelection.

(ii) be better off by following that strategy of debt accumulation.

Consider the situation where $\alpha_m < \frac{E\alpha}{1+\lambda}$. Then with zero outstanding debt in period 2, there is a majority in favour of a left-wing candidate $(\alpha_L < \alpha_m)$ standing against a right-wing incumbent $\alpha_R \in \left(\frac{E\alpha}{1+\lambda}, E\alpha\right)$. We show in the first proposition that for a large enough outstanding debt, a new majority arises favouring this 'moderate' right-wing incumbent.

Proposition 6: *When α_m is close enough to $\frac{E\alpha}{1+\lambda}$, there exists a level of outstanding debt D such that all $\alpha \in [\alpha_m, 1]$ strictly prefer the right-wing candidate over the left-wing challenger.*

Proof. In what follows, we suppose that $\alpha_m < \frac{E\alpha}{1+\lambda}$ with α_m close to $\frac{E\alpha}{1+\lambda}$.

Let $D > 0$ be a level of debt such that:

(a) $\underline{\alpha}(D) < \frac{E\alpha}{1+\lambda}$.

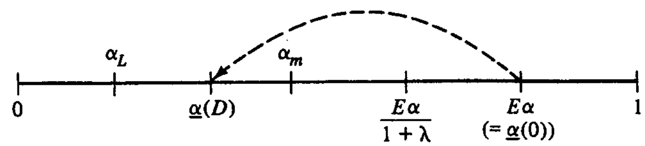

Figure 11.3 Shifting the median voter's preferences to the right

(b) $D \cdot \rho^* \leqslant E\alpha$ (where ρ^* is defined in Lemma 2).
(This condition says that it is feasible to repay the amount of debt D!).
Condition (b) is equivalent to:

$$D \leqslant \frac{\beta \cdot E\alpha}{1 + \beta \cdot \dfrac{\lambda}{1+\lambda}} \tag{30}$$

Whereas condition (a) is equivalent to:

$$D > \frac{\beta \cdot E\alpha}{1+\beta} \tag{31}$$

Note that these two inequalities (30) and (31) are consistent; they define a *non-empty set* of debt levels D.

Using the fact that $\underline{\alpha}(D)$ is continuously decreasing in D, we can always choose D sufficiently close to $\frac{\beta \cdot E\alpha}{1+\beta}$ in order to have:

$$\alpha_L < \underline{\alpha}(D) < \frac{E\alpha}{1+\lambda} \tag{32}$$

(see Figure 11.3).
For such a level of debt the left-wing candidate α_L will default in period 2 if elected; furthermore we know from the foregoing analysis that this left-wing candidate will set:

$$\tau_2 = 1 \quad \text{and} \quad g_2 = \frac{E\alpha}{1+\lambda}.$$

On the other hand the right-wing candidate α_R will *not* default on this outstanding debt, D, if elected, since we have assumed $\alpha_R < E\alpha$; furthermore we know that such a right-wing candidate will set:

$$\tau_2 = \frac{D\rho^*}{E\alpha}; \quad g_2 = 0.$$

Clearly, if the median voter α_m were located below $\underline{\alpha}(D)$, he would automatically vote for the left-wing candidate α_L since both α_m and α_L would choose $\tau_2 = 1$ *and default* in that case. However, if α_m is sufficiently close to $\frac{E\alpha}{1+\lambda}$, the level of debt D can always be chosen such that:

$$\alpha_L < \underline{\alpha}(D) < \alpha_m$$

(by continuity of $\underline{\alpha}$ w.r.t D).
For such a choice of D by the incumbent government, the median voter's most preferred period-2 policy becomes: $\tau_2 = 1$ and *no default*. However, the left-wing candidate will default on D if elected ($\alpha_L < \underline{\alpha}(D)$); and the right-wing candidate will minimize taxes τ_2

$$\left(\alpha_R > \frac{E\alpha}{1+\lambda}\right)!$$

So, the median voter must compare the losses involved in electing either of the two candidates: if the left-wing candidate is elected, the median voter gets: $\frac{E\alpha}{1+\lambda}$; if the right-wing candidate is elected he gets:

$$\alpha_m\left(1 - \frac{D\rho^*}{E\alpha}\right) + \rho^* \cdot s(\alpha_m; \rho^*).$$

(It is easy to show that the first period choice of τ_1 by the right-wing incumbent is given by $\tau_1 = 0$. Given this choice of τ_1, a left-wing party will indeed always default). Thus the median income earner (and therefore the median voter) votes for the right-wing incumbent if and only if:

$$\alpha_m\left(1 - \frac{D\rho^*}{E\alpha}\right) + \rho^* \cdot s(\alpha_m; \rho^*) > \frac{E\alpha}{1+\lambda} \tag{33}$$

Let $\alpha_m = \frac{E\alpha}{1+\lambda}$, then (35) is equivalent to

$$\frac{D\alpha_m}{E\alpha} < s(\alpha_m; \rho^*) \tag{34}$$

But from the proof of Lemma 2 we know that (34) is satisfied when $\alpha_m = \frac{E\alpha}{1+\lambda}$. By continuity, the same inequality will hold for $\alpha_m < \frac{E\alpha}{1+\lambda}$ but sufficiently close to $\frac{E\alpha}{1+\lambda}$. □

By accumulating debt the moderate right-wing incumbent makes the left-wing challenger look bad in the eyes of moderate voters. The latter care about preserving the real value of their savings (i.e., the government not defaulting); they also like large expenditures on public goods. The problem for the left-wing candidate is that he cannot commit himself both to maximizing expenditure on public goods and not defaulting on the public debt. *When it comes to choosing between no default but fiscal restraint on the one hand and increased spending on public goods, but default on outstanding debt on the other, a lower-middle class voter may well prefer the former alternative.* An incumbent moderate-right-wing party can foresee this and thus use public debt to enhance its likelihood of re-election. The question remains, whether it is in the interest of a right-wing party to follow that strategy. The next proposition establishes this.

Proposition 7: *When λ is sufficiently small and α_m is sufficiently close to $\frac{E\alpha}{1+\lambda}$ it will be in the right-wing incumbent's interest to accumulate a positive amount of debt ($D > 0$) in order to ensure its reelection.*

Proof. If the incumbent sets $D = 0$, the left-wing challenger wins the next election so that the right-wing party's total utility is given by

$$\log(\alpha_R - s(\alpha_R;0,\hat{\rho})) + \beta\log\left(\frac{E\alpha}{1+\lambda} + s(\alpha_R;0,\hat{\rho}).\hat{\rho}\right) \tag{35}$$

where: $s(\alpha_R;0,\hat{\rho}) = \dfrac{\beta\hat{\rho}.\alpha_R - \dfrac{E\alpha}{1+\lambda}}{(1+\beta)\hat{\rho}}$

and $\hat{\rho}$ is given by: $s(E\alpha;0,\hat{\rho}) = 0$

i.e.: $\hat{\rho} = \dfrac{1}{\beta(1+\lambda)}$

We can then reexpress (35) as:

$$\log\left(\alpha_R - \frac{\beta(\alpha_R - E\alpha)}{1+\beta}\right) + \beta\log\left(\frac{E\alpha}{1+\lambda} + \frac{\alpha_R - E\alpha}{(1+\lambda)(1+\beta)}\right) \tag{35'}$$

Now, suppose that the incumbent chooses the minimum amount $\underline{D}$ of debt necessary for him to reverse the outcome of the elections; when $\alpha_m = \frac{E\alpha}{1+\lambda}$, this amount is simply defined by the equation:

$$\underline{\alpha}(\underline{D}) = \frac{E\alpha}{1+\lambda} \text{ where } \alpha(D) = E\alpha - \frac{(1+\beta)\lambda D}{(1+\lambda)\beta} \tag{36}$$

which yields:

$$\underline{D} = \frac{\beta E\alpha}{1+\beta} \tag{37}$$

The incumbent right-wing's total utility in that case will be given by:

$$\log\left(\alpha_R + \frac{\underline{D}}{1+\lambda} - s(\alpha_R;\underline{D},\rho(\underline{D}))\right) + \beta\log(\alpha_R\left(1 - \frac{\underline{D}\rho(\underline{D})}{E\alpha}\right) +$$
$$s(\alpha_R;\underline{D},\rho(\underline{D})).\rho(\underline{D})) \tag{38}$$

Now we can show that for λ sufficiently small:

$$\alpha_R - \frac{\beta(\alpha_R - E\alpha)}{1+\beta} < \alpha_R\left(+ \frac{\underline{D}}{1+\lambda} - s(\alpha_R;\underline{D},\rho(\underline{D})\right) \tag{39}$$

and

$$\frac{E\alpha}{1+\lambda} + \frac{\alpha_R - E\alpha}{(1+\lambda)(1+\beta)} < \alpha_R\left(1 - \frac{\underline{D}\rho(\underline{D})}{E\alpha}\right) + s(\alpha_R;\underline{D},\rho(\underline{D}))\rho(\underline{D}) \tag{40}$$

First, from the proof of lemma 2 we know that for $\underline{D} > \underline{D}$ the equilibrium rate $\rho(\underline{D})$ is given by:

$$\rho(\underline{D}) = \frac{(1+\lambda)E\alpha}{\beta[(1+\lambda)E\alpha - \underline{D}\lambda]} \tag{41}$$

The corresponding savings for the α_R income group are equal to:

$$s(\alpha_R,\underline{D}),\rho(\underline{D})) = \frac{\beta\rho(\underline{D}).[\frac{\underline{D}}{1+\lambda} - \alpha_R(1 - \frac{\underline{D}\rho(\underline{D})}{E\alpha}}{(1+\beta)\rho(\underline{D})}$$

Inequality (5) is then equivalent to:

$$E\alpha - \alpha_R(-2\beta\lambda - 1 - \lambda - \beta^2\lambda) > 0 \tag{39'}$$

which is automatically satisfied for λ small since $\alpha_R < E\alpha$ by assumption.

Inequality (40), on the other hand, can be expressed as:

$$E\alpha\left[\frac{1}{1+\beta+\lambda} - \frac{(1+\beta)(1+\lambda)}{\beta(1+\beta+\lambda)} - \frac{1}{1+\lambda} + \frac{1}{(1+\beta)(1+\lambda)}\right] >$$
$$\alpha_R\left[\frac{1}{(1+\lambda)(1+\beta)} - 1 + \frac{1+\lambda}{1+\beta+\lambda} - \frac{(1+\lambda)(1+\beta)(1+\lambda+\beta\lambda)}{\beta(1+\beta+\lambda)}\right] \tag{40'}$$

which is automatically satisfied when $\lambda > 0$ and $\alpha_R < E\alpha$.

Proposition 7 now follows immediately from a term by term comparison of (35) and (38).

6 Conclusions

To sum up, what have we established in this section? We have shown that, even though agents are forward-looking, debt can play an important strategic role in the political game between a left-wing and a right-wing party. The particular illustration of the strategic role of debt considered here was about a right-wing party[21] accumulating excessively large amounts of debt so as to change the preferences of the median voter in its favour by creating a situation where the left-wing party appears financially irresponsible in the eyes of a majority of voters holding a substantial fraction of their savings in government bonds.

The fact that voters become more concerned about the government monetizing the debt, when they hold a substantial fraction of their savings in government bonds, seems rather plausible. In light of historical experience (at least in the 20th century) it seems equally plausible that left-wing administrations may be more inclined to erode the real value of outstanding public debt than right-wing administrations. The next step in the argument, following logically from these two observations – namely, that a right-wing administration may deliberately increase the government's indebtedness to create a problem of potential monetization of the debt so as to ensure its reelection – somehow seems less plausible. Are governments perhaps not as cynical as we make them appear in this model?

Alternatively, they may have superior instruments available to manipulate the outcome of elections. For instance, it has often been argued that a policy inducing more voters to become home-owners on even shareholders is pursued by right-wing administrations partly because home-owners tend to vote more conservatively. Exactly how this works is not clear but is the mechanism perhaps similar to the one highlighted in this paper? A third reason might be that governments may not know exactly the distribution of bond-holdings in the economy. They may then not be able to predict exactly the preferences of voters concerning default. A fourth reason, (perhaps the most important of all) is that a government accumulating large deficits may itself appear financially irresponsible and thus be voted out of office for incompetent management (recent events, however, do not seem to corroborate this explanation).

In any event, we do not wish to argue that the main interest of the model developed here is summarized in Propositions 6 and 7. Rather the whole reasoning about government action (and specifically about fiscal policy) behind these propositions is as instructive as the conclusions. Other interesting aspects of the model relate to how empirically plausible predictions about fiscal policy of one or the other party emerge from simple

assumptions about which income group's interests each party seeks to promote. Moreover a general lesson from this section is that *conflicts of interest may exist between the middle-income groups and the extremes* (very low and very high income groups). In this respect our model has similar properties as the one in Cuikerman and Meltzer (1988). These conflicts of interest are quite general and rise whenever the public good is not a perfect substitute for the private good. We expect that even if there is perfect substitution between public and private goods, such a conflict may exist if the income-tax schedule is sufficiently progressive, for then the higher income groups bear most of the costs of servicing the debt. As a result, a conflict may arise concerning the default decision between middle-income earners and the other income groups. Many aspects relating to this model of course need much further development. A systematic treatment of uncertainty is necessary. More needs to be said about the political system: how do parties choose their location and what determines the equilibrium number of parties? If there are more than two parties what political equilibrium emerges? Finally, this paper along with those of Alesina and Tabellini (1987a and b) and Persson and Svensson (1989) has highlighted some of the costs of a democratic two-party system. An interesting and important project is to investigate and formalize the benefits of such a system.

NOTES

We are particularly grateful to Alberto Alesina for introducing us to the field of Macroeconomics and Politics and for many useful comments. We would also like to thank Olivier Blanchard, Jean-Pierre Danthine, Rudiger Dornbusch, Pietro Reichlin and Philippe Weil for very helpful discussions.

1 In our model even a proportional income tax has redistributive effects.

2 Our results can be obtained for any utility function satisfying the following properties:
- private and public consumption are substitutes
- the marginal rate of substitution between the private and the public good is increasing with consumption of the private good:

$$\frac{d}{dc_1}\left\{-\frac{\partial U/\partial c_1}{\partial U/\partial g_1}\right\} < 0$$

A utility function with these properties gives rise to the basic conflict about fiscal policy in our model where agents with income below average prefer large expenditure on public goods. Similarly, the conflict in our model regarding default on public debt would arise with any utility function with the properties above.

Moreover it one assumes intertemporal separability one also obtains our result about Ricardian super indeterminacy (provided of course that the social planner only cares about Pareto-efficiency). (See Section 3 for a derivation of the result of Ricardian super indeterminacy.)

3 Given the form of the utility function, we only consider such public goods as public education, health care, social security, etc.; these can be viewed quite naturally as substitutes for private consumption.

4 Introducing distortionary taxation would not alter our main results about the political equilibrium and the commitment and strategic roles of debt. Interesting additional effects probably arise if taxes are distortionary. For instance, the political equilibrium may depend on the well known trade off between equity and efficiency. We shall pursue these additional aspects in future research.

5 In our model we have normalized the set of taxable incomes to be [0, 1]. Equivalently, we could have taken this set to be $\underline{\alpha}$, $1 + \underline{\alpha}$], with an income tax schedule composed of a tax exemption equal to $\underline{\alpha}$ and a uniform tax rate $\tau \in [0, 1]$, and redefined the consumers' utility function to be:

$$u(c) = \log(c - \underline{\alpha})$$

Note that introducing a lower bound on taxable incomes amounts to imposing an upper bound $\bar{\tau} < 1$ on the tax rate when there is no tax-exemption. By doing so, we avoid an unpleasant feature of our savings functions: namely, that agents may have positive savings even if all their income is taxed away (see footnote 11).

6 Agents can save by holding three different assets: they can hold cash which provides zero interest; they can buy government bonds with interest rate ρ; or they can lend to other agents who wish to borrow. Holding cash is always dominated by either lending to other agents or buying government bonds.

We assume that there is a perfectly competitive capital market and that private agents never default on their debts. Given these assumptions, the interest rate on private loans must always be equal to the interest rate on government bonds (when the government does not default on its debt).

7 An interesting extension of our model would be to analyse the implications for fiscal policy of having more than two parties. We shall investigate this in future research.

8 We thus assume that parties in power break their campaign pledges if this is in their interest and that there is no reputational loss from doing so. Electoral campaigns then are pure 'cheap talk'. Electoral programs have no commitment value and nobody is fooled by them. Judging from recent campaigns, this does not seem to be a very unrealistic assumption.

9 A full-blown analysis of the political game with uncertainty is beyond the scope of this paper. Several interesting issues arise with the introduction of uncertainty. We shall just mention two: to begin with, uncertainty about future income may result in uncertainty about the outcome of future elections. This may bring about default in equilibrium so that government bonds become a risky asset. Agents then face a portfolio-choice problem *ex-ante* instead of a simple savings decision. Secondly, when governments choose their debt policy in the first period they also have to make difficult compromises because of the uncertainty of the electoral outcome. Thirdly, interesting issues arise concerning default when the government is uncertain about the distribution of bond-holdings in the economy.

10 In all other respects, the dictator is identical to a democratically-elected government. In particular, our dictator is not above the law and behaves so as to respect all constitutional rules imposed on him.

n extremely useful property of $s(\alpha; \rho, \tau_t, g_t)$ for our purposes is the linearity ith respect to α. This allows us for instance to easily solve for the equilibrium iterest rate. While the shape of $s(\alpha; \rho, \tau_t, g_t)$ simplifies our analysis considerably, none of our results seem to depend directly on its specific form. This is reassuring since linearity is probably not a robust property.

There are several other noteworthy features about $s(\alpha; \rho, \tau_t, g_t)$. First, when the government runs no deficits so that $D = 0$, one observes that agents with income below average borrow from the capital market and those with incomes above average lend at the equilibrium interest rate $\rho = 1/\beta$, if and only if $\tau_1 \geqslant \tau_2$. Otherwise, the borrowing and lending functions are reversed. That is, if $\tau_1 < \tau_2$ then low-income agents save and high-income agents borrow. These predictions are modified when the government runs deficits only to the extent that the higher the supply of government bonds, the more all income-groups tend to save.

Second, a slightly awkward feature of our savings function is that agents may have positive savings even if $\tau_1 = 1$. They save, even though all their income is taxed away. This is possible since we allow for negative consumption. In foonote 5 we have argued that this unpleasant feature of our model is simply the result of a normalization. A tax rate such as $\tau_1 = 1$ should not be interpreted literally. In practice, governments have upper bounds on how much they can effectively tax income. This upper bound is normalized to equal one if our model.

12 Since individual utility functions are strictly concave and identical, the utilitarian welfare function is maximized when all individuals' consumption is equal to the average income. This outcome can be implemented by setting $\cdot = \tau_2 = 1$. For $\tau_1 = \tau_2 = 1$, it can be shown that the utilitarian social planner is different between any level of debt $D \in [0, E\alpha \cdot \beta]$.

ice τ_2 is chosen in period 2, savings must be treated as a constant.

e thus rule out voting behaviour driven by ideological considerations. This is early a very strong assumption. However, in our defence, we should point out that it has been widely observed that income is the best predictor of voting behaviour.

15 Recall that a left-wing government followed by another left-wing government does not need to accumulate debt to redistribute income, since income is more efficiently redistributed through high taxes in both periods. Debt is used only because the right-wing government sets low tax rates in period 2.

16 We assume here that the government defaults on its outstanding nominal debt by running an infinitely-high inflation, so that not only the real value of government debt is totally eroded but also the real value of other nominal assets. In practice, implicit default through inflation (monetization of the debt) seems more common than explicit default.

This is why we have focussed on this form of default. In addition, default through inflation is more costly than explicit default to the extent that it also wipes out the real value of other nominal assets. If we establish that a government has incentives to default via inflation even though this hurts its own constituency by eroding their private savings then *a fortiori* these incentives are present if the government defaults explicitly and thus does not afffect the real value of its constituency's savings.

In footnote 17 we briefly analyse the effects of explicit default. In particular we consider whether a government prefers explicit default over monetization if given a choice.

17 The difference between explicit default and monetization is that in the former case only government bonds becomes worthless while in the latter case all other nominal assets as well as government bonds see their value being eroded. Creditors therefore prefer explicit default over monetization and debtors have the reverse preferences. Given a choice between monetization or explicit default a government is all the more tempted to default explicitly on the outstanding public debt (instead of monetizing the debt) if it represents the interest of agents who are borrowers. Thus, to find out how the incentives for explicit default differ from the incentives of monetization in our model we must determine who are the borrowers and who are the lenders in the internal capital market.

The identity of the borrowers and lenders is most easily identified when there is no outstanding government debt ($D = 0$). Then the savings function is given by:

$$s(\alpha; 1/\beta, \tau_1, \tau_2) = \frac{(\tau_1 - \tau_2)(E\alpha - \alpha)}{(1 + \beta)/\beta}$$

One notes immediately that intertemporal transfers then only take place when $\tau_1 \neq \tau_2$. The reason is that an individual agent only wishes to perform intertemporal transfers at the equilibrium interest rate, when $\rho = 1/\beta$ if his or her consumption is different in the two periods. *Consumption smoothing* is the motive for intertemporal transfers! Now, an individual agent's consumption in both periods differs only if the tax-rates in both periods differ. Given that optimal tax rates in both periods are either equal to zero (when a right-wing administration is in place) or one (when the left-wing party is in power), there are only two cases to consider:

(i) $\tau_1 - \tau_2 = 1$
(ii) $\tau_1 - \tau_2 = -1$

(i) In this case, agents with incomes $\alpha < E\alpha$ save and those with incomes $\alpha > E\alpha$ borrow. When $\tau_1 = 1$ and $\tau_2 = 0$, the agents with incomes below average get a higher consumption in period 1, because of the government's policy of maximum redistribution in that period, than in period 2 (where a policy of minimum redistribution is selected). Consumption smoothing then dictates that they save. The opposite is true for agents with income above average, which is why they borrow.
(ii) This case is entirely symmetric to (i); here low-income agents borrow, in anticipation of a more redistributive policy in the future and for the exactly opposite reasons the wealthy save. (Note that these rather intuitive results depend critically on our assumptions of rational expectations on the one hand on our assumptions on the tax-treatment of savings on the other. In our model interest revenue from savings is not taxed. We appeal to the principle of no double taxation to justify this assumption. Of course this principle is never systematically applied in practice, for obvious reasons. An interesting extension of our model, thus might be to allow taxation of interest income).

Next, consider how an individual agent's savings change when the government increases the level of outstanding government debt. We have:

$$s(\alpha; 1/\beta, \tau_1, \tau_2, D) = \frac{(\tau_1 - \tau_2)(E\alpha - \alpha) + D(1 + 1/\beta)}{(1 + \beta)/\beta}$$

Thus, $\frac{ds(\cdot)}{dD} = 1$.

As the government increases D, everyone saves more so as to exactly compensate for expected future increases in taxes. Thus the identify of the borrowers and lenders of private funds is independent of the level of government debt. (Only the volume of borrowing and lending varies with D to the extent that now $\tau_2 \in \left\{1, \frac{D}{E\alpha \cdot \beta}\right\}$. In fact, the higher is D the lower is the volume of funds exchanged in the internal capital markets). Since the identity of the borrowers and lenders does not change with D it is now straightforward to determine the difference in incentives to default explicitly rather than through monetization. Basically, a left-wing government following a right-wing government ($\tau_2 = 1$; $\tau_1 = 0$) prefers monetization since its constituency is mainly composed of borrowers.In the opposite case where a right-wing government follows a left-wing government $\left(\tau_1 = 1; \tau_2 = \frac{D}{E\alpha \cdot \beta}\right)$, the right-wing government prefers monetization again, since its constituency is then composed mainly of borrowers (case (i)). In the case where a left-wing government is followed by another left-wing administration ($\tau_1 = \tau_2 = 1$) the issue does not arise. Finally when the right follows the right $\left(\tau_1 = 1; \tau_2 = \frac{D}{E\alpha \cdot \beta}\right)$ explicit default is preferred to monetization. Since, in this final case, we establish that monetization is better than no default, it follows that *a fortiori* explicit default is better than no default.

18 λ can be interpreted in several different ways. It may be a pure technological cost: to produce one unit of public good one requires $1 + \lambda$ units of private good. Alternatively, it may represent *a cost of public funds* (λ then measures the efficiency-loss of allocating funds to the public sector). Whatever interpretation one takes it is a strong assumption to suppose that the rate of transformation is constant and independent of the level of production of public goods. We maintain this assumption mainly to remain in the spirit of the model where everything is linear.

Finally, note that propositions 4 and 5 are false, only if $\lambda > 0$. *When* $\lambda \leq 0$, *all types of government* $\alpha \in [0, 1]$ *prefer to default in period 2.* (See footnote 20 for details).

19 It is easy to show that $\tau_1 = 0$ is optimal for a right-wing incumbent government. We restrict attention to the case where $\tau_1 = 0$ for expositional reasons. In fact a more general result can be established that holds for all $\tau_1 \in [0, 1]$. (See footnote 20).

20 If $\lambda < 0$, this set of income-groups is empty. All governments, no matter which income-group's interests they seek to promote, favour default *ex-post.* This can be seen as follows:

Consider first the case where $\tau_1 = 1$. Then, condition (24) becomes:

$$\frac{d}{1 + \lambda} > s(\alpha; \rho) = s(E\alpha; \rho) = D, \text{ since } \tau_2 = \tau_2 = 1.$$

In other words, default is attractive, if and only if $\lambda \leq 0$. Note that $\tau_2 = 1$ for all $\alpha \leq \frac{E\alpha}{1 + \lambda}$. Next, when $\alpha > \frac{E\alpha}{1 + \lambda}$ and $\tau_2 \in \left\{0, \frac{D\rho}{E\alpha}\right\}$, we can apply the following lemma and conclude that all types $\alpha > E\alpha$ wish to default:

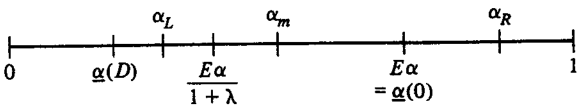

Figure 11.4 Shifting the median voter's preferences to the left

Lemma: $\frac{\alpha d}{E\alpha} > s(\alpha; \rho) \Leftrightarrow \alpha \in [E\alpha, 1]$.

Proof. We begin by deriving the equilibrium interest rate, ρ^*, when the period-2 government is expected to set $g_2 = 0$: the equilibrium interest rate is given by the equation

$$\int_0^1 s(\alpha; \rho) f(\alpha)\, d\alpha = Es(\alpha; \rho) = s(E\alpha; \rho) = D$$

or

$$\beta\rho\left[\frac{D + \tau_1 E\alpha}{1+\lambda} + E\alpha(1-\tau_1)\right] - \left[E\alpha\left(1 - \frac{D\rho}{E\alpha}\right)\right] = D(1+\beta)\rho$$

Rearranging terms one obtains:

$$\rho^* = \frac{(1+\lambda)E\alpha}{\beta[E\alpha(1 + \lambda(1-\tau_1)) - D\lambda]} \tag{28}$$

Let $\hat{\alpha}$ be the income group indifferent between default and no default, then

$$\frac{\hat{\alpha}D}{E\alpha} = s(\hat{\alpha}; \rho^*)$$

or using (29)

$$(1+\beta)\rho^* \frac{\hat{\alpha}D}{E\alpha} = \beta\rho\left(\frac{D + \tau_1 E\alpha}{1+\lambda} + \hat{\alpha}(1-\tau_1)\right) - \left(\hat{\alpha} - \frac{\hat{\alpha}D\rho^*}{E\alpha}\right)$$

The lemma now follows from the monotonicity and linearity of the savings function w.r.t. α. □

Notice that the proof works for any value $\tau_1 \in [0, 1]$ and for any λ. The condition $\frac{\alpha D}{E\alpha} > s(\alpha; \rho)$ simply says that any income group α satisfying this property prefers default when $g_2 = 0$. To summarize, when $\tau_1 = 1$ and $\lambda \leq 0$ all types of government prefer default. Moreover, when $\tau_1 = 0$ and $\tau_2 \in \left\{0, \frac{D\rho}{E\alpha}\right\}$ all types $\alpha > E\alpha$ prefer default. It remains to verify the incentives to default when $\tau_1 = 0$ and $\tau_2 = 1$. Here, it suffices to apply Lemma 1 which states that all $\alpha < \underline{\alpha}(D) \equiv E\alpha - \frac{(1+\beta)\lambda D}{(1+\lambda)\beta}$ prefer default (this lemma applies for all values of λ).

Note that for $\lambda \leq 0$ we have $\underline{\alpha}(D) \geq E\alpha$. Thus, when $\lambda \leq 0$, all governments who wish to set $\tau_2 = 1$ prefer default and all governments into wish to set $\tau_2 = 0$ prefer default as well.

21 The strategic use of debt-accumulation is not the exclusive attribute of right-wing administrations. Our model allows for the symmetric possibility that a moderate left-wing party accumulate excessively large amounts of debt so as to ensure its reelection against a right-wing opponent. Such an (implausible) situation corresponds to the political configuration shown in Figure 11.4:

(1) $\alpha_R > E\alpha$, so that the right-wing candidate defaults on the outstanding debt if reelected.

(2) $\alpha_m \in \left(\frac{E\alpha}{1+\lambda}, E\alpha\right)$, so that without debt-accumulation the right-wing candidate is elected, and with debt-accumulation the median voter prefers *no default* on the oustanding debt.

(3) $\alpha_L < \frac{E\alpha}{1+\lambda}$ but close to $\frac{E\alpha}{1+\lambda}$, so that by accumulating a sufficient amount of debt D, the left-wing party ends up being located *above* the cut-off point $\underline{\alpha}(D)$: this in turn provides the guarantee that the left-wing party will not default on D if reelected.

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Discussion

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Can public debt be used in a strategic sense by political parties? More specifically, can one envision governments altering significantly the level of their countries' public debt with a view to improving their chance of