The Politics of Intergenerational Redistribution

Guido Tabellini

Universitá di Cagliari and University of California, Los Angeles

This paper studies the political-economic equilibrium of a two-period model with overlapping generations. In each period the policy is chosen under majority rule by the generations currently alive. The paper identifies a "politically viable" set of values for public debt. Any amount of debt within this set is fully repaid in equilibrium, even without commitments. By issuing debt within this set, the first generation redistributes revenue in its favor and away from the second generation. The paper characterizes the determinants of the equilibrium intergenerational redistribution and identifies a difference between debt and social security as instruments of redistribution.

I. Introduction

This paper studies government debt as an instrument of intergenerational redistribution. Two features distinguish debt from other redistributive instruments. First, issuing debt involves the promise of future transfers from yet-unborn generations. Second, the promise is made without the consent of the future generations that will bear the burden of the redistribution. Two natural questions arise: Under what circumstances are these promises kept, and why? And can older generations take advantage of the fact that future generations do not

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participate in the decision to borrow? Both questions are addressed in this paper.

The recent interesting literature on intergenerational redistribution does not provide a satisfactory answer to these questions. Most of the literature assumes that issuing debt commits future generations to repay it.[1] But this assumption has no counterpart in any real-world political institutions. An exception is Kotlikoff, Persson, and Svensson (1988), who study an implicit reputation mechanism. However, their equilibrium is not renegotiation-proof and the equilibrium intergenerational distribution is indeterminate.[2]

In this paper, reputation does not play a role and commitment is ruled out. The policy is chosen in each period by a majority of the voters currently alive. Yet in equilibrium, debt is repaid and the old take advantage of the fact that the young do not participate in the decision to borrow. The intuitive reason is that issuing debt creates a constituency in favor of repaying it. Once debt is issued, the decision whether or not to repay it concerns both the intergenerational and the intragenerational distribution of resources: debt repudiation harms the old, but it harms the wealthy more than the poor. The desire to avoid an intragenerational redistribution may induce some young taxpayers (the children of the wealthiest debt holders) to oppose repudiating the debt. Hence debt repayment is favored by a coalition that includes both old and young voters. If debt is not too large and at the same time is sufficiently widely held, this coalition is the winning coalition.[3]

There is a precise sense in which the old take advantage of the fact that debt is issued without the consent of the young. The young who favor repaying the debt do so only ex post, once the debt is issued. If they could precommit ex ante not to repay the debt, before the debt was issued, they would all wish to do so. The reason is that ex ante the policy has only intergenerational, but no intragenerational, effects. Hence if the young could vote on the decision to issue debt, they would all oppose it.

[1] This assumption is made explicitly in Cukierman and Meltzer (1989) and implicitly in Hansson and Stuart (1989). The latter assume that a policy can be changed only if there is unanimity. Since in their model the old are always opposed to changing the policy, the unanimity requirement is equivalent to a commitment technology.

[2] A second exception is Rotemberg (1989), who studies a bargaining model between the two generations currently alive. But it is difficult to interpret this bargaining equilibrium with reference to a political institution.

[3] The idea that redistributive considerations may provide incentives not to create policy surprises has also been studied in Rogers (1986) and with respect to capital taxation in Persson and Tabellini (1989, 1990). None of these works, however, focuses on intergenerational redistribution.

Thus the lack of commitment cuts both ways. On the one hand, the inability to commit to repay the debt prevents the old generation from achieving all the desired intergenerational redistribution. But the impossibility to commit *not* to repay the debt, on the other hand, induces some of the young to vote in favor of an intergenerational transfer that ex ante they would have opposed! For this reason, issuing government debt "creates facts" that can alter future collective decisions, even without commitment.

This emphasis on the incentives to honor preexisting obligations also points to an important difference between debt and social security. If there was commitment, debt and social security would be equivalent instruments of intergenerational redistribution. But with no commitment, this equivalence disappears. The reason is that the ex post incentives to honor debt and social security are different. Debt repayment is supported by a coalition of old voters and the young children of the wealthy. This coalition is different from the one that would support a social security system. In the model of this paper, for instance, a social security system would never be viable, even if debt repayment is an equilibrium. In a related paper (Tabellini 1990), I show that social security is supported by a coalition of old voters and the poorest fraction of the young voters. These considerations may contribute to explain why debt and social security coexist in the same society at the same time. More generally, this distinction between debt and social security is reminiscent of the Lucas and Stokey (1983) result, that the maturity structure of government debt matters. There, as here, a Modigliani-Miller theorem on the equivalence of alternative public financial instruments fails to hold because of some ex post government incentive constraints.

The paper is organized as follows. Section II sets up the model of a two-period closed economy with overlapping generations. The first generation is born in period 1 and lives two periods. The second generation is born in period 2 and lives only one period. Both generations are linked by bidirectional altruism. This altruism is sufficiently weak that no private transfers occur in equilibrium; altruism matters only for how agents vote. The first generation is heterogeneous, and different individuals hold different amounts of public debt. The economic equilibrium is briefly described in Section III. Section IV analyzes the vote that takes place in the last period over how much debt to repay. Young voters trade off the benefit of debt repayment for their parents against the taxes that they have to pay. If their parents hold a very large amount of debt, young voters may favor repayment. Old voters face a similar, but opposite, trade-off. Debt repayment is a political equilibrium if debt is not too large and it is sufficiently widely held. The decision to issue debt and the determinants of the equilibrium intergenerational redistribution are studied in Section V. Finally, Section VI contains some concluding remarks.

II. The Model

Consider a two-period closed economy. In period 1 only one generation—called "parents"—is alive. In period 2 another generation—called "kids"—is born. Each parent has $1 + n$ kids. Thus $n \gtreqless 0$ is the rate of population growth. Parents live two periods and kids live one period. Both generations are altruistic. Thus the ith parent maximizes

$$W^i = U(c^i) + d^i + \delta(1 + n)V(x^i), \quad 1 > \delta > 0, \tag{1}$$

where c^i and d^i denote the parent's consumption in periods 1 and 2, respectively, and x^i denotes the kid's consumption in period 2. The ith kid maximizes

$$J^i = \frac{\gamma}{1 + n} d^i + V(x^i), \quad 1 > \gamma > 0. \tag{2}$$

The functions $U(\cdot)$ and $V(\cdot)$ are twice continuously differentiable, concave utility functions, and the coefficients δ and γ measure the altruism of parents and kids. Altruism is weighted by the rate of growth of the population. Thus as the family size increases (as n grows), parents give less weight to their own welfare relative to their kids' welfare; the opposite is true about the kids' altruism. This specification of preferences is plausible and simplifies the algebra but is not crucial for results.

I consider the following government policy. In period 1, each parent receives a nonnegative lump-sum transfer, g. The transfer is financed by issuing government debt. In period 2, the debt is repaid by a combination of taxes on the kids' income and on the outstanding debt. Clearly, if the kids pay a positive tax, this policy redistributes in favor of the parents' generation.

Different families have the same preferences but different endowments. At the beginning of life, the ith parent receives $1 + e^i$ units of nonstorable output. The individual-specific variable e^i is observed only by the ith parent. It can be either positive or negative and is distributed in the population according to a known distribution $G(\cdot)$, with zero mean, nonpositive median, and bounded support $[\underline{e}, \overline{e}]$ inside the interval $[-1, 1]$. Let s^i denote parent i's savings. Then write the ith parent's budget constraint for period 1 as

$$c^i + s^i \leq 1 + e^i + g. \tag{3}$$

The only store of value is government debt, b, that before taxes earns a gross rate of return q and is taxed (or repudiated) at the rate $1 \geq \theta \geq 0$. Hence, savings are constrained to be nonnegative: $s^i \geq 0$ for all i.

In period 2, parents cash in on their savings (if any) and receive a second endowment, a.[4] Parents can leave nonnegative bequests to their kids and kids can give nonnegative transfers (gifts) to their parents. Kids of different families are all alike. At birth they receive w units of output, which is taxed at the rate $1 \geq \tau \geq 0$. Hence, the budget constraints of parents and kids in period 2 can be written, respectively, as

$$\begin{aligned} c^i + t^i &\leq q(1-\theta)s^i + f^i(1+n) + a, \\ x^i + f^i &\leq w(1-\tau) + \frac{t^i}{1+n}, \end{aligned} \tag{4}$$

where $f^i \geq 0$ and $t^i \geq 0$ denote gifts and bequests, respectively.

There is no government consumption. Hence, if we denote average variables by omitting the i superscript, the government budget constraints are

$$g \leq b, \quad q(1-\theta)b \leq (1+n)\tau w. \tag{5}$$

Finally, period 1 equilibrium in the asset market requires that average savings equal average government debt:

$$\int_0^\infty s^i dH(s^i) = b, \tag{6}$$

where $H(\cdot)$ is the endogenous distribution of savings in the parents' population. By Walras's law, equations (3)–(6) imply that the good markets are also in equilibrium.

Tax policy is chosen by majority rule at the beginning of each period and before any private economic decision is made. In period 1, parents vote on how much debt to issue. In period 2, both parents and kids vote on the tax rate on debt, θ. The government budget constraints determine the lump-sum transfer g and the tax rate on kids, τ, residually.

A political-economic equilibrium must satisfy three conditions: (i) Economic equilibrium: for any given policy, economic decisions are optimal for private agents and markets clear. (ii) Political equilibrium:

[4] The nonnegativity constraint on savings can be relaxed, and the algebra would actually be simpler, if we assume that negative savings are subsidized at the same rate θ at which positive savings are taxed. Moreover, the only role of the second-period endowment is to ensure that in equilibrium $d^i > 0$ for all i. All the results go through identically if $a = 0$, but the proofs would be more complicated.

in every period, the policy implemented is (weakly) preferred to any other policy by a majority of the voters currently alive. (iii) Rationality: the expectations of individuals in their roles as economic agents and voters are fulfilled.

There are three features of the model that deserve special attention. First, whereas parents have heterogeneous endowments, all kids have the same income. This assumption captures the well-known fact that wealth inequality is much more pronounced than income inequality. This extreme asymmetry of the model can be relaxed, at the price of some complications, provided that the parents' wealth and the kids' income are not perfectly positively correlated. Second, since the parents' endowments are not publicly observed, individual savings are also private information. This in turn implies that nonlinear taxation of savings is not feasible. Parents can be taxed only by repudiating the debt, in proportion to how much debt they hold. Together, these two features imply that debt repudiation redistributes wealth from rich to poor families as well as across generations. Finally, since the parents' preferences are linear in their own period 2 consumption, private intergenerational transfers are the same for all families, irrespective of the parents' initial endowments. This third feature considerably simplifies the description of the political equilibrium because it implies that the voters' preferences are single-peaked. It could be replaced by a more general utility function provided that single-peakedness is satisfied.

III. The Economic Equilibrium

In this section individuals are considered in their roles as economic agents, who take the current and expected future policy as given. It is straightforward to verify that optimality for all families in period 2 implies

$$1 \geq \delta V_x(x^i) \geq \delta\gamma, \quad \text{all } i, \tag{7}$$

where a subscript on a function denotes a derivative. If the first (second) inequality is strict, the nonnegativity constraint on bequests (gifts) is binding.[5] As noted above, by (7) all households are in the same position with respect to the gift and bequest constraints: If one household is constrained, so are all the others. As a consequence, the kids' consumption is the same for all families, and from now on the superscript is dropped from x. I assume throughout that

$$1 > \delta V_x(w) > \delta\gamma. \tag{8}$$

[5] In deriving (7), I relied on the fact that $d^i > 0$ for all i and, hence, that $a > 0$ and is sufficiently large.

Thus in the absence of any government intervention, both parents and kids would like to leave negative transfers to each other. This assumption guarantees that there is a conflict of interest between the two generations and hence that there is a potential role for public policy.

The amount saved by each parent in period 1 is determined by the first-order condition

$$U_c(1 + e^i + b - s^i) \geq q(1 - \theta^e) \equiv r^e, \tag{9}$$

with equality if $s^i > 0$, where θ^e denotes the expectation of θ and r^e is the expected net-of-tax rate of return on public debt. Thus the savings of parent i can be written as

$$s^i \equiv \max(0, z + e^i), \tag{10}$$

where z is implicitly defined by

$$U_c(1 + b - z) - r^e = 0. \tag{11}$$

All parents with $e^i \leq -z$ save a zero amount. All other parents save an amount $s^i = z + e^i$.

Recalling that e^i is distributed in the population according to the cumulative function $G(\cdot)$, with support $[\underline{e}, \bar{e}]$, $\bar{e} > 0 > \underline{e}$, we can express the equilibrium condition in the market for government debt, (6), as

$$b - z[1 - G(-z)] - \int_{-z}^{\bar{e}} e^i dG(e^i) = 0. \tag{12}$$

Equations (11) and (12) jointly define the equilibrium values of z and r^e as functions of government debt: $z^* = Z(b)$ and $r^{*e} = R(b)$. Section A of the Appendix proves that $Z_b > 0$ and that $R(b)$ can be drawn as in figure 1: the equilibrium interest rate is increasing for $b \leq -\underline{e}$ and is constant for $b > -\underline{e} > 0$. To the right of point A (for $b > -\underline{e}$), every parent saves a positive amount; here, the constant interest rate simply reflects the constant marginal utility of period 2 consumption. To the left of point A (for $b \leq -\underline{e}$), the no-borrowing constraint is binding for some of the poorer parents. In this region, issuing debt raises the interest rate since some of the constrained parents must be induced to forgo current consumption and buy public debt.

I now examine the political equilibrium.

IV. Voting on Debt Repudiation

Before turning to the issue of debt repayment, consider the following policy. Suppose that in period 2 both parents and kids were to vote on a social security system that collects a tax from every kid and distributes the proceeds as a lump sum to every parent. By (8), all

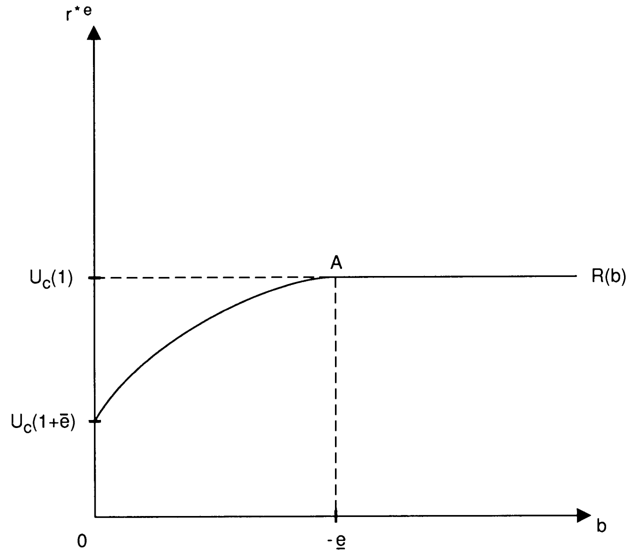

FIG. 1

parents would be in favor of such a system and all kids would oppose it. Hence, with population growth (if $n > 0$), in this model a social security system would not be politically viable under majority rule. The central result of this section is that debt repayment instead is politically viable: even though the kids outnumber the parents and even though both are eligible to vote, repudiating the debt in period 2 may be opposed by a majority of the voters.

A. *The Voters' Preferences*

In period 2, the voters take the debt outstanding and the interest rate q as given. Hence, voting for a repudiation rate θ is equivalent to choosing an actual net-of-tax rate of return on public debt, $r \equiv q(1 - \theta)$. Since θ is constrained to be in the interval $[0, 1]$, r must lie in the interval $[0, q]$.[6] Let us write the private budget constraints in terms of this ex post rate r. Inserting the government budget constraint, (5), in the private budget constraints, (4), and imposing the nonnegativity constraints on private transfers, we obtain

$$d^i + (1 + n)x \leq w(1 + n) + r(s^i - b) + a, \tag{13a}$$

[6] As noted above, the constraint $\theta \leq 1$ follows from the assumption that the endowment e^i is private information. On the other hand, the constraint $\theta \geq 0$ cannot be derived from any primitive informational assumption. In equilibrium, however, this nonnegativity constraint is never binding, as implied by proposition 2 in Sec. V.

$$d^i \leq rs^i + f^i(1 + n) + a, \tag{13b}$$

$$(1 + n)x \leq w(1 + n) - rb + t^i. \tag{13c}$$

Equation (13a) is the family budget constraint, and (13b) and (13c) are implied by the nonnegativity constraints on bequests and gifts, respectively.

Consider now the welfare effect of changing r on the ith parent, W_r^i. Applying the envelope theorem to (1) and (13) and after some transformations, we find[7]

$$W_r^i = b\left(\frac{s^i}{b} - \delta V_x\right). \tag{14}$$

By (14), each dollar of debt repaid affects the ith parent's welfare in two ways. On the one hand, it increases his wealth (and hence his utility) by s^i/b. On the other hand, it increases the tax burden on his kids by the fraction $1/(1 + n)$ of one dollar; this gives the parent a disutility of δV_x. This second effect is the same for all parents. The net welfare effect depends on the relative wealth of the ith parent and is more likely to be positive the wealthier the parent is.

The effect of changing r on the ith kid's welfare, J_r^i, depends on whether or not the bequest constraint (13b) is binding. When the constraint is not binding (i.e., if $\delta V_x = 1$), changing r affects the welfare of every kid in the same direction as that of his parent. Intuitively, changing the rate of return on debt here has the only effect of redistributing wealth across families and not across generations. On the other hand, if the bequest constraint (13b) binds, so that $t^i = 0$ and $\delta V_x < 1$, then J_r^i can be computed as illustrated above for W_r^i to obtain

$$J_r^i = \frac{b}{1 + n}\left(\gamma\frac{s^i}{b} - V_x\right), \tag{15}$$

which can be interpreted along the same lines as (14).

I now show that the following lemma is true.

LEMMA 1. In equilibrium, the nonnegativity constraint on bequests, (13b), is always binding.

[7] Equation (14) has been derived as follows. Let λ^i and μ^i be the Lagrange multipliers associated with (13b) and (13c). Then the envelope theorem implies

$$W_r^i = \lambda^i(s^i - b) + \mu^i s^i - \mu^i(1 + n)\frac{df^i}{dr}.$$

By the parents' first-order conditions, $\mu^i = 1 - \delta V_x$ and $\lambda^i = \delta V_x$. Moreover, by (8), the kids are always gift-constrained for any $b \geq 0$. Hence, $df^i/dr = 0$. Using these facts in the equation above yields (14).

Proof. By assumption, the median e^i does not exceed the average e^i. Hence, by (10) and (12), the savings of the median parent do not exceed average savings, b.[8] Thus when parents leave positive bequests, so that $\delta V_x = 1$, by (14) at least 50 percent of the parents favor a lower rate of return on debt. Next, consider the kid of a parent with average wealth, such that $s^i = b$. For him, changing r redistributes only between him and his parents and not between his family and all other families. Since he discounts the welfare of his parents, this average kid prefers a rate of return r so low that the bequest constraint is binding. All the kids of poorer parents (at least 50 percent of the kids) prefer even lower rates of return on debt, since for them reducing r also redistributes from other families to their own family. Hence, a value of r such that parents leave positive bequests cannot be supported as a political equilibrium under majority rule. Q.E.D.

This result is important for two reasons. First, it underscores that the absence of commitment matters: there is an upper bound to the amount of intergenerational redistribution that is politically viable in equilibrium. Second, this result implies that we can restrict our attention to the case in which the bequest constraint binds. In this case, the kids' preferences for the ex post rate r are given by (15).

In summary, there are two groups of voters, parents and kids. By (14) and (15), in both groups the voters' preferences can be ranked in terms of the parents' relative wealth: wealthier voters prefer higher rates of return on public debt. But parents and kids in the same family have different preferences: since δ, $\gamma < 1$, the parents prefer higher rates of return than their own kids. Finally, it can be shown that individual preferences are single-peaked. As a consequence, the equilibrium policy is that preferred by the median voter of period 2.

As will be shown in the next subsection, the median voters are a pair: a parent and a kid (not his own kid) who vote in the same way and have the same desired rate of return on public debt. Let s^m/b be the relative wealth of the median voter parent in period 2. By (14) and (13c), and the fact that $q \geq r \geq 0$, the rate of return preferred by the median voter parent is defined by

$$r = q \quad \text{if} \frac{s^m}{b} > \delta V_x\left(w - \frac{qb}{1+n}\right), \tag{16a}$$

$$r = 0 \quad \text{if} \frac{s^m}{b} < \delta V_x(w). \tag{16b}$$

[8] This can be seen by noting that eq. (9) and fig. 1 imply $b \geq z$, with strict inequality if $b < -\underline{e}$. Hence, $s^i = \max(0, z + e^i) \leq \max(0, b + e^i)$. The average e^i is zero and the median e^i is negative. Hence, for at least 50 percent of the parents, $s^i \leq \max(0, b)$.

Otherwise $r \in [q, 0]$ is defined by

$$\frac{s^m}{b} - \delta V_x\left(w - \frac{rb}{1+n}\right) = 0. \tag{16c}$$

But under rational expectations, $r = r^{*e}$ (or, equivalently, $\theta = \theta^e$), where $r^{*e} = R(b)$ is the rate that clears the market for public debt in period 1. As shown in figure 1, $R(b) > 0$ if $b > 0$. Hence by (16), in a political-economic equilibrium, government debt can be issued only in amounts that satisfy

$$\frac{s^m}{b} - \delta V_x\left(w - \frac{R(b)b}{1+n}\right) \geq 0. \tag{17}$$

This condition defines a *politically viable* set of values of public debt. Any amount of debt in this set is fully repaid in equilibrium, and any amount not in this set cannot be sold in equilibrium. I now turn to a more careful investigation of (17).[9]

B. *The Median Voter*

To characterize the politically viable set, we have to identify the median voter. That requires combining the two groups of voters, parents and kids. Consider a parent with period 2 relative wealth equal to s^i/b. By (14) and (15), the optimal rate of return for this parent is the same as that for the kid of a parent whose relative wealth s^k/b is defined by[10]

$$\frac{s^k}{b} = \frac{1}{\delta\gamma}\frac{s^i}{b} > \frac{s^i}{b}. \tag{18}$$

Equation (18) enables us to match each kid with a parent (not his own parent, but a poorer one) that votes exactly like him. Let $H(\cdot)$ be the cumulative distribution of the parents' relative wealth at the

[9] When (17) is satisfied with equality, the equilibrium value of θ is unique given q. However, the model does not pin down a unique equilibrium combination of q and θ. This occurs because, since debt is the only asset, a fully anticipated wealth tax is of no consequence whatsoever. This would not be true if there were other taxable forms of wealth with returns technologically fixed, such as land or capital. A previous version of this paper considered this extension and derived analogous but much more complicated results.

[10] Equation (18) has been obtained by setting (14) and (15) equal to zero and by noting that only δV_x in (14) and (15) depends on r. Thus (18) matches the votes, but not necessarily the preferences, of parents and kids (since for some voter the optimal rate of return could be outside the interval $[0, q]$). As stated earlier, the voters' preferences are single-peaked. Hence, the characterization of the political equilibrium in (18) and in lemma 2 below applies irrespective of whether or not any voter is at the corners 0 and q.

beginning of period 2. Then the median voters in period 2 are the parent with relative wealth s^m/b and the kid of the parent with relative wealth $s^m/\gamma\delta b$, where s^m/b is defined by

$$H\left(\frac{s^m}{b}\right) + (1 + n)H\left(\frac{s^m}{\delta\gamma b}\right) = \left[1 - H\left(\frac{s^m}{b}\right)\right] + (1 + n)\left[1 - H\left(\frac{s^m}{\delta\gamma b}\right)\right]. \tag{19}$$

The left- (right-) hand side of (19) represents all the parents and kids who prefer a rate of return on debt smaller (greater) than or equal to that preferred by the parent s^m/b. They are the poorest (richest) parents and kids. For s^m/b and $s^m/\delta\gamma b$ to be the median voter parent and kid, there must be an equal number of voters on both sides of them. This condition is illustrated in figure 2 for the case in which $s^i > 0$ for all i. The solid curve in the upper panel represents a hypothetical distribution of the parents' relative savings, $H(\cdot)$. By (18), this distribution can be mapped into the kids' distribution by matching each kid with a parent who votes like him. The solid curve in the lower panel depicts such a transformation. Since $\delta\gamma < 1$, the kids' distribution is shifted to the left and has a different shape compared to the parents' distribution; intuitively, each kid votes like a poorer parent. By construction, a parent and a kid on the same vertical line vote alike. The relative wealth of the median voter parent, s^m/b, is found by equating the sum of the two shaded areas (the one on the lower panel weighted by $1 + n$) to the (weighted) sum of the nonshaded areas.

Equation (19) simplifies to

$$H\left(\frac{s^m}{b}\right) + (1 + n)H\left(\frac{s^m}{\gamma\delta b}\right) = 1 + \frac{n}{2}, \tag{20}$$

which uniquely defines the relative wealth of the median voter parent, s^m/b, in terms of the (endogenous) cumulative distribution of relative wealth, $H(\cdot)$. Since $\delta\gamma < 1$, (20) implies that s^m/b is to the left of the median value of s^i/b (and hence also that $s^m/b < 1$), and $s^m/\gamma\delta b$ is to the right of it (see n. 11 below). Hence, as illustrated in figure 2, the coalition to the right of the median voters pair (the right-hand side of [19]) consists of a majority of the parents and a minority of the kids.

To complete the discussion of how s^m/b is determined in equilibrium, we need to derive the distribution of relative wealth, $H(\cdot)$, from the primitive distribution of initial endowments, $G(\cdot)$. Doing that results in the following lemma.

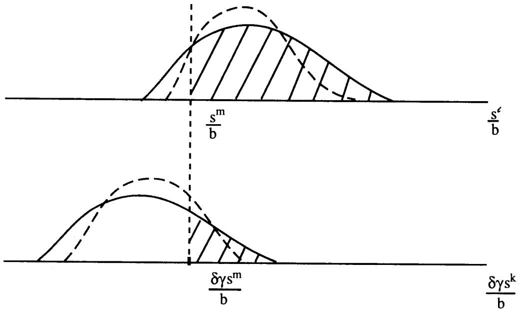

FIG. 2

LEMMA 2. In period 2 the median voter parent has relative wealth $s^m/b = S(b)$, where $S(\cdot)$ is a continuous function such that

$$\begin{aligned} S(b) &= 0 && \text{if } b \leq \tilde{b} > 0, \\ S(b) &> 0 && \text{if } b > \tilde{b}, \\ S_b(\tilde{b}) > 0,\ S_b(b) &\gtreqless 0 && \text{if } b > \tilde{b}. \end{aligned}$$

Proof. By (10), s^m/b can be expressed as a function of government debt and of the median voter's initial endowment, e_2^m:

$$\frac{s^m}{b} = \max\left(0, \frac{z^* + e_2^m}{b}\right), \tag{21}$$

where $z^* = Z(b)$ is defined implicitly by (6) and (11), as discussed in Section III above. To determine e_2^m, consider the random variable $(z^* + e^i)/b$, which is a known transformation of the random variable e^i. For any $y \geq 0$, prob$[(z^* + e^i)/b \leq y] = G(by - z^*)$. Hence, by (21) and after some simplifications, we can rewrite (20) as

$$G(e_2^m) + (1 + n)G\left[\frac{e_2^m + (1 - \delta\gamma)z^*}{\delta\gamma}\right] - 1 - \frac{n}{2} = 0. \tag{22}$$

Equation (22) implicitly defines the initial endowment of the median voter parent as a function of government debt: $e_2^m = E(b)$. By the implicit function theorem, $E(b)$ is continuous and $E_b(b) < 0$.[11]

[11] Applying the implicit function theorem to (22), we get

$$\frac{de_2^m}{db} = \frac{-G\{[e_2^m + (1 - \delta\gamma)z^*]/\delta\gamma\}}{[1 - G(-z^*)](g(e_2^m)\delta\gamma + g\{[e_2^m + (1 - \delta\gamma)z^*]/\delta\gamma\})} < 0,$$

where $g(\cdot) = G_e(\cdot)$. Hence, issuing debt changes the identity of the median voter parent: as debt rises, the median voter parent corresponds to a parent with a smaller initial endowment. Note that, since $\delta\gamma < 1$, eq. (22) implies that $e_2^m < e^m$, where e^m is the median e^i. Thus as claimed above, the median voter parent is poorer than the median.

Hence

$$\frac{s^m}{b} = \max\left[0, \frac{Z(b) + E(b)}{b}\right] \equiv S(b).$$

Differentiating this function with respect to b completes the proof. Q.E.D.

An example of the function $S(b)$ is illustrated in figure 3. Its properties as well as the threshold value $\tilde{b}$ depend on the form of the utility function, $U(\cdot)$, and on the distribution of initial endowments, $G(\cdot)$. Figure 3 has been drawn under the assumption that $U(\cdot)$ is logarithmic and $G(\cdot)$ is uniform.

The ambiguity in the slope of $S(b)$ for $b > \tilde{b}$ reflects two opposite effects of issuing government debt. Since the debt proceeds are distributed as a lump sum to every parent, issuing debt reduces the inequality of period 2 wealth. More equal wealth affects the political equilibrium in two opposite ways. On the one hand, it increases the size of the parents' coalition to the right of the median voter parent: since the median voter parent is poorer than the average ($s^m/b < 1$), more equal wealth means that there are fewer parents to the left of s^m/b and more to its right.[12] This fact tends to push s^m/b to the right and hence to increase the equilibrium rate of return on debt. Intuitively, as debt is more widely held, there are more parents who benefit from higher rates of return on debt. Thus issuing debt creates a constituency in favor of repaying it. On the other hand, more equal wealth reduces the size of the kids' coalition supporting more debt repayment. The reason is that the kids in this coalition are the wealthiest kids; as wealth becomes more equal, there are fewer such kids. This fact tends to push s^m/b to the left and, hence, to decrease the equilibrium rate of return on debt.

These two effects of issuing government debt when $s^m/b > 0$ are illustrated in figure 2. As debt rises, the parents' and the kids' distributions change as indicated by the dashed curves. The shaded area in the upper panel increases, and that in the lower panel shrinks. Depending on which of these two effects prevails, s^m/b can either increase or decrease. If the first effect prevails, $S_b > 0$, and as debt rises, there are more voters in favor of repaying it. Otherwise the opposite is true. This finding, that issuing government debt changes the political equilibrium in period 2, is important. It implies that, even in the absence of commitments, debt can be used strategically to influence future policy decisions. This implication is analyzed more thoroughly throughout the remainder of the paper.

[12] By (10) and (11) and if $s^i > 0$, then $\text{sign}[(\partial s^i/b)/\partial b] = \text{sign}(\{b - [1 - G(-z)]s^i\})$. Thus $(\partial s^i/b)/\partial b > 0$ for any parent poorer than the average.

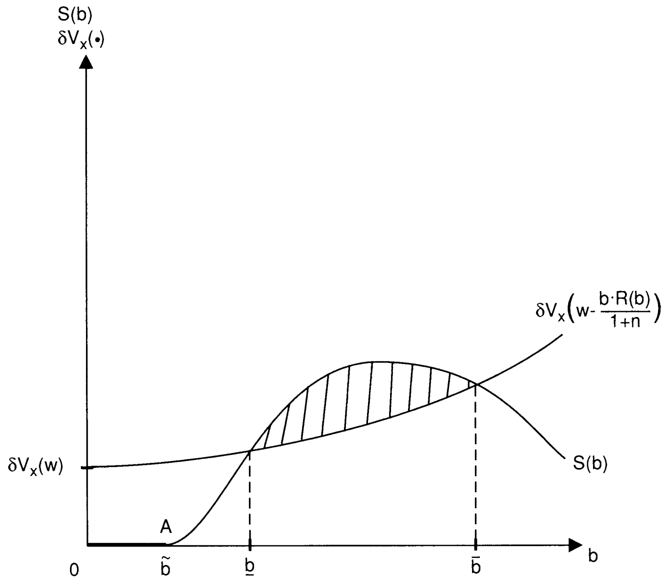

FIG. 3

C. *The Politically Viable Set*

I now turn to a discussion of the repudiation rate chosen in the political equilibrium and of how this constrains the redistributive policies that can be implemented in period 1.

Lemma 2 and condition (17) together imply the following proposition.

PROPOSITION 1. The politically viable set of values for public debt is defined by the inequality

$$S(b) - \delta V_x\left(w - \frac{R(b)b}{1+n}\right) \geq 0. \tag{23}$$

This set is illustrated in figure 3 by the interval $[\underline{b}, \bar{b}]$. The second term in (23), $\delta V_x(\cdot)$, is drawn as the upward-sloping curve. This term always has a positive slope since the function $V(\cdot)$ is concave. The first term, $S(b)$, is drawn as the curve that first increases and then decreases. As already remarked, by lemma 2 the slope of $S(b)$ is unambiguously positive only at point A in the diagram. Hence, the politically viable set could be nonconvex, or it could even be empty. The Appendix provides an example of a nonempty and convex politically viable set, similar to that of figure 3, for the case of a uniform distribution $G(\cdot)$ and logarithmic utility function $U(\cdot)$.

We already know from lemma 1 that the politically viable set is bounded from above. It turns out that it is also bounded away from zero, from below. This can be seen by noting that for any $b \leq \tilde{b}$, $S(b) = 0$, whereas $\delta V_x > 0$, so that (23) is violated. Thus under majority rule, society will choose not to repudiate only if government debt is large enough. This result may seem surprising, but it has a simple explanation. If debt is too small, it is held by a minority of the parents. Hence there will always be a majority of the voters in favor of debt repudiation. But once enough debt is issued and hence debt is sufficiently widely held, the constituency of debt holders may be large enough that repudiation is no longer viable.

If the politically viable set is nonempty, some intergenerational redistribution can take place in equilibrium, even in the absence of any commitment. This finding is particularly striking in light of the previous observation that a social security system is not viable in this economy. Why does issuing government debt succeed where a simple social security system fails? The answer is that, by issuing government debt, the parents tie together the intergenerational and the intragenerational effects of reneging on the policy. The tax on a kid to repay the debt can be much smaller than the amount reimbursed to his wealthy parent. Hence, by issuing debt, the parents gain the support of the wealthier kids for a policy that transfers income to the parents.

V. Equilibrium Intergenerational Redistribution

I now turn to a description of the political equilibrium of period 1, in which the parents vote on how much debt to issue. Two main results are derived in this section. First, I show that the parents benefit from being able to issue debt without the kids' consent. Hence, even if commitments are not feasible, the parents have a "first-mover advantage" with respect to the yet-unborn generation. Second, I characterize the determinants of the equilibrium intergenerational redistribution. Throughout the section I assume that the politically viable set is nonempty, for otherwise no debt could be issued.

Since there is no uncertainty, the voters in period 1 realize that issuing an amount b of debt in the politically viable set results in a lump-sum transfer to every parent that, in terms of period 2 consumption goods, is worth $R(b)b$ (naturally, different parents consume the transfer in different periods). The transfer is financed by a tax $\tau w = R(b)b/(1 + n)$ on the kids. No amount outside the politically viable set can be sold since nobody would buy it. Consider the welfare effect on the ith parent of marginally raising b. Repeating the procedure illustrated in Section IVA, we find

$$W_b^i = U_c^i - r^{*e}\delta V_x + bR_b\left(\frac{s^i}{b} - \delta V_x\right). \quad (24)$$

The first two terms on the right-hand side of (24) summarize the net direct effect of issuing debt: namely, to increase the parents' income by one unit (which yields a marginal utility of $U_c^i = U_c(c^i)$ to voter i) and to decrease the kids' income by r^{*e} units (which costs a disutility of $-r^{*e}\delta V_x$). Since $U_c^i \geq r^{*e}$ and $1 - \delta V_x \geq 0$, this direct effect is always nonnegative and strictly positive if the parent is bequest-constrained (i.e., if $1 - \delta V_x > 0$). The third term on the right-hand side of (24) summarizes the indirect general equilibrium effect of issuing debt, operating through the change in the interest rate. This indirect effect is evaluated differently by different consumers. Issuing debt can raise the interest rate, and this redistributes income from poor to wealthy households. Hence this third term is nonnegative for households wealthier than the average, but it can be negative for poor households.

To simplify the analysis, I assume that for all parents the direct effect always dominates the indirect effect. As shown in section B of the Appendix, this happens if

$$[1 - G(-z^*)](1 - \delta V_x)r^{*e} + G(-z^*)\delta V_x U_{cc} b > 0 \quad (25)$$

for all $b \leq -\underline{e}$, where U_{cc} is evaluated at the point $1 + b - z^*$, V_x is evaluated at the point $w - [(r^{*e}b)/(1 + n)]$, and the equilibrium conditions (9) and (12) hold. Intuitively, this condition says that for poor parents the nonnegativity constraint on bequests binds more than the nonnegativity constraint on savings. The Appendix provides an example in which $U(\cdot)$ is logarithmic and $G(\cdot)$ is uniform, in which condition (25) is satisfied for an appropriate $V(\cdot)$ function. The Appendix also proves that under (25) the parents' preferences are single-peaked and that they all would like to issue debt up to the point at which the nonnegativity constraint on bequests is not binding (i.e., up to the point at which $\delta V_x = 1$). But by lemma 1, this point is outside the politically viable set. The political equilibrium of period 1 is then very simple, as shown in proposition 2.

PROPOSITION 2. Under condition (25), with unanimity the equilibrium level of debt coincides with the upper bound of the politically viable set (point $\bar{b}$ in fig. 3).[13]

[13] If condition (25) does not hold, then the general equilibrium effects of the fiscal deficit may induce a majority of the parents to oppose issuing debt up to the upper bound of the politically viable set. In this case, the absence of commitment would not

This result underscores that incomplete political participation matters. As explained in the previous section, the equilibrium intergenerational redistribution is supported by the wealthier fraction of the kids because it is tied to the intragenerational effects of the policy. But ex ante, this tie is much weaker than ex post. Ex post, once the debt is issued and expectations have been formed, repudiating the debt redistributes wealth from rich to poor families. Ex ante, on the other hand, the intragenerational consequences of issuing debt are due only to the general equilibrium effect of issuing debt. By (25), this effect is not very large, and it disappears altogether for $b \geq -\underline{e}$. Hence, there is a difference between the ex ante and ex post attitude of the kids toward intergenerational transfers through public debt. Incomplete political participation matters because it enables the parents to exploit this difference. If the kids could also vote in period 1, they would anticipate their ex post preferences toward repaying the debt, and they would generally oppose issuing it.[14]

Hence, even in the absence of commitments, issuing government debt can "create facts" that are not reversible. To reverse the initial policy, the government would have to tax each parent in a lump-sum fashion (and to undo the general equilibrium effects of issuing debt that operate through the change in interest rate). But the government does not have the information to do this: once debt is issued, the government loses track of who holds it and in what proportion. Even though it knows the aggregate distribution of the parents' savings, the government cannot observe the amounts held by a specific individual. Hence, each parent can be taxed only in proportion to his savings and not in a lump-sum fashion. This irreversibility of the original policy is what gives rise to the difference between the ex ante and the ex post preferences of the kids. It is for this reason that the parents have a first-mover advantage with respect to the yet-unborn generations.

I now discuss how the equilibrium intergenerational redistribution is affected by changes in the underlying parameters. Throughout I assume that condition (25) holds, so that proposition 2 applies. Consider first an increase in the kids' per capita income, w. Referring to figure 3, we see that increasing w leaves the $S(b)$ curve unaffected and shifts the δV_x curve downward. Hence, a higher value of w increases the upper bound of the sustainable region and leads to more

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impose a binding constraint on the period 1 voters. This case is analogous to that studied by Cukierman and Meltzer (1989). Naturally, the results of proposition 1 concerning the politically viable set itself do not depend on condition (25). Finally, if (25) is violated, the parents' preferences are not necessarily single-peaked.

[14] All the kids would always oppose issuing a debt larger than $-\underline{e}$. Some of the wealthy kids may vote in favor of issuing a debt smaller than $-\underline{e}$.

intergenerational redistribution. The intuition is simple: when the kids' income increases, the altruistic motive of kids becomes stronger and that of the parents becomes weaker. Hence, in period 2 all voters prefer a higher rate of return on government debt, which in turn enables the parents to issue a larger amount of debt in period 1. This finding is similar to that derived by Cukierman and Meltzer (1989) under the commitment assumption.

Next, consider an increase in the rate of growth of the population, n. The curve δV_x in figure 3 shifts down since the burden of repaying the debt is now shared among a larger population of kids. It can be shown that the curve $S(b)$ is also shifted downward.[15] Intuitively, as n increases, the proportion of voters in favor of less debt repayment (the kids) rises, so that the political equilibrium of period 2 supports a smaller amount of intergenerational redistribution. Thus the net effect is ambiguous: a higher rate of population growth can lead to either more or less intergenerational redistribution, depending on the specific properties of the kids' utility function and of the initial wealth distribution.

Finally, the size of the politically viable set depends on the distribution of initial endowments, $G(\cdot)$. As discussed in Section IV*B* and illustrated in figure 2, the relationship between this set and the initial distribution of wealth is ambiguous. On the one hand, the more concentrated the initial wealth is, the smaller is the coalition of parents who support debt repayment. In the limit, if this coalition is too small, the politically viable region is empty, in which case no domestic government debt can be issued. On the other hand, if the initial wealth distribution is too equal, then the kids' coalition supporting debt repayment may be too small. In the limit, if every parent has the same wealth, then debt repudiation is equivalent to a lump-sum tax on the parents. In this case, no kid would favor repaying the debt and the viable set would also be empty. Hence, too much inequality and too little inequality both limit the politically viable intergenerational redistribution.

VI. Concluding Remarks

There is a widespread opinion that domestic government debt is honored because of reputation incentives.[16] Recently Bulow and Rogoff

[15] Using (22) (and since e_2^m is smaller than the median of e^i), we can show that e_2^m is a decreasing function of n. That is, increasing n leads to a poorer median voter parent. By (21), this then implies that s^m/b is decreasing in n.

[16] The literature on reputation and wealth taxation is surveyed in Persson and Tabellini (1989). Grossman and Van Huyck (1988) and Chari and Kehoe (1989) study reputation incentives with reference to debt repudiation.

(1989) have cast doubt on this idea by showing that reputation incentives work only if a repudiating government is shut out from world capital markets also as a lender and not just as a borrower. It is hard to believe that domestic debt repudiation would have such dismal consequences.

This paper has explored an alternative line of thought, which emphasizes the redistributive consequences of debt repudiation. The main insight of the paper is that issuing debt creates a constituency in support of repaying it. Thus issuing debt "creates facts" even in the absence of commitments. The reason is that once debt is issued, repudiation has redistributive consequences. Opposition to such a redistribution can give rise to a majority in favor of repaying the debt.

This idea has been applied in the paper to explain why a generation can extract resources from future, yet-unborn, generations. By issuing government debt, the intergenerational redistribution is tied to the intragenerational consequences of choosing how much debt to repay. Young voters motivated by the desire to avoid intragenerational redistributions may accept transferring resources to the older generation, even though they would have opposed such a transfer if it was voted on in isolation. This may explain why alternative methods of intergenerational redistribution, such as social security and government debt, coexist at the same time in the same society. These methods may be equivalent from an economic point of view. But they differ in their political viability since they tie the intergenerational aspect to other redistributive issues in a different way.

This same idea can be analyzed in alternative frameworks, unrelated to the intergenerational issue. Aghion and Bolton (1989) have independently applied it to an economy in which there is no intergenerational conflict but individuals differ in their preferences for private versus public consumption. It can be applied to more general forms of wealth taxation besides debt repudiation and to privatization decisions.

Appendix

A. Economic Equilibrium

Applying the implicit function theorem to (11) and (12), we see that $R(b)$ and $Z(b)$ are continuous functions with slope

$$R_b = -\frac{G(-z^*)U_{cc}}{1 - G(-z^*)} \geq 0,$$
$$Z_b = \frac{1}{1 - G(-z^*)} > 0. \tag{A1}$$

Consider the poorest parent, for which $e^i = \underline{e}$. By (9)–(11), the no-borrowing constraint is just binding for this parent when $b = -\underline{e}$. Hence, if $b > -\underline{e}$, all parents save a positive amount. By (12), then, if $b \geq -\underline{e}$, we have $z^* = b$ and $G(-z^*) = 0$. This, together with (9), implies $r^e = U_c(1)$ for any $b \geq -\underline{e}$. Conversely, if $b < -\underline{e}$, then the savings of at least some parents are zero. Hence, $G(-z^*) > 0$, so that by (A1) $R_b > 0$. By continuity of $R(b)$, equations (11) and (12) imply that $R(0) = U_c(1 + \bar{e})$. Hence, $R(b)$ can be drawn as in figure 1.

B. *Proof of Proposition 2*

i) Consider the case $b \leq -\underline{e}$. Using (11), we can rewrite equation (24) as

$$W_b^i = U_c^i - r^{*e}\delta V_x - \frac{G}{1 - G} U_{cc} b\left(\frac{s^i}{b} - \delta V_x\right), \tag{A2}$$

where $G(\cdot)$ is evaluated at the point $-z^*$ and $U_{cc}(\cdot)$ is evaluated at the point $1 + b - z^*$. Consider parent j, for whom $e^j = -z^*$. This parent is just borrowing constrained. Hence, for him, $s^j = 0$ and (8) holds as an equality. Thus, for this parent, (A2) yields

$$W_b^j = r^{*e}(1 - \delta V_x) + \frac{G}{1 - G} U_{cc} b\delta V_x, \tag{A3}$$

which is positive by (25).

All parents with $e^i < e^j$ also have $s^i = 0$. But since they are borrowing constrained, by (8) they also have $U_c^i > r^{*e}$. Hence, by (A2) and (A3), for all these parents, $W_b^i > W_b^j > 0$. Finally, all parents with $e^i > e^j$ save a positive amount. Hence, for them, $U_c^i = r^{*e}$ and (A2) becomes

$$W_b^i = r^{*e}(1 - \delta V_x) + \frac{G}{1 - G} U_{cc}\delta b V_x - \frac{G}{1 - G} U_{cc} s^i. \tag{A4}$$

Thus, again, $W_b^i > W_b^j > 0$. Thus under (25), $W_b^i > 0$ for all voters when b is in the range $[0, -\underline{e}]$.

ii) Next, consider the case $b > -\underline{e}$. As in the results of Section II, if $b \geq -\underline{e}$, then $s^i > 0$ for all i; in this case, $U_c^i = U_c(1) = r^{*e}$ for any $b \geq -\underline{e}$ and all i, and only the direct effects of issuing debt matter. Hence, for $b \geq -\underline{e}$, equation (24) reduces to

$$W_b^i = U_c(1)\left[1 - \delta V_x\left(w - \frac{U_c(1)b}{1 + n}\right)\right] \geq 0 \tag{24'}$$

with strict inequality if $1 - \delta V_x > 0$.

Combining cases i and ii, we then conclude that, for all voters, $W_b^i > 0$ for any value of b smaller than that for which the bequest constraint binds (i.e., for which $1 - \delta V_x > 0$). The parents then are unanimous: they all want to issue debt until $1 - \delta V_x = 0$. Q.E.D.

C. *Example*

Suppose that the distribution of initial endowments is uniform, with support $[-e, e]$, where $1 > e > 0$. Thus

$$G(e^i) = \frac{e^i + e}{2e}, \quad g(e^i) = \frac{1}{2e}. \tag{A5}$$

Suppose further that $U(c) = \ln c$. By (12), after some transformations, we obtain

$$\begin{aligned} z^* &= -e + 2\sqrt{eb} \quad \text{for } b \leq e, \\ z^* &= b \quad \text{for } b > e. \end{aligned} \tag{A6}$$

Combining (A5) and (A6), we get

$$1 - G(-z^*) = \frac{\sqrt{eb}}{e}. \tag{A7}$$

Moreover, by (11) and (A6),

$$r^{*e} = \frac{1}{1 + b - z^*} = \frac{1}{1 + b + e - 2\sqrt{eb}} \tag{A8}$$

and

$$U_{cc}(1 + b - z^*) = -\left(\frac{1}{1 + b - z^*}\right)^2 = -(r^{*e})^2. \tag{A9}$$

Combining all this information, we can rewrite (25) as

$$\frac{\sqrt{eb}}{e}(1 - \delta V_x) - \left(1 - \frac{\sqrt{eb}}{e}\right)\delta V_x b r^{*e} > 0. \tag{A10}$$

With (A8) this expression simplifies to

$$\frac{1 + b + e - 2\sqrt{eb}}{1 + e - \sqrt{eb}} > \delta V_x\left(w - \frac{r^{*e}b}{1 + n}\right), \tag{A11}$$

which is satisfied for appropriate specifications of the function $V(\cdot)$.

Retaining the same specifications for $G(\cdot)$ and $U(\cdot)$, consider now equation (22) in lemma 2. It can be rewritten as

$$\frac{e_2^m + e}{2e} + (1 + n)\frac{[e_2^m + (1 - \delta\gamma)z^*]\dfrac{1}{\delta\gamma} + e}{2e} - 1 - \frac{n}{2} = 0. \tag{A12}$$

Making use of (A6) and simplifying yields

$$e_2^m = \frac{(1 + n)(1 - \gamma\delta)(e - 2\sqrt{eb})}{1 + n + \gamma\delta}. \tag{A13}$$

Moreover, by (21) and (A6),

$$s^m = \max\left[0, 2\sqrt{eb} - e + \frac{(1 + n)(1 - \gamma\delta)(e - 2\sqrt{eb})}{1 + n + \gamma\delta}\right], \tag{A14}$$

which in turn yields

$$S(b) = \frac{s^m}{b} = \max\left(0, \frac{2\sqrt{eb} - e}{b}\phi\right), \tag{A15}$$

where $\phi = \gamma\delta(2 + n)/(1 + n + \gamma\delta)$. Thus $S(b) = 0$ for $b \leq e/4$ and $S(b) > 0$ for $b > e/4$. Moreover, for $b \geq e/4$, we have

$$S_b(b) = \frac{\phi e}{b^2\sqrt{eb}}(\sqrt{eb} - b) \tag{A16}$$

and

$$S_{bb}(b) = -\frac{\phi}{b}\left(\frac{e}{b^2} - \sqrt{eb}\right). \tag{A17}$$

By (A16), $S(b)$ reaches a maximum at the point $b = e$. Incidentally, this is the smallest value of b for which even the poorest parent is not borrowing constrained. To the left of this point, $S_b > 0$. To the right, $S_b < 0$. At the point $b = e$, we have

$$S(e) = \phi = \frac{\gamma\delta(2 + n)}{1 + n + \gamma\delta}. \tag{A18}$$

Thus S_b can be drawn as in figure 3. By (23) a sufficient condition for the sustainable set to be nonempty is

$$V_x\left(w - \frac{e}{1 + n}\right) < \frac{\gamma(2 + n)}{1 + n + \gamma\delta}. \tag{A19}$$

For if (A19) holds, then by (A8) and (17), $\delta V_x < S(b)$ at the point $b = e$.

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